http://bit.ly/2o3FkHF

Current jellyfish sting recommendations can worsen stings

Being stung by a jellyfish is one of the fastest ways to ruin a fun day at the beach. But what you do after you're stung has the potential to make you feel much better or make matters a lot worse.

Researchers at the University of Hawai'i - Mānoa (UHM) investigated whether commonly recommended first aid actions such as rinsing with seawater or scraping away tentacles lessen the severity of stings from two dangerous box jellyfish species. Their results, published this week in the journal Toxins, reveal that some of the most commonly recommended practices actually worsen stings.

"Anyone who Googles 'how to treat a jellyfish sting' will encounter authoritative web articles claiming the best thing to do is rinse the area with seawater, scrape away any remaining tentacles, and then treat the sting with ice," said Dr. Angel Yanagihara, lead author of the paper and assistant research professor at the UHM Pacific Biosciences Research Center (PBRC) and John A. Burns School of Medicine (JABSOM). "We put those methods to the test in the lab, and found they actually make stings much, much worse."

Box jellies are among the deadliest animals in the oceans, responsible for more deaths every year than sharks. Even mild stings cause severe pain and can leave horrible scars.

Yanagihara, aided by Dr. Christie Wilcox, a postdoctoral fellow at JABSOM, looked at the best ways to respond to stings from two dangerous box jelly species, the Hawaiian box jelly Alatina alata here in Hawaii and the largest box jelly in the world, the Australian box jelly Chironex fleckeri . In order to conduct the study, Yanagihara, traveled to Cape York Australia in December, 2016 to work on-site with live Chironex. For both, they examined how different ways of removing tentacles--rinsing with vinegar or seawater, scraping with a credit card, or simply plucking them off--affected the amount of venom injected during a sting using a human tissue model designed by Yanagihara. They also looked at whether treating with ice packs or hot packs reduced the damage done by the venom.

The team found that some of the most commonly recommended actions, including rinsing with seawater, scraping the tentacles, and applying ice, dramatically increased the severity of the stings. "Less than one percent of stinging cells on a tentacle actually fire when you're first stung," explained Wilcox. "So anything you do that moves the tentacles or adherent stinging cell capsules around has the potential to increase the amount of venom injected into you by many fold."

Instead of rinsing with seawater or scraping, the team found that rinsing with vinegar--which irreversibly prevents the stinging cells from firing--or even simply plucking tentacles off with tweezers led to less venom injection. And after the sting, applying heat actively decreased venom activity. Applying ice not only didn't help, for stings from the Hawaiian box jelly, it actually enhanced the venom's activity to make stings cause more than twice the damage. And, if you have it available, the team found the best way to treat a jelly sting was the combination of Sting No More® Spray and Cream, a venom-inhibiting product duo developed by Yanagihara with Hawaii Community Foundation, National Institutes of Health and Department of Defense funding.

"Box jellies are incredibly dangerous animals. The more venom they inject, the more likely a victim is to suffer severe, even life threatening symptoms," said Yanagihara. "The increases in venom injection and activity we saw in our study from methods like scraping and applying ice could mean the difference between life and death in a serious box jelly sting."

"It's all too easy to find bad advice on treating jelly stings on the internet," said Wilcox. But she also noted that such bad advice isn't solely the fault of the sites that provide it. "Even in the peer-reviewed literature, there are a lot of examples of recommendations that are made in passing in discussion sections without any direct evidence to

back them up, and then those just keep getting repeated and cited over and over even though they're not based on rigorous, empirical scientific evidence."

The team expects these statistically powered findings will prompt online medical sites, government agencies, and the broader medical community to re-evaluate the advice they provide on treating jelly stings. International collaborators and colleagues have joined in this effort and are conducting similar studies around the world using this Yanagihara-Wilcox sting model to test locally prevalent jellyfish species in a similar push to develop evidence-based medical practices.

Sting No More® (Alatalab Solutions, LLC) was developed under a Department of Defense grant that aimed to rapidly and effectively treat stings in US Special Operations Command combat divers. With the intention of supporting the development of technologies and therapies of benefit to people, the funding required a commercialization plan for resulting products. All testing of the new commercial product, in the current study was performed under an approved University of Hawai'i Conflict of Interest plan. This product demonstrates the strongly pro-innovation culture at UH dedicated to bringing to the public sector technologies that have been developed with federal and state research dollars.

http://bit.ly/2mTKDcD

Deep brain stimulation provides long-term relief from severe depressions

With electrodes, the Freiburg doctors stimulated a brain region that is involved in the perception of pleasure. It relieved symptoms of the depression in six of the eight patients.

Treatment with deep brain stimulation can provide lasting relief to patients suffering from previously non-treatable, severe forms of depression several years into the therapy or even eliminate symptoms entirely. This is the finding of the first long-term study on this form of therapy, conducted by scientists at the Medical Center - University of Freiburg. Seven of the eight patients receiving continuous stimulation in the study showed lasting improvements in their symptoms up to the last observation point four years into treatment. The therapy remained equally effective over the entire period. The scientists prevented minor side-effects from appearing by adjusting the stimulation. The study was published in the journal Brain Stimulation on 1 March 2017.

"Most of the patients respond to the therapy. The remarkable thing is that the effect is also lasting. Other forms of therapy often lose their effectiveness in the course of time. This makes deep brain stimulation a highly promising approach for people with previously non-treatable depression," says principal investigator Prof. Dr. Thomas Schläpfer, head of the Interventional Biological Psychiatry Unit at the Department of Psychiatry and Psychotherapy of the Medical Center - University of Freiburg. Deep brain stimulation is a method based on mild electric impulses that can be used to influence selected brain regions with great precision.

Stimulation Takes Effect from the First Month On

The eight test subjects had suffered continuously for three to eleven years from a severe depression that responded neither to drugs nor to psychotherapy or treatments like electroconvulsive therapy. The doctors implanted razor-thin electrodes and stimulated a brain region that is involved in the perception of pleasure and is thus also important for motivation and quality of life. The doctors evaluated the effect of the therapy each month with the help of the established Montgomery-Asberg Rating Scale (MARDS). The patients' average MARDS score fell from 30 points to 12 points already in the first month and even dropped slightly further by the end of the study. Four patients achieved a MARDS score of less then 10 points, the threshold for diagnosis of depression.

Some of the patients suffered briefly from blurred or double vision. "We managed to alleviate the side effects by reducing the intensity of the stimulation, without diminishing the antidepressant effect of the therapy," says Prof. Dr. Volker A. Coenen, head of the Stereotactic and Functional Neurosurgery Unit at the Department of Neurosurgery of the Medical Center - University of Freiburg. The doctors did not observe personality changes, thought disorders, or other side effects in any of the patients.

Larger Follow-Up Study Aims at Registration of Therapy in Europe

If a further five-year study with 50 patients currently underway at the Medical Center - University of Freiburg confirms the effectiveness and safety of the therapy, Prof. Coenen sees the possibility of registering the therapy in Europe. This would allow the therapy to be used outside of studies: "In a few years, deep brain stimulation of this kind could be an effective treatment option for patients with severe depressions," says Prof. Coenen.

Original title of the study: Deep Brain Stimulation to the Medial Forebrain Bundle for Depression- Long-term Outcomes and a Novel Data Analysis Strategy
Doi: 10.1016/j.brs.2017.01.581
Link to the study: http://www.sciencedirect.com/science/article/pii/S1935861X17306034

http://bit.ly/2ms0QtC

Backyard gene editing risks creating a monster

Biohackers have already signalled their intention to use CRISPR, which poses a big problem for the authorities

THE gene-editing revolution continues to gather pace, but it is also throwing us curveballs. One is an unexpected technical hitch (see "Mosaic problem stands in the way of gene editing embryos"). Another concerns oversight and ownership: who gets to use it, and for what?

In January, David Ishee, a dog breeder from Mississippi, told the US Food and Drug Administration that he planned to use CRISPR gene editing to fix a mutation that makes Dalmatians prone to kidney disease (see "How dogs are helping decode the genetic roots of personality").

The FDA responded by telling Ishee that he could experiment, but not sell or even give away his modified dogs. The law was recently amended so that gene-edited animals require approval before they can be sold.

But the FDA also said it would reconsider if presented with evidence that certain types of gene editing pose "minimal risk". How that will be defined or decided is not clear, but it means we could soon see a cottage industry of gene-edited animals created in biohackers' sheds.

At first glance, that seems an amazingly laissez-faire attitude towards a technology that the US director of national intelligence last year flagged as a threat to national security. Any tinkering with genes raises the spectre of bioterrorism.

In reality, the FDA is walking a fine line, trying to keep abreast of a fast-moving field without stifling innovation. It cannot allow the biohacker tail to wag the CRISPR dog. But the problem requires a more sophisticated response than retrofitting old laws to new problems.

Most biohackers are motivated by curiosity or altruism. But clearly this is not enough of a safeguard. Quite apart from the prospect of bad actors, US intelligence has also warned of "unintentional misuse".

The risk can't be contained by restricting uses of CRISPR, just as nobody can stop people making bombs out of fertiliser. But the technical simplicity that makes CRISPR such an exciting technology also risks creating an unruly beast that the authorities must find a way to tame.

http://bit.ly/2nJ8Zds

Vitamin E, selenium supplements did not prevent dementia

Antioxidant supplements vitamin E and selenium - taken alone or in combination - did not prevent dementia in asymptomatic older men, according to a study published online by JAMA Neurology.

Antioxidants as potential treatment for cognitive impairment or dementia have been of interest for years because oxidative stress has been implicated as a dementia pathway.

The Prevention of Alzheimer's Disease by Vitamin E and Selenium (PREADViSE) clinical trial initially enrolled 7,540 older men who used the supplements for an average of about five years and a subset of 3,786 men who agreed to be observed longer. The men received either vitamin E, selenium, both or a placebo.

The incidence of dementia (325 of 7,338 men [4.4 percent]) was not different among the four study groups, according to the results in the

article by Richard J. Kryscio, Ph.D., of the University of Kentucky, Lexington, and coauthors.

Limitations of the study include losing about half of the participants to long-term follow-up during the transition from a randomized clinical trial to a cohort study. Publicity about the negative effect of supplements also may have played a role, according to the authors.

"The supplemental use of vitamin E and selenium did not forestall dementia and are not recommended as preventive agents. This conclusion is tempered by the underpowered study, inclusion of only men, a short supplement exposure time, dosage considerations and methodologic limitations in relying on real-world reporting of incident cases," the article concludes.

(JAMA Neurol. Published online March 20, 2017. doi:10.1001/jamaneurol.2016.5778; available pre-embargo at the For The Media website.)

Related material: The editorial, "Preventing Dementia: Many Issues and Not Enough Time," by Steven T. DeKosky, M.D., of the University of Florida, Gainesville, and Lon S. Schneider, M.D., of the Keck School of Medicine of the University of Southern California, Los Angeles, also is available on the For The Media website.

To place an electronic embedded link in your story: Links will be live at the embargo time: *http://jamanetwork.com/journals/jamaneurology/fullarticle/10.1001/jamaneurol.2016.5778*

http://bit.ly/2mTWR4Y

Protein could prevent brain damage caused by stroke

A small protein that could protect the brain from stroke-induced injury has been discovered by researchers from The University of Queensland and Monash University.

UQ Institute for Molecular Bioscience researcher Professor Glenn King, who led the research, said the small protein showed great promise as a future stroke treatment.

"We believe that we have, for the first time, found a way to minimise the effects of brain damage after a stroke," Professor King said. "The small protein we discovered, Hi1a, blocks acid-sensing ion channels in the brain, which are key drivers of brain damage after stroke.

"During preclinical studies, we found that a single dose of Hi1a administered up to eight hours after stroke protected brain tissue and drastically improved neurological performance.

"This world-first discovery will help us provide better outcomes for stroke survivors by limiting the brain damage and disability caused by this devastating injury."

Stroke claims six million lives worldwide each year, and five million survivors are left with a permanent disability.

Professor King said he hoped this discovery could radically improve outcomes for stroke patients. "One of the most exciting things about Hi1a is that it provides exceptional levels of protection for eight hours after stroke onset, which is a remarkably long window of opportunity for treatment," he said.

"Hi1a even provides some protection to the core brain region most affected by oxygen deprivation, which is generally considered unrecoverable due to the rapid cell death caused by stroke.

"We are now working to secure financial support to fast-track this promising stroke therapy towards clinical trials."

This research was published overnight in Proceedings of the National Academy of Sciences of the United States of America.

It involved scientists from UQ's Institute for Molecular Bioscience, School of Biomedical Sciences, Queensland Brain Institute, and Centre for Advanced Imaging; and Monash University's Biomedical Discovery Institute and Department of Pharmacology.

http://bit.ly/2nBivi2

First patient cured of rare blood disorder

Chicagoan receives stem cell transplant for CDA

Using a technique that avoids the use of high-dose chemotherapy and radiation in preparation for a stem cell transplant, physicians at the University of Illinois Hospital & Health Sciences System have documented the first cure of an adult patient with congenital dyserythropoietic anemia. CDA is a rare blood disorder in which the body does not produce enough red blood cells, causing progressive organ damage and early death.

The transplant technique is unique, because it allows a donor's cells to gradually take over a patient's bone marrow without using toxic agents to eliminate a patient's cells prior to the transplant.

Dr. Damiano Rondelli, the Michael Reese Professor of Hematology at the University of Illinois at Chicago, says the protocol can be used even in patients with a long history of disease and some organ damage because of the minimal use of chemotherapy.

"For many adult patients with a blood disorder, treatment options have been limited because they are often not sick enough to qualify for a risky procedure, or they are too sick to tolerate the toxic drugs used alongside a standard transplant," said Rondelli, who is also division chief of hematology and oncology and director of the stem cell transplant program at UI Health.

"This procedure gives some adults the option of a stem cell transplant which was not previously available."

For more than 30 years, Northbrook, Illinois, resident David Levy's only course of treatment for CDA was regular blood transfusions to ensure his organs and tissues received enough oxygen. Levy was 24 when the pain became so severe he had to withdraw from graduate school. "I spent the following years doing nothing--no work, no school, no social contact--because all I could focus on was managing my pain and getting my health back on track," Levy said.

By age 32, Levy required transfusions every two to three weeks; had lost his spleen; had an enlarged liver; and was suffering severely from fatigue, heart palpitations and iron poisoning, a side effect of regular blood transfusions. "It was bad," Levy said. "I had been through enough pain. I was angry and depressed, and I wanted a cure. That's why I started emailing Dr. Rondelli."

Rondelli says that because of Levy's range of illnesses and inability to tolerate chemotherapy and radiation, several institutions had denied him the possibility of a stem cell transplant. UI Health's advances in curing sickle cell patients opened up a new possibility. Rondelli performed Levy's transplant in 2014.

"The transplant was hard, and I had some complications, but I am back to normal now," said Levy, now 35. "I still have some pain and some lingering issues from the years my condition was not properly managed, but I can be independent now. That is the most important thing to me." Levy is finishing his doctorate in psychology and running group therapy sessions at a behavioral health hospital.

Rondelli says the potential of this approach to stem cell transplantation is very promising.

"The use of this transplant protocol may represent a safe therapeutic strategy to treat adult patients with many types of congenital anemias -- perhaps the only possible cure," Rondelli said.

This case report is published in a letter to the editor in the journal Bone Marrow Transplantation.

http://bit.ly/2n6TmJw

Last remnant of North American ice sheet on track to vanish

Study involving CU Boulder shows Barnes Ice Cap on Baffin Island will melt in about 300 years because of warming climate

The last piece of the ice sheet that once blanketed much of North America is doomed to disappear in the next several centuries, says a new study by researchers at Simon Fraser University in British Columbia and the University of Colorado Boulder.

The Barnes Ice Cap, a Delaware-sized feature on Baffin Island in the Canadian Arctic, is melting at a rapid pace, driven by increased greenhouse gases in the atmosphere that have elevated Arctic temperatures. The ice cap, while still 500 meters thick, is slated to melt in about 300 years under business-as-usual greenhouse gas emissions.

The results provide compelling evidence that the current level of warming is almost unheard of in the past 2.5 million years, according to the authors.

Only three times at most in that time period has the Barnes Ice Cap been so small, a study of isotopes created by cosmic rays that were trapped in rocks around the Barnes Ice Cap indicated.

"This is the disappearance of a feature from the last glacial age, which would have probably survived without anthropogenic greenhouse gas emissions," said Adrien Gilbert, a glaciologist at Simon Fraser University in British Columbia in Canada and lead author of the new study published online today in Geophysical Research Letters, a journal of the American Geophysical Union.

While the melting of the Barnes Ice Cap will likely have negligible effects on sea level rise, its end could herald the eventual dissolution of the larger ice sheets like Greenland and Antarctica, said CU-Boulder Professor Gifford Miller, a study co-author.

"I think the disappearance of the Barnes Ice Cap would be just a scientific curiosity if it were not so unusual," said Miller, the associate director of CU Boulder's Institute of Arctic and Alpine Research who has conducted research on Baffin Island annually for the past five decades. "One implication derived from our results is that significant parts of the southern Greenland Ice Sheet also may be at risk of melting as the Arctic continues to warm."

Elevated sea rise created by a melting Greenland would automatically cause the Antarctic Ice Sheet, whose dimensions are controlled by sea level, to also shrink in size, Miller said.

The Barnes Ice Cap is part of the Laurentide Ice Sheet that has covered millions of square miles of North America episodically since the start of Quaternary Period roughly 2.5 million years ago. The ice sheet grew and shrank over time as Earth went through various climate cycles, and the ice was a mile thick at present-day Chicago about 20,000 years ago. It started receding substantially around 14,000 years ago when Earth slipped out of its last ice age.

The ice cap stabilized about 2,000 years ago until the effects of the recent warming caught up with it.

Miller was conducting research on Baffin Island in 2009 when he realized the ice cap had shrunk noticeably as compared to images from a few decades earlier. He recruited Gilbert and Gwenn Flowers from Simon Fraser to develop a model of how the ice cap might behave in the future.

In the new study, the researchers used their model to estimate when the ice cap would disappear under different greenhouse gas emissions scenarios. They project that under all future emission scenarios the ice cap will be gone within 200 to 500 years.

For a moderate emissions scenario that assumes Earth's greenhouse gas emissions will peak around the year 2040, they project the ice cap to be gone in 300 years.

"The geological data is pretty clear that the Barnes Ice Cap almost never disappears in the interglacial times," Miller said. "The fact that it's disappearing now says we're really outside of what we've experienced in 2.5 million-year interval. We are entering a new climate state."

The Barnes Ice Cap is like a canary in a coal mine, said Miller, who also is a professor in CU Boulder's Department of Geological Sciences. Even if humans stopped emitting greenhouse gases today, the ice cap would still disappear in the next few centuries.

In 2010, the project received a boost from Waleed Abdalati, current director of the Cooperative Institute for Research in Environmental Sciences (a joint venture of CUBoulder and NOAA), who was NASA's chief scientist at the time. Abdalati supported the flight of a NASA plane monitoring ice loss in the Arctic to revisit the Barnes Ice Cap.

In addition to measuring changes in the ice cap's height, researchers used ice-penetrating radar aboard the aircraft to reveal its hidden, sub-glacial topography. The measurements were key for the computer model subsequently developed by Gilbert and Flowers to predict the evolution of the Barnes Ice Cap.

http://bit.ly/2mPnR4X

A simple fix to avoid some unnecessary coronary stents

Intracoronary nitroglycerin is overlooked by cardiologists and current cardiovascular guidelines

PHILADELPHIA -- Physician researchers at Thomas Jefferson University suspect that some cases of coronary artery spasm go unrecognized and are incorrectly treated with stents. The good news - there could be a simple fix to eliminate these unnecessary stenting procedures. The team published a case series in Catheterization and Cardiovascular Interventions describing six patients who were scheduled for angioplasty and stenting for the diagnosis of coronary artery disease (five of whom had a cardiac catheterization days prior). However, when the cardiologists gave nitroglycerin prior to placing the stent, the blockages resolved, indicating the true diagnosis of coronary artery spasm. Angioplasty was deferred and all patients were successfully treated with medication.

"Our suspicion is that some patients receive stents unnecessarily since they are misdiagnosed as having fixed atherosclerotic blockage while the true culprit, coronary spasm, goes unrecognized," said senior author Michael Savage, M.D., Director of the Jefferson Angioplasty Center and the Ralph J. Roberts Professor of Cardiology in the Sidney Kimmel Medical College at Thomas Jefferson University. "Cardiologists need to know that they could be overlooking coronary spasm and thus, over treating their patients with stents."

Cardiovascular guidelines on cardiac catheterization and coronary intervention with stents go to great lengths emphasizing the importance of antiplatelet (blood thinning) medications to prevent blood clots in the stents. On the other hand, they fail to mention any role for intracoronary nitroglycerin during cardiac catheterization or before angioplasty with stenting.

"By simply administering nitroglycerin before the procedure, we can save patients from unnecessary risks related to stents such as blood clots and restenosis," said Alec Vishnevsky, M.D., cardiology fellow and first author on the study. Coronary spasm can be treated with medications that dilate the blood vessels. Unless there is severe atherosclerotic disease, stents are generally not recommended since spasm can reappear in the artery upstream or downstream to where the stent is placed.

Dr. Savage and his team also noticed a trend among the six patients in the study. Most were younger than the average heart disease patient and had only a single vessel affected. "Interventional cardiologists should be especially suspicious of coronary artery spasm when they encounter a patient under the age of 60 with disease isolated to a single vessel. We recommend that future guidelines include intracoronary nitroglycerin for these patients," he said.

In addition to Drs. Savage and Vishnevsky, coauthors included Drs. David Fischman, Howard Julien, Paul Walinsky, David Ogilby, Nicholas Ruggiero and Babu Jasti.

Article Reference: Vishnevsky, A., et al. "Unrecognized coronary vasospasm in patients referred for percutaneous coronary intervention: Intracoronary nitroglycerin, the forgotten stepchild of cardiovascular guidelines." Catheterization and Cardiovascular Interventions. 2017. DOI: 10.1002/ccd.27034

http://bbc.in/2nCaeKH

Spider venom may offer stroke therapy

A protein in spider venom may help protect the brain from injury after a stroke, according to research.

Scientists found a single dose of the protein Hi1a worked on lab rats. They said it showed "great promise as a future stroke treatment" but had not yet been tested in human trials. The Stroke Association said the research was at its early stages but it would "welcome any treatment that has the potential to reduce the damage caused by stroke".

The researchers, from the University of Queensland and Monash University, travelled to Fraser Island in Australia to hunt for and capture three potentially deadly Australian funnel web spiders.

"We regularly collect spiders from Fraser Island off the south coast of Queensland," explained lead researcher Prof Glenn King. "The reason for this is that funnel-web spiders dig burrows that can be as deep as

20-30 cm. Thus, digging them up from hard clay soils is very difficult. Fraser Island is a sand island which makes it easy for us to extract the spiders from their burrows."

The team then took the spiders back to their laboratory "for milking". This involved coaxing the spider to release its venom, which could then be sucked up using pipettes. Next the scientists dissected the venom gland of the spiders and honed in on a protein in the venom to recreate a version of it in their lab. They then injected this Hi1a into the lab rats.

A stroke is a brain attack that happens when the blood supply to part of the brain is cut off or there is bleeding on the brain

Every two seconds, someone in the world will have a stroke

Almost 17 million people who had never had a stroke before had one in 2010

Stroke is the second most common cause of death, causing about 6.7 million deaths each year, one every five seconds

Almost one in every eight deaths is caused by stroke

The burden of stroke-related illness, disability and early death is set to double within the next 15 years

Source: Stroke Association

They found that the protein blocked acid-sensing ion channels in the brain - something the researchers say are key drivers of brain damage after stroke.

Prof King said the protein showed "great promise as a future stroke treatment". "We believe that we have, for the first time, found a way to minimise the effects of brain damage after a stroke. "Hi1a even provides some protection to the core brain region most affected by oxygen deprivation, which is generally considered unrecoverable due to the rapid cell death caused by stroke." The research was published in Proceedings of the National Academy of Sciences.

Why look to spider venom in the first place? Prof King explains:

"My lab is interested in developing drugs for human nervous system disorders. Many of these disorders involve either dysfunctional ion channels (e.g. epilepsy) or over-active ion channels (chronic pain and stroke).

Thus, we are typically looking for molecules that modulate the activity of ion channels. The venoms of small venomous invertebrates such as spiders, centipedes and scorpions have evolved to target the nervous system of insects, and consequently they are absolutely full of ion channel modulators.

Because the human nervous system is more complex and wired differently to insects, ion channel modulators that kill or paralyse insects can actually be beneficial to humans. Thus, looking in venoms for ion channel drugs is not as weird as it seems."

Dr Kate Holmes, deputy director for Research at the Stroke Association, said: "We do not have an accurate picture of what happens in human brains from this research, therefore, it is currently unknown if this could be a successful treatment option for humans in the future. "We welcome any treatment that has the potential to reduce the damage caused by stroke, particularly if this can benefit people who are unable to arrive at hospital quickly.

"Current treatments must be given in half this time period, and it is too early for us to know if this research can offer an alternative for stroke patients. "We urge for stroke to be treated as an emergency - the sooner a person can get to hospital after a stroke, the sooner the right treatment can be received, which can improve survival and help recovery."

http://bit.ly/2nRVPHz

Artificial lungs in a backpack may free people with lung failure

An artificial lung that's small enough to be carried in a backpack has been shown to work in sheep.

By Clare Wilson

An artificial lung that's small enough to be carried in a backpack has been shown to work in sheep. It's one of several such devices being developed that could transform the lives of people with lung failure,

who are currently dependent on large machines. The new device still requires an oxygen tank to be wheeled around, although tank-free prototypes are also being tested.

People with lung failure are usually connected to a machine that pumps their blood through a gas exchanger to provide oxygen and remove carbon dioxide – but this often confines them to bed. The longer they are bed-ridden, the weaker their muscles become and the less likely they are to recover.

To avoid this vicious circle, those who are well enough may be helped to walk around the hospital, but this is difficult because the machines are bulky with lots of long tubes. Interest in better options grew after the 2009 swine flu outbreak, when many patients ended up on this kind of support.

Artificial lungs could provide a stopgap for people recovering from severe lung infections or waiting for a lung transplant – although a transplant would still be a better long-term solution for those with permanent lung damage. Yet making artificial lungs has proven harder than making a mechanical heart, say.

"The heart is just a pump," says William Federspiel of the University of Pittsburgh, whereas the lungs contain a fabulously convoluted network of branching air sacs to allow gases to diffuse in and out of the blood. "The lungs have a tremendous capability for gas exchange and there's no man-made technology that can come close for efficiency."

The challenge is further complicated by the fact that some lung failure patients also have weakened hearts, and may need help pumping the blood into the artificial organs.

Federspiel's team has developed an artificial lung that combines the pump and gas exchanger into one device that's small and light enough to be carried in a backpack, making walking easier. The device would be connected to the patient's neck, requiring just a short tube. "We want very little tubing that runs outside the body," says Federspiel.

This month, he published the results of experiments in four sheep, showing that the device could fully oxygenate the animals' blood for a six hour test period – although he says they have since demonstrated that it works for five days.

Another kind of artificial lung is under development at Carnegie Mellon University in Pittsburgh. It is aimed at patients whose hearts are working well enough to pump the blood through the gas exchanger, and connects to the heart's arteries, with tubing coming out through the chest and the gas exchange device strapped to the patient's body.

Work due to be published later this year showed it kept three out of four sheep alive for two weeks. The experiment had to be stopped in one sheep because it developed a slow heartbeat, which wasn't caused by the device, says Keith Cook of Carnegie Mellon University, who was involved in the work.

Both this device, and the artificial lung developed by Federspiel, require an oxygen supply – so any human patient would still have to wheel around an oxygen tank, but they would be far more mobile than they are currently.

However, a more efficient device is in the works that runs off the air in a room, so no cylinder is required. This runs blood through extremely thin channels formed by polymer membranes, providing a larger area for gas exchange.

A miniature version has been found to work in tests on rats. Another benefit of the ultrathin tubes – just 20 micrometres in diameter – is that they mimic the pressures on blood cells exerted by the tiny capillaries of the natural lungs, helping to keep them healthier, says Joseph Potkay of the US Department of Veterans Affairs.

http://bit.ly/2nJMqoG

Predatory bacteria as a new 'living' antibiotic

Antibiotic resistance is one of medicine's most pressing problems. Now, a team from Korea is tackling this in a unique way: using bacteria to fight bacteria.

Before the discovery of penicillin in 1928, millions of lives were lost to relatively simple microbial infections. Since then, antibiotics have transformed modern medicine. The World Health Organization estimates that, on average, antibiotics add 20 years to each person's life. However, the overuse of antibiotics has put pressure on bacteria to evolve resistance against these drugs, leading to the emergence of untreatable superbugs.

Now, researchers at South Korea's Ulsan National Institute of Science and Technology (UNIST) aim to fight fire with fire by launching predatory bacteria capable of attacking other bacteria without harming human cells. "Bacteria eating bacteria. How cool is that?" asks Professor Robert Mitchell, the team leader. He and his colleagues are also developing a natural compound called violacein to tackle Staphylococcus, a group of around 30 different bacteria known to cause skin infections, pneumonia and blood poisoning. Some Staphylococcus bacteria such as MRSA (methicillin-resistant Staphylococcus aureus) are resistant to antibiotics, making infections harder to treat.

Violacein is a so-called 'bisindole': a metabolite produced by bacteria from the condensation of two molecules of tryptophan (an essential amino acid used in many organisms to ensure normal functioning and avoid illness and death). This compound is vibrant purple in colour and of interest to researchers for its anticancer, antifungal and antiviral properties. Researchers have discovered that it can stop bacteria from reproducing, and even kill the multidrug resistant bacterium Staphylococcus aureus, when used in the right doses. It also works well in conjunction with other existing antibiotics.

Mitchell and his team isolated a bacterial strain, called D. violaceinigra strain. NI28, from forest soil collected near Ulsan in South Korea. Using a technique called high performance liquid chromatography to separate and quantify compounds produced by the bacteria, they showed that strain N128 is capable of producing large quantities of crude violacein. They are now collaborating with fabric manufacturer Yeejoo Co., the Korea Institute of Ceramic Engineering and Technology, and research teams in Turkey and Romania to manufacture antibacterial fabrics infused with violacein that can effectively kill S. aureus.

The team is also working on the predatory bacterium Bdellovibrio bacteriovorus. This is an obligate predator of bacteria, normally found in river water or soil. It attacks and enters the bacteria it must predate on to survive, growing and dividing repeatedly. Once inside, it eats the host from the inside out. When it has had its fill, it ruptures the host bacterium's cell membrane and exits, ready to attack the next bacterium. Previous research showed that B. bacteriovorus does not harm human cells and can attack over 100 different bacterial pathogens.

The researchers examined how the predatory ability of B. bacteriovorus was affected by indole, a well-known metabolite produced by E. coli and many other bacteria. Indole regulates various biological functions in bacteria, for example regulating the stability of small DNA molecules, as well as functioning as a signalling molecule, which different communities of bacteria use to 'talk' and coordinate gene expression within a population. The researchers tested the predatory ability of B. bacteriovorus by setting up a bacterial version of a gladiator contest in flasks. They put various bacteria face to face with B. bacteriovorus and then artificially added different concentrations of indole and examined how this affected B. bacteriovorus' predatory behaviour. They found that B. bacteriovorus takes much longer to attack E. coli—a common bacterial strain that can cause food poisoning, infections and fever—in the presence of indole. To make sure the predator-prey relationship was not influenced by E. coli's own production of indole, they also tested the predatory ability of B. bacteriovorus on another food poison-causing bacterium called Salmonella, which does not produce indole. The result was the same: in high concentrations, indole even blocks and prevents the predatory bacteria from attacking altogether.

Professor Mitchell hopes this research is a step in the direction of understanding how B. bacteriovorus can be used and controlled to attack specific bacteria that cause illness, while avoiding 'good' bacteria necessary for daily survival. This could help in further development of 'living antibiotics.'

http://bit.ly/2n7A0ns

Could OTC medicines be the answer to alcoholism?

Study determining whether two over-the-counter medications can diminish alcohol abuse

Researchers have long wondered if medications could treat alcohol abuse. Ihsan Salloum, M.D., chief of the Division of Alcohol and Drug Abuse at the University of Miami Miller School of Medicine, hopes to answer that question in part with a new clinical trial with E. Sherwood Brown, M.D., Ph.D., at UT Southwestern Medical Center in Dallas. The study is determining if two over-the-counter (OTC) medications can diminish alcohol abuse in diagnosed bipolar patients.

The $2.5 million, five-year trial is currently in year two and funded by the National Institute of Alcohol Abuse and Alcoholism (NIAAA) of the NIH. The study will gauge the effectiveness of citicoline and pregnenolone, over-the-counter medications used for improved brain function and mood control, as a treatment for alcohol abuse in people who also suffer from bipolar disorder. While research on the use of prescription medications for curbing alcohol abuse in people with bipolar disorder has had very limited success, smaller previous studies have shown these two OTC medications can be effective, leaving Salloum and Brown excited about their potential.

"This proof of concept study hopes to accomplish what we in the medical community have long hoped for -- a medication to reduce alcohol abuse," said Salloum. "In addition, because of their properties, the two drugs being studied could also improve patients' moods and emotional balance."

The trial targets diagnosed bipolar disorder patients because more than 60 percent of this population suffers from some sort of alcohol-use disorder. These patients are also at higher risk for suicide and co-morbidities, such as illnesses and accidents, often attributed to either their diagnosis and/or alcohol use.

Over the course of the 12-week study in Miami and Dallas, participants will be assigned citicoline, pregnenolone or a placebo and take the medication twice daily. They will also need to attend a weekly appointment at the University of Miami Health System or UT Southwestern Medical Center for feedback.

Through 2018, the University of Miami and UT Southwestern will track patient data. If one or both of the OTC medications are successful in treating alcoholism in bipolar patients, the study will continue through years four and five. If citicoline and/or pregnenolone are deemed effective at the end of the five-year trial, larger studies will be launched to evaluate their viability in people with alcohol-use disorders who do not suffer from mental health problems.

http://bit.ly/2nMsjX3

Results of mouse studies deeply affected by the way the animals are handled

A new study shows that how mice are picked up by the experimenter can substantially change their behaviour in cognitive tests.

The work, by Dr Kelly Gouveia and Professor Jane Hurst from the University of Liverpool, was published in Scientific Reports today and funded by the NC3Rs [(1)].

The researchers discovered that mice handled by a 'mouse-friendly' tunnel for transfer to the test arena showed much more active exploration during testing than those picked up by the tail, which had a major positive impact on test performance.

In the tests, mice were placed near a new attractive stimulus (urine from the opposite sex) that should stimulate approach and investigation, especially during the first contact. This was repeated in three sessions, to get animals familiar with the new scent. Throughout all the sessions, mice picked by the tail showed very little willingness to explore the test arena and therefore investigate the new stimulus.

Many animals failed to sniff the stimulus even once, making it challenging to compare the sessions and to collect enough data to reach statistical significance. By contrast, mice picked up in a tunnel explored their environment readily, showed a strong interest in the new stimulus, and a clear effect of becoming familiar with it in the consecutive sessions.

To test discrimination between two different scents, the mice were then placed near a different urine stimulus. Because the performance of mice picked up by the tail was so poor from the start, they did not discriminate between the known and new scents. Those handled by a tunnel showed robust discrimination, making them much more reliable experimental subjects.

The traditional way to pick up a mouse from the cage is by grasping the base of the tail, although this has no scientific validation. This method, although fast and not painful, is known to be aversive to mice and to cause stress and anxiety [(2)].

In their previous work, the team from Liverpool developed alternative methods of handling mice that are much more animal-friendly and just as quick once the handlers are trained [(2,3)]. This involves picking up mice by guiding them into an open tunnel that is inexpensive and autoclavable (see photo). Professor Hurst showed that this technique makes a big difference to how mice respond to the handler - while mice picked up by the tail show caution and are reluctant to approach the handler, mice used to the tunnel interact with the tunnel and with the person handling them much more willingly [(2,3)].

Mice are the most common animal used in research and handling is an important part of both routine husbandry and experimental procedures. Handling stress could therefore impact the welfare of millions of mice used in research world-wide.

But minimising the stress associated with handling is key not only to the animal's well-being; it has scientific importance as well. It is well established that anxiety in rodents correlates with reduced exploration. Unnecessary stress or anxiety due to handling before testing is likely to shift the animal's attention away from a particular test and make it less able to learn and/or solve specific tasks. Avoiding this by using a better handling method could improve the reliability of a wide range of behavioural tests used to understand learning and memory, assess gene function, test sensory deficits, or for drug discovery, for example.

Use of a non-aversive handling can remove the requirement for prior familiarisation with the handling procedure and test environment, as animals that are not anxious will readily explore the novel environment. This could save valuable time during testing, as well as substantially improve the reliability of behavioural responses to test stimuli that are not confounded by handing-induced anxiety.

Commenting on the work, Professor Hurst said: 'The method used to pick up laboratory mice has a surprisingly strong influence on their anxiety, and our study shows that this has a major impact on the reliability of their behavioural response to test stimuli. A simple change to picking up mice up in a tunnel rather than by the tail could have a really positive impact on the wide range of research that relies on behavioural testing, as well as improving the well-being of test animals.'

Dr Mark Prescott, NC3Rs said: 'This study provides further evidence for the need to shift away from tail handling of laboratory mice, this time for scientific reasons. Tunnel handling should be the method of choice for researchers conducting behavioural tests with these animals.'

To help train handlers in the tunnel method, Professor Hurst's team, in collaboration with the NC3Rs, have created a mouse handling video tutorial. The NC3Rs has announced 2017 to be the 'Year of laboratory rodent welfare', launching a number of exciting initiatives focusing on the welfare of mice and rats.

References:

[1] Gouveia K, Hurst JL (2017) Optimising reliability of mouse performance in behavioural testing: the major role of non-aversive handling. Scientific Reports 7: 44999. doi: 10.1038/srep44999

[2] Hurst JL, West RS (2010) Taming anxiety in laboratory mice. Nature Methods. Oct;7(10): 825-6. doi: 10.1038/nmeth.1500

[3] *Gouveia K, Hurst JL (2013) Reducing mouse anxiety during handling: Effect of experience with handling tunnels. PLoS ONE 8(6): e66401. doi:10.1371/journal.pone.0066401*

http://bit.ly/2mXTo5w

Suicide risk is higher in first year after deliberate self-harm

Self-harm with a firearm is associated with highest suicide risk in the following month

NEW YORK, NY - New findings suggest that American adults who survive deliberate self-harm are at increased risk of suicide in the first year after such an event, indicating a need to direct clinical interventions in the critical 12 months following such episodes. The suicide risk is greatest in the month immediately following a self-harm attempt using a firearm, according to a study from researchers at Columbia University Medical Center (CUMC), New York Psychiatric Institute, and colleagues. Results of the study were published today in American Journal of Psychiatry.

"This study supports our hypothesis that use of a firearm or other violent self-harm methods greatly increases the risk of suicide, especially in the short term," said Mark Olfson, MD, MPH, professor of psychiatry at CUMC and senior author of the report.

Using Medicaid data from 45 states during 2001-2007, the researchers sought to determine the 1-year risk of repeated self-harm and suicide in 61,297 people who had been clinically diagnosed with deliberate self-harm . The data were linked to the National Death Index, which provides information about dates and cause of death. The researchers analyzed a variety of possible risk factors, such as demographic characteristics, recent treatment for common mental disorders, and both the setting and method of self-harm. Firearm-related self-harm was of particular interest, since the rate of suicide from firearms is eight times greater in the U.S. than in other high-income countries.

Nearly 20 percent--mostly older, white people who had been recently treated for a mental disorder such as depression or alcohol use disorder--repeated nonfatal self-harm during the follow-up period. The 1-year suicide rate in adults with deliberate self-harm was 37 times higher than in the general population. In this group, males were twice as likely to complete suicide than females; older, white adults had triple the suicide risk than younger, non-white adults.

Two-thirds of suicides during initial self-harm episodes were caused by violent methods, with over 40 percent related to firearms. The risk of suicide was approximately 10 times greater in the first month after an initial episode of self-harm using a violent method compared with the following 11 months.

"The patterns seen in this study suggest that clinical efforts should focus on ensuring the safety of individuals who survive deliberate self-harm during the first few months after such attempts--particularly when a violent method such as a firearm has been used," said Dr. Olfson. "For these patients, clinicians should strongly consider inpatient admission, intensive supervision, and interventions targeting underlying mental disorders to reduce suicide risk. In addition, clinicians can encourage family members to install trigger locks or temporarily store firearms outside the patient's home."

The study, titled "Suicide Following Deliberate Self-Harm," was published in the American Journal of Psychiatry on March 21, 2017. The authors are Mark Olfson, MD, MPH, Melanie Wall, PhD, Shuai Wang, PhD, Stephen Crystal, PhD, Tobias Gerhard, PhD, and Carlos Blanco, M.D., PhD.

Dr. Wang is an employee of Quartet Health. Dr. Gerhard has received research grant funding from Bristol-Myers Squibb. He serves on an external safety review committee for a Merck study, and has provided expert consultation to law firms on behalf of Roche and Pfizer. The additional authors report no financial conflicts of interest.

The study was supported by grant R01 MH107452 from National Institute of Mental Health, and grant U19 HS021112 from the Agency for Healthcare Research and Quality.

http://bit.ly/2mU4oA2

Older mothers are better mothers

Children of older mothers have fewer behavioral, social and emotional difficulties

The result should be seen in conjunction with the widespread recommendation not to have children too late. This recommendation is based on knowledge about e.g. declining fertility and the health risks

during pregnancy and while giving birth which are associated with advanced maternal age.

"However, when estimating the consequences of the rising maternal age it's important to consider both the physical and psychosocial pros and cons," says Professor Dion Sommer from Aarhus BSS, who is one of the researchers behind the result.

Previous research has indicated that a higher maternal age is associated with increased psychosocial well-being during the pregnancy and the early days after the child is born. The new results indicate that the advantages for the older mothers and their children extend all the way into the children's school age, but decline before age 15.

Why do women postpone motherhood?

When today's mothers have children later in life than before, it is due to several reasons: We live longer, women have more educational and career opportunities, and contraception has improved. Today (2015), the average pregnancy age is an entire 30.9 years. This also means that most Danish children today are born when their mother is over 30 years old, and that the proportion of children whose mother was over 40 years old when they were born has quadrupled compared to 1985.

How does having an older mother affect the child's upbringing?

Older mothers are at greater risk of experiencing complications during pregnancy and while giving birth than younger mothers. They are at greater risk of having a miscarriage, giving birth prematurely and having children with deformities.

On the other hand, studies show that older women thrive better during the first part of motherhood. They worry less during the pregnancy, are more positive about becoming parents and generally have a more positive attitude towards their children.

Previous studies that have tracked children up until their school age indicate that children with older mothers - regardless of their parents' background, education and finances - have a better language and have fewer behavioural, social and emotional problems. This study tracked children of school age and found that children with older mothers had fewer behavioural, social and emotional problems at age 7 and 11, but not at age 15.

Stable relationships

The reason is that older mothers have more stable relationships, are more educated and have obtained better access to material resources. But it is also interesting to look at the significance of age when these factors are removed from the equation. In such analyses, age can be interpreted as an indicator of psychological maturity.

"We know that people become more mentally flexible with age, are more tolerant of other people and thrive better emotionally themselves. That's why psychological maturity may explain why older mothers do not scold and physically discipline their children as much," says Professor Dion Sommer.

"This style of parenting can thereby contribute to a positive psychosocial environment which affects the children's upbringing," he concludes.

FACTS

The study of the correlation between maternal age and children's social and emotional development was carried out when the children were 7, 11 and 15 years old respectively. The results have been published in the scientific journal European Journal of Developmental Psychology.

So far, many studies have examined the correlation between education, job or marital status and older mothers, while very few have looked at the significance of age in and of itself.

http://bit.ly/2nrhCrN

Nepal's rich indigenous medical knowledge is under threat

Nepal's ethnic communities have a repertoire of knowledge related to use of herbs and animals for medicine

Nepal is a diverse demography with over 125 ethnic communities. It is equally rich in biodiversity. The diverse ethnic communities have a rich repertoire of knowledge related to the use of the herbs and animals for medicinal purposes.

A recent research article published in *Journal of Institute of Science and Technology* explores indigenous knowledge systems in the Darai community living in the Chitwan Valley in Nepal, some 200 kilometres southwest of capital Kathmandu.

The article, available online on the NepJOL platform supported by INASP, describes this community's usage of animal and plant products to treat various diseases and ailments as a result of rich indigenous knowledge.

Darai man applying Calotropis gigonita (Local name: Aak) (牛角瓜)to treat fractured area and sprain on feet to minimise pain and speedy recovery.

The Darai people - better known for their skills in weaving bamboo baskets - use 28 animal species to treat 22 different types of ailments, and 76 plant species to treat 36 types of ailments ranging from simple diseases like common cold and headache to complex diseases like typhoid, the research found.

"They did not use single plants or animal products for a single disease, but they used a mixture of multiple plants or animal products to treat an ailment; reciprocally, a single animal or plant product could be used to treat many different ailments," says Dr Nanda Bahadur Singh, author of the article and Professor of Ethno-genomics and Ethno-biology at Central Department of Zoology, Tribhuvan University, Kirtipur, Kathmandu.

The article analyses the types of plants or animals, the organs or parts used for medicinal purpose and the form it is ingested or applied in.

Medicinal plant Pogosteomon benghalensis (Local name: Rudhilo) (ミズトラノオ属) to treat fever and chronic typhoid. **INASP**

"The parts or the organs used for medical purposes varied with the species, so did the form of medicine," says Dr Singh. "In the case of animals, flesh, eggs, fat, bone etc. were used. In the case of plants, leaves, roots, fruits, flower, bark etc. were used."

Mostly the products were consumed raw. They were also consumed as paste, cooked, dried, in liquor and powder form.

The research article titled "Medical Ethnobiology and Indigenous Knowledge System Found in Darai Ethnic Group of Chitwan, Nepal" written by Manisha Poudel and Dr Nanda Bahadur Singh was a result of the field research in Mangalpur village in Chitwan district. The authors interviewed local healers and village elders to gather information and took a jungle walk to identify the samples.

Darai is only one of the dozens of communities living in the hills, mountains and the plains of Nepal which has rich indigenous knowledge. Dr Singh has studied many of them and has found that the indigenous knowledge system is very rich.

However the rich knowledge of the community passed on from generation to generation orally is now facing a risk because of the swift modernization, introduction of the internet, easy access and availability of allopathic medicine, and the younger generation's desire to migrate out of the village and adopt modern lifestyles.

"For that exact reason, it is important to document the traditional knowledge," says Dr Singh. "And we have done it in detail in a very scientific way."

He believes that the article, along with the other research he has done on indigenous knowledge systems, could be an important stepping stone to conduct large-scale research to improve Nepal's public health system.

Manisha Poudel, one the authors, interviewing the key informant. **INASP**

"It is worrying that people are forgetting the traditional medicinal practices and depending solely on modern medicines," says Dr Singh. "While modern medicine has its own value, it is never sufficient alone to treat all types of illnesses."

He adds, "That is why an integrated system comprising of the best practices of different systems of allopathic and traditional systems should be applied in healthcare."

Dr Singh says, although rigorous scientific research hasn't been carried out to extract the compounds available in the plant and animal products they use to treat the diseases, local people have suggested effectiveness and demonstrated success in the use of traditional medicines for curing and controlling diseases.

It is understandable that modern medicines have been developed from certain compounds extracted from various types of plants and animals, he says. "The focus of our next research should be on extracting the molecules of the traditional medicines and put them to scientific tests."

Dr Singh concludes that there is a huge value in the indigenous knowledge that we haven't been able to put to use and so "We are working to set up a laboratory at the department for molecular research."

Explore further: *Environment change threatens indigenous traditional knowledge*

More information: *Medical Ethno-biology and Indigenous Knowledge System Found in Darai Ethnic Group of Chitwan, Nepal. Journal of Institute of Science and Technology 2017.*

http://bit.ly/2obuxLP

Loss of smell linked to increased risk of early death

In a study of adults aged 40 to 90 years who were followed for 10 years, poor smell was linked with an increased risk of dying.

During the study, 411 of 1774 participants (23%) died. After controlling for demographic, health-related, and cognitive confounders, each additional correctly identified odor lowered the risk of mortality by 8%. Individuals who performed at chance level on tests (indicating complete olfactory loss) were at a 19% higher risk of death than individuals with normal smell function.

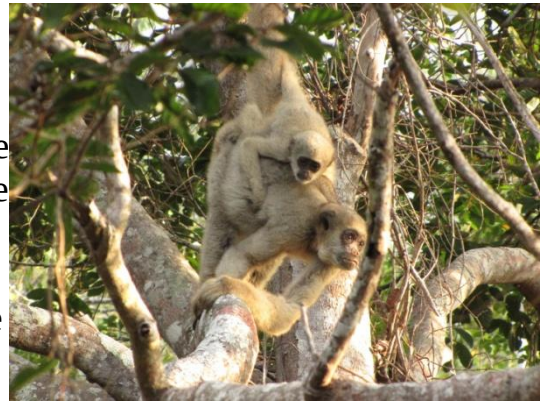
The results contribute to the growing evidence that olfactory assessments might provide insights on the aging brain.

"Our results were not explained by dementia, which was previously linked to smell loss. Instead, mortality risk was uniquely predicted by smell loss," said Dr. Jonas Olofsson, senior author of the Journal of the American Geriatrics Society study. "In our future research, we will try to pinpoint the biological processes that can explain this phenomenon."

http://bit.ly/2n0c5FB

Yellow fever killing thousands of monkeys in Brazil

In a vulnerable forest in southeastern Brazil, where the air was once thick with the guttural chatter of brown howler monkeys, there now exists silence.



Yellow fever, a virus carried by mosquitoes and endemic to Africa and South America, has robbed the private, federally-protected reserve of its brown howlers in an unprecedented wave of death that has swept through the region since late 2016, killing thousands of monkeys.

These are Muriqui monkeys inhabiting a federally-protected reserve in southeastern Brazil, called RPPN Feliciano Miguel Abdala. **Carla Possamai, Muriqui Project of Caratinga**

Karen Strier, a University of Wisconsin-Madison professor of anthropology, has studied the monkeys of this forest since 1983. She visited the reserve -- her long-term study site near the city of Caratinga -- in the state of Minas Gerais, in January of 2017. "It was just silence, a sense of emptiness," she says. "It was like the energy was sucked out of the universe."

Using what in some cases are decades of historical data, Strier and a team of Brazilian scientists focused on studying primates in Brazil's

patchwork Atlantic Forest are poised to help understand and manage what happens next. They have never seen monkeys perish in such numbers, so quickly, from disease.

With her Brazilian counterpart Sérgio Lucena Mendes, a professor of animal biology at the Universidade Federal de Espirito Santo, and their former postdoctoral researcher, Carla Possamai, Strier is ready to census the monkeys that remain at the reserve, comparing the new data to prior censuses performed in the forest. They also plan to study how the surviving brown howler monkeys regroup and restructure their societies, since their existing social groups have been destroyed.

Strier's study forest, just 4 square miles in size, is a land-locked island of green surrounded by agricultural and pasture lands. How yellow fever showed up here is a mystery, and the monkeys in the forest have nowhere else to go. Less than 10 percent of Brazil's Atlantic Forest remains intact and much of it exists only as small patches in a fragmented landscape.

"I am very surprised at the speed with which the outbreak is advancing through the landscape and by how the virus can jump from one patch of forest to another, even if they are hundreds of meters apart," says Mendes. "It is also surprising that it is spreading across such a large geographic region."

The way yellow fever has spread also concerns Brazilian health officials. As of mid-March 2017, they have confirmed more than 400 human cases of the disease, mostly in Minas Gerais, causing nearly 150 human deaths. The Brazilian Ministry of Health is investigating another 900 possible cases and concern is mounting that it will spread to cities, threatening many more people.

Brazilian authorities also want to protect the monkeys from people who fear the animals may be spreading the disease. "We need to show that they help inform when the virus arrives in a region, because being more sensitive than humans, they die first," Mendes explains.

A dead monkey is like a canary in a coal mine, alerting public health officials that a pathogen may be present, mobilizing preventative and precautionary efforts. So, what does it mean when so many have perished?

"No one really knows the consequences for the other primates or the forest when nearly the entire population of an abundant species dies from disease in just a few months," says Strier. "We are in a position to learn things we never knew before, with all the background information that we have collected."

Nearly two decades ago, Strier helped expand and secure protection for the primates at her study forest, which include four monkey species: the brown howler, the black capuchin, the buffy-headed marmoset and, Strier's animal of interest, the critically-endangered northern muriqui.

It is too soon to say whether the howler monkey population can recover but Strier remains optimistic, in large part because of a career spent studying and helping conserve the brown howler's main competitor, the muriquis. "The muriquis have shown us that it's possible for small populations of primates to recover if they are well-protected," says Strier.

When she first arrived at her study forest, known as RPPN Feliciano Miguel Abdala, there were just 50 muriquis. By September 2016, there were nearly 340, representing one-third of the species' total known population. The animals reside in just 10 forests in southeastern Brazil and nowhere else in the world. Strier's efforts and those of her colleagues have helped restore their numbers.

She is relieved that, so far, the muriquis appear to be less susceptible to yellow fever. "It was really tense -- scary -- to go into the forest, knowing the howlers were gone but not knowing how bad things might also be for the muriquis," Strier recalls.

Her long-term studies have revealed that muriquis have a lifespan of more than 40 years and she has known some of the individual muriquis in the forest their entire lives. Strier can recognize individuals based on natural differences in their fur and facial markings.

Now, in the face of ecological tragedy, she and her colleagues have an opportunity to study how the muriquis adapt in a forest nearly devoid of their competitors.

"It's like a controlled natural experiment, but one you would never plan to do," Strier says. "My happy hypothesis is that the muriquis are out foraging, feasting on all the best fruits and leaves that the howlers used to eat. Will they eat more of their favorite foods, or travel less? Will their social order change? Will they form smaller groups?"

She has documented that kind of behavioral flexibility before. In the late 1980s and early 90s, the muriquis began splitting into smaller groups. In the early 2000s, as their population grew, they began spending more time on the ground, rather than in the trees, often consuming fallen fruits and even half-eaten "leftovers" under the trees.

"I feel like I am 20 years old again" she says. "I have so many questions that are important to answer, for the primates, their Atlantic forest habitat, and for the people that share their world."

To raise awareness about and funds for her muriqui project, Strier is working with the Brazilian non-profit that administers the reserve, called Preserve Muriqui, and Global Wildlife Conservation, a Texas-based non-profit dedicated to conserving the diversity of life on earth.

http://bit.ly/2niQL0C

'Super sponge' promises effective toxic clean-up of lakes and more

Sponge that can absorb mercury from a polluted water source within seconds

Mercury is very toxic and can cause long-term health damage, but removing it from water is challenging. To address this growing problem, University of Minnesota College of Food, Agricultural and Natural Sciences (CFANS) Professor Abdennour Abbas and his lab team created a sponge that can absorb mercury from a polluted water source within seconds. Thanks to the application of nanotechnology, the team developed a sponge with outstanding mercury adsorption properties where mercury contaminations can be removed from tap, lake and industrial wastewater to below detectable limits in less than 5 seconds (or around 5 minutes for industrial wastewater). The sponge converts the contamination into a non-toxic complex so it can be disposed of in a landfill after use. The sponge also kills bacterial and fungal microbes.

Think of it this way: If Como Lake in St. Paul was contaminated with mercury at the EPA limit, the sponge needed to remove all of the mercury would be the size of a basketball.

This is an important advancement for the state of Minnesota, as more than two thirds of the waters on Minnesota's 2004 Impaired Waters List are impaired because of mercury contamination that ranges from 0.27 to 12.43 ng/L (the EPA limit is 2 ng/L). Mercury contamination of lake waters results in mercury accumulation in fish, leading the Minnesota Department of Health to establish fish consumption guidelines. A number of fish species store-bought or caught in Minnesota lakes are not advised for consumption more than once a week or even once a month. In Minnesota's North Shore, 10 percent of tested newborns had mercury concentrations above the EPA reference dose for methylmercury (the form of mercury found in fish). This means that some pregnant women in the Lake Superior region, and in Minnesota, have mercury exposures that need to be reduced. In addition, a reduced deposition of mercury is projected to have economic benefits reflected by an annual state willingness-to-pay of $212 million in Minnesota alone.

According to the US-EPA, cutting mercury emissions to the latest established effluent limit standards would result in 130,000 fewer asthma attacks, 4,700 fewer heart attacks, and 11,000 fewer premature deaths each year. That adds up to at least $37 billion to $90 billion in annual monetized benefits annually.

In addition to improving air and water quality, aquatic life and public health, the new technology would have an impact on inspiring new regulations. Technology shapes regulations, which in turn determine the value of the market. The 2015 EPA Mercury and Air Toxics Standards regulation was estimated to cost the industry around of $9.6

billion annually in 2020. The new U of M technology has a potential of bringing this cost down and make it easy for the industry to meet regulatory requirements.

Research by Abbas and his team was funded by the MnDRIVE Global Food Venture, MnDRIVE Environment, and USDA-NIFA. They currently have three patents on this technology. To learn more, visit http://www.abbaslab.com.

To read the full study published in Advanced Functional Materials *titled, "A Nanoselenium Sponge for Instantaneous Mercury Removal to Undetectable Levels," visit DOI: 10.1002/adfm.201606572.*

http://nyti.ms/2ndG4eh

Shaking Up the Dinosaur Family Tree

For more than a century, the placement of dinosaurs on the branches of their family tree has been based on the shape of their hips.

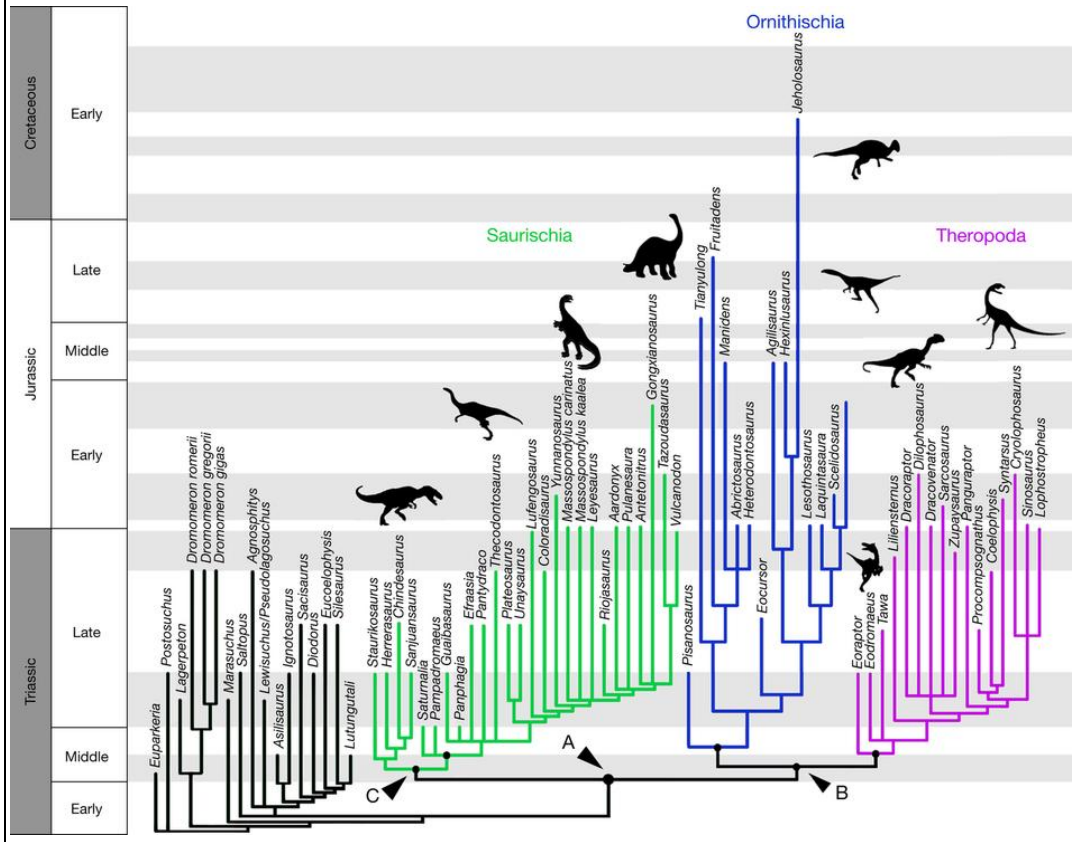
By NICHOLAS WADE MARCH 22, 2017

This classification has now been radically challenged by proponents of a new tree which, if accepted, swaps large subfamilies around, sheds new light on dinosaurs' evolution and suggests they may have originated not in South America, as widely assumed, but perhaps in some Northern Hemisphere locality such as Scotland.

A Victorian paleontologist, Harry Seeley, declared in 1888 that dinosaurs should be divided into the bird-hipped (Ornithischia) and the lizard-hipped (Saurischia) categories that have been accepted ever since.

Under this system, the heavily armored stegosaurs and ankylosaurs are placed on the Ornithischian branch of the family tree. The Saurischian branch includes both sauropods like the herbivorous diplodocus, and theropods like the meat-eating tyrannosaurs.

This longstanding classification has now been disputed by Matthew G. Baron of the University of Cambridge. Mr. Baron is a graduate student and his rewriting of the dinosaur family tree is a project to attain his Ph.D. But his ideas are supported by his two supervisors and co-authors, David B. Norman of the University of Cambridge, and Paul M. Barrett of the Natural History Museum in London, and by a prodigious database he has constructed of dinosaur anatomical features.



The proposed new family tree of dinosaurs. The group to the left is for close relatives but not true dinosaurs. The old tree grouped the theropods, purple, with the Saurischia, green, and viewed the Saurischia and the Ornithischia as the two major branches of the tree. The scale to the left shows the placement of the tree in geological time. A is the branchpoint that includes all the dinosaurs, B represents the joint ancestor of Ornithischia and the theropods, and C is the joint ancestor of Saurischia and an early group known as herrerasaurs. **Baron et al./Nature**

Mr. Baron started his work on the Ornithischian dinosaurs but came to feel they did not fit well in their place on the accepted family tree. With his supervisors' encouragement, he set out to reconsider the entire dinosaur classification system. More than 1,000 species have already been identified, most of them dating from between 200

million and 66 million years ago. Dinosaurs became the dominant terrestrial species after the first date, and perished, all save the lineage leading to birds, at the second.

Mr. Baron spent three years visiting museums throughout the world and assessed important dinosaur fossils for the presence of 457 diagnostic anatomical features. Based on this information, a computer program called TNT arranged the dinosaur specimens in possible family trees. After analyzing 32 billion trees, the computer spat out the best possible arrangement of Mr. Baron's three years' worth of data collection. The run took just five minutes.

The new family tree of dinosaurs, published on Wednesday in the journal Nature, is quite unlike the old. "The results of this study challenge more than a century of dogma and recover an unexpected tree topology that necessitates fundamental reassessment of early dinosaur evolution," Mr. Baron and his supervisors write.

Essentially they have found that the Ornithischian dinosaurs have many similarities with the theropods and so probably shared a common ancestor. As it happens, Thomas Huxley, the celebrated 19th century champion of Darwin's theory of evolution, also thought Ornithischia and theropods belonged together in the same group, which he called Ornithoscelida. Mr. Baron says this name should be revived, with the two main branches of the new family tree being the Ornithoscelida and the Saurischia.

Mr. Baron's revolutionary new family tree may not be immediately accepted but experts seem likely to give it a serious hearing because of its database, the largest ever assembled, and its use of a standard tree-drawing program.

"It will be interesting to see how paleontologists receive this original and provocative reassessment of dinosaur origins and relationships," Kevin Padian, a dinosaur expert at the University of California, Berkeley, wrote in an accompanying commentary in Nature.

"It's a radical proposal with a reasonable basis but no one expects it will be the last word," Dr. Padian said in an interview. Given that such a sudden shift in the dinosaur family tree might even be possible, people could wonder if dinosaur experts know what they're doing, he said. His answer is that they do, but they have been faced with an unusual problem. There has been an explosion of new discoveries in the last 30 years, showing that new dinosaur groups evolved with a mix of old features inherited from their ancestors and new ones shaped by natural selection. But the new features are the same in many cases, an instance of what biologists call convergent evolution, making it very hard to assign each group to its right place on the dinosaur family tree.

Paul Sereno, a dinosaur specialist the University of Chicago who laid the basis for the modern version of Seeley's classification, said the new paper would certainly stir the pot but he couldn't see what new features or scoring system had contributed to the new result.

Mr. Baron said his work was not based on any new diagnostic features but on more data and the absence of any prior assumptions about what the tree should look like.

Having a correctly drawn family tree allows paleontologists to peer more deeply into the origins of the dinosaurs, because the species that lie close to the root of the major families may carry the same traits as the first dinosaur. Based on his tree, Mr. Baron believes that the original dinosaurs were small, two-footed animals with large grasping hands, as others have said before, but also omnivorous. Early dinosaurs had both knifelike teeth for eating meat and flatter teeth for chewing plants.

"In the very harsh climates of the late Triassic, being a generalist is probably a clever strategy," Mr. Baron said. "The ability to run fast and eat anything and grasp with the hands is what gave dinosaurs their advantage."

A critical stage in human evolution was walking upright, which freed the hands for grasping tools and weapons. "The parallels with human evolution are very noticeable and make you wonder what they could

have achieved," Mr. Baron said. "Toward the end, certain groups like the velociraptors were starting to get intelligent."

The new tree implies that dinosaurs emerged some 247 million years ago, a little earlier than previous estimates, and that their origin may not have been in South America, where several very early dinosaurs have been found. Some species that could have shared a common ancestor with the first dinosaur have been found in places now part of the Northern Hemisphere, such as Saltopus elginensis, a small dinosaurlike creature found in Scotland. But Dr. Norman said present sampling did not allow any region to be identified as the dinosaurs' place of origin, only that the Northern Hemisphere was just as likely as the Southern.

The proposed new family tree of dinosaurs has a lot of statistical support, Dr. Norman said. "That doesn't mean it's right, just that it's the best we can do with the data we've got at the moment," he said.

http://bit.ly/2ndSsea

Surprising new role for lungs: Making blood

Cells in mouse lungs produce most blood platelets and can replenish blood-making cells in bone marrow, study shows

Using video microscopy in the living mouse lung, UC San Francisco scientists have revealed that the lungs play a previously unrecognized role in blood production. As reported online March 22, 2017 in Nature, the researchers found that the lungs produced more than half of the platelets -- blood components required for the clotting that stanches bleeding -- in the mouse circulation. In another surprise finding, the scientists also identified a previously unknown pool of blood stem cells capable of restoring blood production when the stem cells of the bone marrow, previously thought to be the principal site of blood production, are depleted.

"This finding definitely suggests a more sophisticated view of the lungs -- that they're not just for respiration but also a key partner in formation of crucial aspects of the blood," said pulmonologist Mark R. Looney, MD, a professor of medicine and of laboratory medicine at UCSF and the new paper's senior author. "What we've observed here in mice strongly suggests the lung may play a key role in blood formation in humans as well."

The findings could have major implications for understanding human diseases in which patients suffer from low platelet counts, or thrombocytopenia, which afflicts millions of people and increases the risk of dangerous uncontrolled bleeding. The findings also raise questions about how blood stem cells residing in the lungs may affect the recipients of lung transplants.

Mouse lungs produce more than 10 million platelets per hour, live imaging studies show

The new study was made possible by a refinement of a technique known as two-photon intravital imaging recently developed by Looney and co-author Matthew F. Krummel, PhD, a UCSF professor of pathology. This imaging approach allowed the researchers to perform the extremely delicate task of visualizing the behavior of individual cells within the tiny blood vessels of a living mouse lung.

Looney and his team were using this technique to examine interactions between the immune system and circulating platelets in the lungs, using a mouse strain engineered so that platelets emit bright green fluorescence, when they noticed a surprisingly large population of platelet-producing cells called megakaryocytes in the lung vasculature (see video S1, video S2). Though megakaryocytes had been observed in the lung before, they were generally thought to live and produce platelets primarily in the bone marrow.

"When we discovered this massive population of megakaryocytes that appeared to be living in the lung, we realized we had to follow this up," said Emma Lefrançais, PhD, a postdoctoral researcher in Looney's lab and co-first author on the new paper.

More detailed imaging sessions soon revealed megakaryocytes in the act of producing more than 10 million platelets per hour within the lung vasculature (see video S5), suggesting that more than half of a mouse's total platelet production occurs in the lung, not the bone

marrow, as researchers had long presumed. Video microscopy experiments also revealed a wide variety of previously overlooked megakaryocyte progenitor cells and blood stem cells sitting quietly outside the lung vasculature -- estimated at 1 million per mouse lung.

Newly discovered blood stem cells in the lung can restore damaged bone marrow

The discovery of megakaryocytes and blood stem cells in the lung raised questions about how these cells move back and forth between the lung and bone marrow. To address these questions, the researchers conducted a clever set of lung transplant studies:

First, the team transplanted lungs from normal donor mice into recipient mice with fluorescent megakaryocytes, and found that fluorescent megakaryocytes from the recipient mice soon began turning up in the lung vasculature. This suggested that the platelet-producing megakaryocytes in the lung originate in the bone marrow.

"It's fascinating that megakaryocytes travel all the way from the bone marrow to the lungs to produce platelets," said Guadalupe Ortiz-Muñoz, PhD, also a postdoctoral researcher in the Looney lab and the paper's other co-first author. "It's possible that the lung is an ideal bioreactor for platelet production because of the mechanical force of the blood, or perhaps because of some molecular signaling we don't yet know about."

In another experiment, the researchers transplanted lungs with fluorescent megakaryocyte progenitor cells into mutant mice with low platelet counts. The transplants produced a large burst of fluorescent platelets that quickly restored normal levels, an effect that persisted over several months of observation -- much longer than the lifespan of individual megakaryocytes or platelets. To the researchers, this indicated that resident megakaryocyte progenitor cells in the transplanted lungs had become activated by the recipient mouse's low platelet counts and had produced healthy new megakaryocyte cells to restore proper platelet production.

Finally, the researchers transplanted healthy lungs in which all cells were fluorescently tagged into mutant mice whose bone marrow lacked normal blood stem cells. Analysis of the bone marrow of recipient mice showed that fluorescent cells originating from the transplanted lungs soon traveled to the damaged bone marrow and contributed to the production not just of platelets, but of a wide variety of blood cells, including immune cells such as neutrophils, B cells and T cells. These experiments suggest that the lungs play host to a wide variety of blood progenitor cells and stem cells capable of restocking damaged bone marrow and restoring production of many components of the blood.

"To our knowledge this is the first description of blood progenitors resident in the lung, and it raises a lot of questions with clinical relevance for the millions of people who suffer from thrombocytopenia," said Looney, who is also an attending physician on UCSF's pulmonary consult service and intensive care units.

In particular, the study suggests that researchers who have proposed treating platelet diseases with platelets produced from engineered megakaryocytes should look to the lungs as a resource for platelet production, Looney said. The study also presents new avenues of research for stem cell biologists to explore how the bone marrow and lung collaborate to produce a healthy blood system through the mutual exchange of stem cells.

"These observations alter existing paradigms regarding blood cell formation, lung biology and disease, and transplantation," said pulmonologist Guy A. Zimmerman, MD, who is associate chair of the Department of Internal Medicine at the University of Utah School of Medicine and was an independent reviewer of the new study for Nature. "The findings have direct clinical relevance and provide a rich group of questions for future studies of platelet genesis and megakaryocyte function in lung inflammation and other inflammatory conditions, bleeding and thrombotic disorders, and transplantation."

The observation that blood stem cells and progenitors seem to travel back and forth freely between the lung and bone marrow lends support to a growing sense among researchers that stem cells may be much more active than previously appreciated, Looney said. "We're seeing more and more that the stem cells that produce the blood don't just live in one place but travel around through the blood stream. Perhaps 'studying abroad' in different organs is a normal part of stem cell education."

"It has been known for decades that the lung can be a site of platelet production, but this study amplifies this idea by demonstrating that the murine lung is a major participant in the process," said Traci Mondoro, PhD, project officer at the Translational Blood Science and Resources Branch of the NHLBI. "Dr. Looney and his team have disrupted some traditional ideas about the pulmonary role in platelet-related hematopoiesis, paving the way for further scientific exploration of this integrated biology."

The study was supported the UCSF Nina Ireland Program in Lung Health, the UCSF Program for Breakthrough Biomedical Research, and the National Heart, Lung, and Blood Institute (NHLBI), a division of the National Institutes of Health (HL092471, HL107386 and HL130324).

Additional authors included Axelle Caudrillier, PhD, Beñat Mallavia, PhD, Fengchun Liu, MD, Emily E. Thornton, PhD, Mark B. Headley, PhD, Tovo David, PhD, Shaun R. Coughlin, MD, PhD, Andrew D. Leavitt, MD; David M. Sayah, MD, PhD, of UCLA; and Emmanuelle Passegué, PhD, a former UCSF faculty member who is now director of the Columbia Stem Cell Initiative at Columbia University Medical Center.

http://bit.ly/2nPff3n

Toilet to Tap: Brewery Creates Beer from Recycled Wastewater

A Southern California brewery has put sustainability on tap with a new brew made exclusively from wastewater, according to news reports.

By Kacey Deamer, Staff Writer | March 22, 2017 04:21pm ET

This month, Stone Brewing unveiled its "Full Circle Pale Ale," which was made using recycled water from San Diego's Pure Water project, reported Mashable.

This was all done in the name of sustainability, the brewery said, noting how the historic drought in California affected the state's water sources. San Diego's Pure Water project — which aims to provide 30 million gallons (110 million liters) of recycled water a day to the city by 2021 — offered the brewery an opportunity to use a new water source to brew beer, while also helping raise awareness for the project, Mashable reported.

The unconventional brew even tastes great, the Times of San Diego reported, with the city's mayor calling the beer "fantastic." In fact, Stone Brewing CEO Pat Tiernan said the purified, recycled water was purer than the brewery's usual water supply, CW6 San Diego reported. "This particular water will just help us not require so much natural water to come in, and [will] give us a more reliable source. So for us to be able to re-use, that's part of our mantra, that's part of what we do," Tiernan told CW6.

Though the Full Circle Pale Ale was a one-time-only brew made specially for an event, the wastewater beer isn't Stone Brewing's first foray into sustainability. The brewery's headquarters has its own water-reclamation system, according to Mashable, and uses solar energy for 20 percent of the building's power.

http://bit.ly/2n21PMq

Sea urchin spines could fix bones

Scientists have developed a bone grafting material made out of sea urchin spines.

More than 2 million procedures every year take place around the world to heal bone fractures and defects from trauma or disease, making bone the second most commonly transplanted tissue after blood.

To help improve the outcomes of these surgeries, scientists have developed a new grafting material from sea urchin spines. They report their degradable bone scaffold, which they tested in animals, in the journal ACS Applied Materials & Interfaces.

Physicians have various approaches at hand to treat bone defects: Replacement material can come from a patient's own body, donated tissue, or a synthetic or naturally derived product.

All of these methods, however, have limitations. For example, current bioceramics, such as hydroxyapatite, that have been used as scaffolds for bone repair tend to be weak and brittle, which can lead to pieces breaking off. These pieces can then move into adjacent soft tissue, causing inflammation.

Recent studies have shown that biological materials, such as sea urchin spines, have promise as bone scaffolds because of their porosity and strength. Xing Zhang, Zheng Guo, Yue Zhu and colleagues wanted to test this idea in more detail.

Using a hydrothermal reaction, the researchers converted sea urchin spines to biodegradable magnesium-substituted tricalcium phosphate scaffolds while maintaining the spines' original interconnected, porous structure. Unlike hydroxyapatite, the scaffolds made from sea urchin spines could be cut and drilled to a specified shape and size.

Testing on rabbits and beagles showed that bone cells and nutrients could flow through the pores and promote bone formation. Also, the scaffold degraded easily as it was replaced by the new growth. The researchers say their findings could inspire the design of new lightweight materials for repairing bones.

Explore further: New study compares bone-inducing properties of 3-D-printed mineralized scaffolds

More information: Lei Cao et al. Lightweight Open-Cell Scaffolds from Sea Urchin Spines with Superior Material Properties for Bone Defect Repair, ACS Applied Materials & Interfaces (2017). DOI: 10.1021/acsami.7b01645

Abstract

Sea urchin spines (Heterocentrotus mammillatus), with a hierarchical open-cell structure similar to that of human trabecular bone and superior mechanical property (compressive strength ~43.4 MPa) suitable for machining to shape, were explored for potential applications of bone defect repair. Finite element analyses reveal that the compressive stress concentrates along the dense growth rings and dissipates through strut structures of the stereoms, indicating that the exquisite mesostructures play an important role in high strength-to-weight ratios. The fracture strength of magnesium-substituted tricalcium phosphate (β-TCMP) scaffolds produced by hydrothermal conversion of urchin spines is about 9.3 MPa, comparable to that of human trabecular bone. New bone forms along outer surfaces of β-TCMP scaffolds after implantation in rabbit femoral defects for one month and grows into the majority of the inner open-cell spaces postoperation in three months, showing tight interface between the scaffold and regenerative bone tissue. Fusion of beagle lumbar facet joints using a Ti-6Al-4V cage and β-TCMP scaffold can be completed within seven months with obvious biodegradation of the β-TCMP scaffold, which is nearly completely degraded and replaced by newly formed bone ten months after implantation. Thus, sea urchin spines suitable for machining to shape have advantages for production of biodegradable artificial grafts for bone defect repair. Journal reference: ACS Applied Materials and Interfaces

http://bit.ly/2oqqLHY

Old blood can be made young again and it might fight ageing

A protein can boost blood stem cells, making them behave like those of younger people. Is it the key to harnessing young blood's rejuvenating power?

By Jessica Hamzelou

BLOOD from the young seems to have healing powers, but how can we harness them without relying on donors? The discovery of a protein that keeps blood stem cells youthful might help.

The rejuvenating properties of young blood came to light in macabre experiments that stitched young and old mice together to share a circulatory system. The health of the older mice improved, while that of the younger ones deteriorated. Other animal studies have since shown that injections of young or old blood have similar effects.

This may work in people too. Young blood is being trialled as a treatment for conditions like Alzheimer's, and aged mice that received injections of blood from human teenagers showed improved cognition, memory and physical activity levels.

"But these studies rely on young people donating their blood: if this became the go-to therapy for age-related disease it would be difficult to get enough donations to fulfill demand.

The stem cells in our blood could provide an alternative approach. Our red and white blood cells are made by stem cells that themselves come from "mother" stem cells in bone marrow. But as we age, the number of these mother stem cells declines. One of the world's longest-lived women seemed to only have two left in her blood when she died at age 115.

The decline in mother stem cells causes people to have fewer red blood cells, and white blood cells called B and T lymphocytes.

These declines can cause anaemia and weaken the immune system. "Usually the immune system in the elderly is not prepared to fight infections very hard," says Hartmut Geiger at the University of Ulm in Germany.

When Geiger's team examined the bone marrow in mice, they found that older animals have much lower levels of a protein called osteopontin. To see if this protein has an effect on blood stem cells, the team injected stem cells into mice that lacked osteopontin and found that the cells rapidly aged.

But when older stem cells were mixed in a dish with osteopontin and a protein that activates it, they began to produce white blood cells just as young stem cells do. This suggests osteopontin makes stem cells behave more youthfully (EMBO Journal, doi.org/b4jp). "If we can translate this into a treatment, we can make old blood young again," Geiger says.

"It's exciting," says Hanadie Yousef at Stanford University in California. But longer term studies are needed to see whether this approach can rejuvenate the whole blood system, she says.

Until now, most efforts to use blood as a rejuvenation agent have focused on plasma, the liquid component, as some believe it carries dissolved factors that help maintain youth. But Geiger thinks the cells in blood might play a key role, because they are better able to move into the body's tissues.

Heart health

Both soluble factors and blood cells are likely to be important, says Yousef. While injections of young plasma rejuvenate older animals, the treatment doesn't have as strong an effect as when young and old animals share a circulatory system, she says.

Geiger's team is developing a drug containing osteopontin and the activating protein to encourage blood stem cells to behave more youthfully. "It should boost the immune system of elderly people," he says.

Such a drug might have benefits beyond fighting infection and alleviating anaemia. The team also think the protein will boost levels of mother stem cells. Having only a small number of such cells has been linked to heart disease, so Geiger says there is a chance that boosting them may help prevent this.

Osteopontin might also be useful for treating age-linked blood disorders, such as myelodysplasias that involve dysfunctional cells, says Martin Pera of the Jackson Laboratory in Bar Harbor, Maine. "It is possible that rejuvenating bone marrow stem cells could help with these conditions," he says.

"This study provides more evidence that cells can be rejuvenated," says Ioakim Spyridopoulos at Newcastle University, UK. "They have made old blood look young again, although whether it acts young or not will have to be shown in clinical trials."

http://nyti.ms/2oqz27R

A Scholarly Sting Operation Shines a Light on 'Predatory' Journals

Sting documents the seamy side of open-access publishing

By GINA KOLATA MARCH 22, 2017

The applicant's nom de plume was not exactly subtle, if you know Polish. The middle initial and surname of the author, Anna O. Szust, mean "fraudster." Her publications were fake and her degrees were fake. The book chapters she listed among her publications could not be found, but perhaps that should not have been a surprise because the book publishers were fake, too.

Yet, when Dr. Fraud applied to 360 randomly selected open-access academic journals asking to be an editor, 48 accepted her and four made her editor in chief. She got two offers to start a new journal and be its editor. One journal sent her an email saying, “It’s our pleasure to add your name as our editor in chief for the journal with no responsibilities.”

Little did they know that they had fallen for a sting, plotted and carried out by a group of researchers who wanted to draw attention to and systematically document the seamy side of open-access publishing. While those types of journals began with earnest aspirations to make scientific papers available to everyone, their proliferation has had unintended consequences.


CURRICULUM VITAE

dr hab. Anna Olga Szust

Associate Professor

Adam Mickiewicz University in Poznań

History of Science Unit

Institute of Philosophy UAM

Email address:

Personal website:

The résumé of the fictional Anna O. Szust. **Sorokowski et al./Nature**

Traditional journals typically are supported by subscribers who pay a fee while authors pay nothing to be published. Nonsubscribers can only read papers if they pay the journal for each one they want to see.

Open-access journals reverse that model. The authors pay and the published papers are free to anyone who cares to read them.

Publishing in an open-access journal can be expensive — the highly regarded Public Library of Science (PLOS) journals charge from $1,495 to $2,900 to publish a paper, with the fee dependent on which of its journals accepts the paper.

Not everyone anticipated what would happen next, or to what extent it would happen. The open-access business model spawned a shadowy world of what have been called predatory journals. They may have similar names to legitimate journals, but exist by publishing just about anything sent to them for a fee that can range from under $100 to thousands of dollars.

The fee often is between $100 and $400, said Jeffrey Beall, scholarly communications librarian at the University of Colorado, Denver, as the journals compete for paying customers. Of course, it is easier for predatory journals to have low fees because their expenses are minimal. The researchers decided not to list any of the fake journals that they uncovered in the sting, saying that some have names so close to those of legitimate journals that it would be confusing.

There are now thousands of fake open-access journals, about as many as legitimate ones, according to one of the creators of Dr. Fraud, Katarzyna Pisanski, a researcher in the School of Psychology at the University of Sussex in England, and her colleagues.

It was that alternate world that Dr. Fraud tapped into. The legitimate journals rejected her application out of hand, but many fake ones did not hesitate to take her on.

The investigators, writing about their sting operation in Nature, said they had seen young colleagues fall for the blandishments of predatory journals, not realizing that the emails they received were from publications that only wanted their money. Dr. Pisanski and her colleagues wanted to help researchers understand how fake journals operated.

“The emails can be very flattering,” Dr. Pisanski said, telling the recipients they are “eminent researchers” and “inviting” them to contribute. When researchers respond and send in papers, “they are published at lightning speed, often without peer review,” she said.

But not everyone who publishes in these journals is an innocent dupe. Mr. Beall, who until recently published a list of predatory journals, said he believes many researchers know exactly what they are doing when they publish there.

“I believe there are countless researchers and academics, currently employed, who have secured jobs, promotions, and tenure using

publications in pay-to-publish journals as part of their credentials and experience for the jobs and promotions they got," Mr. Beall said.

And it can require real diligence on the part of employers to ferret out those questionable publications, Mr. Beall said.

"Examining someone's publications now requires close scrutiny," Mr. Beall said. "Merely eyeballing a C.V. is insufficient now."

David Knutson, the manager of communications at PLOS, said that young researchers may feel relentless pressure to publish, at all costs.

"These authors are shopping around their papers," he said. "There is so much pressure to publish."

As for Dr. Fraud, she got some lucrative offers. One journal suggested she organize a conference, whose papers would then be published; she would get 40 percent of the proceeds. Another invited her to start a new journal and offered her 30 percent of the profits.

Dr. Pisanski and her colleagues told the journals that accepted Dr. Fraud that she wanted to withdraw her application to be an editor. But it was not easy to withdraw.

Dr. Fraud remains listed as a member of the editorial boards of at least 11 of those journals. She is also listed as a member of conference-organizing committees. At least one journal she did not apply to also listed her as an editor.

And, Dr. Pisanski and her colleagues wrote, Dr. Fraud is even listed as an advisory board member of the Journals Open Access Indexing Committee. Its mission? To "increase the visibility and ease of use of open-access scholarly journals."

Correction: March 24, 2017

An article on Thursday about open-access publications that publish articles for a fee referred incorrectly to Jeffrey Beall, a scholarly communications librarian at the University of Colorado, Denver. He holds no medical degree or a Ph.D., and therefore is not "Dr. Beall." (He has two master's degrees.)

Correction: March 24, 2017

An earlier version of this article misspelled the given name of a librarian at the University of Colorado, Denver. He is Jeffrey Beall, not Jeffery. The error was repeated in a correction.

http://bit.ly/2mBQBmn

Research highlights potential way to combat toxoplasmosis parasite

It lives inside one third of the UK population and is a common infection in cats, however until now scientists knew little about how the toxoplasmosis parasite communicated with its host.

New research, by the University of Glasgow's Wellcome Centre for Molecular Parasitology in collaboration with The University of Vermont, has revealed how the parasite uses a key protein to form a communication network and ultimately continue the infection process.

The paper, which is published today in eLife, has identified a key "intracellular network of protein" that allows the toxoplasmosis parasites to communicate with each other while inside the host. The research has also shown that disrupting this network leads to reduced replication of the parasite and an inability to leave the single host cell – which ultimately halts infection.

Toxoplasma gondii is a parasite that commonly infects cats, but it is also carried by other warm-blooded animals, including humans. Up to one-third of the UK population is chronically infected with the parasite, although most experience few harmful effects.

However, women who become infected during pregnancy can pass the parasite to their unborn child. This can result in serious health problems for the baby such as blindness and brain damage. People who have compromised immunity, such as individuals infected with HIV, are also at risk of serious complications owing to the reactivation of dormant parasitic cysts in the brain.

Toxoplasma parasites must actively invade host cells so they can replicate and survive. During an infection, this replication is synchronised, meaning that all parasites in the host cell replicate at the same time.

Until now it was unknown how these parasites co-ordinated this tightly regulated process. However, through experimental work, the researchers have discovered that the protein actin helps the parasite

cells form an extensive network that connects individual Toxoplasma parasites. When this protein is depleted in the parasite, not only does this network collapse, but the parasites also start to replicate out of synch and are trapped inside the host cell.

Professor Markus Meissner from the University of Glasgow, one of the lead authors of this study, said: "This work greatly increases our understanding of the Toxoplasma parasite, and provides an insight into how this potentially dangerous parasitic infection can be disrupted.

"When we first saw the formation of such an extensive network, we didn't believe our eyes and the first thing we discussed was if this is just an artefact. However, at the end all our control experiments demonstrated that it is very real. The major challenge was to convince some of our colleagues who were also looking into the role of actin in these parasites." The findings could provide clues to new treatment for other parasite diseases, including malaria, which cause substantial morbidity and mortality worldwide.

Dr Aoife Heaslip, previously of the University of Vermont who is now an Assistant Professor at the University of Connecticut, said: "We've known for many years that actin was an important protein needed for parasite entry into host cells. However our recent discover that actin forms communication channels between parasites as they grow inside host cells adds a whole new dimension to our understanding."

More information: Javier Periz et al. F-actin forms an extensive filamentous network required for material exchange and parasite maturation, eLife (2017). DOI: 10.7554/eLife.24119

http://bit.ly/2oqlvNI

UVA finds ANOTHER immune system link science said didn't exist

Unexpected connection likely sabotaging vaccines designed to treat cancer

The University of Virginia School of Medicine has again shown that a part of the body thought to be disconnected from the immune system actually interacts with it, and that discovery helps explain cases of male infertility, certain autoimmune diseases and even the failure of cancer vaccines.

Scientists developing such vaccines may need to reconsider their work in light of the new findings or risk unintentionally sabotaging their own efforts.

UVA's Kenneth Tung, MD, said that many vaccines likely are failing simply because researchers are picking the wrong targets - targets that aren't actually foreign to the immune system and thus won't provoke the desired immune responses.

Overturning Orthodoxy

Tung, of UVA's Beirne B. Carter Center for Immunology Research, and a team of collaborators have discovered an unexpected interaction between men's testes and the immune system.

While science textbooks insist the testes are barricaded from the immune system by an impenetrable wall of cells, the researchers have determined there's actually a very small door in that wall, a door that appears to open in only one direction.

The team discovered that the testes release some, but not all, of the antigens - substances that can spur an immune response - that are created during the production of sperm. Because the testes release these antigens naturally, the immune system ignores them.

That's a normal, healthy response, but it also may explain why cancer vaccines are failing.

Cancer vaccines target antigens, so if vaccine developers rely on antigens that are ignored by the immune system, the vaccine won't work.

"In essence, we believe the testes antigens can be divided into those which are sequestered [behind the barrier] and those that are not," Tung said. "Antigens which are not sequestered would not be very good cancer vaccine candidates."

The good news is that doctors can determine which antigens a patient's cancer cells release. By targeting sequestered antigens - the

ones unknown to the immune system - doctors could greatly increase vaccines' chances of success.

Treating Infertility

The finding also may prove important for couples seeking to have children. Up to 12 percent of men who suffer from infertility have an autoimmune response to their own reproductive cells. That means their immune systems are attacking their sperm, essentially.

Tung and his collaborators shed light on what may be happening, showing that a particular step during the creation of sperm is responsible for determining whether the sperm antigens will spark an immune response.

Cells called "regulatory T cells" then help control the immune system's response to the non-sequestered antigens. In men who are infertile because of an autoimmune disorder, something is going wrong with the process, leading the immune system to attack when it shouldn't.

With that knowledge, doctors may be able to develop new treatments for the autoimmune disorders and the resulting infertility.

Rethinking the Immune System

The discovery of the unknown immune interaction comes less than two years after UVA's Jonathan Kipnis and Antoine Louveau rewrote textbooks when they discovered that the brain has a direct connection to the immune system, a connection long thought not to exist.

That discovery could have profound effects in the quest to defeat diseases ranging from Alzheimer's to multiple sclerosis.

Tung and his colleagues have published their findings in the Journal of Clinical Investigation. The research team consisted of Tung, of UVA's Department of Pathology, its Department of Microbiology, Immunology and Cancer Biology and its Beirne B. Carter Center for Immunology Research; Jessica Harakal; Hui Qiao; Claudia Rival; Jonathan C.H. Li; Alberta G.A. Paul: Karen Wheeler; Patcharin Pramoonjago; Constance M. Grafer; Wei Sun; Robert D. Sampson; Elissa W.P. Wong of the Center for Biomedical Research, Population Council; Prabhakara P. Reddi; Umesh S. Deshmukh; Daniel M. Hardy of Texas Tech University Health Sciences Center; Huanghui Tang of Northwestern University; C. Yan Cheng of the Center for Biomedical Research, Population Council; and Erwin Goldberg of Northwestern University.

http://bit.ly/2noUqdr

When inspectors swoop in, hospital staff save more lives

Largest gains seen in teaching hospitals that have reputations on the line.

Beth Mole - 3/22/2017, 1:33 AM

Even the best and brightest employees will slack a bit when the boss isn't looking—we're not machines, after all. (*Editor's note: get back to work!*) Perhaps a project doesn't move along as briskly as it could, or a protocol isn't followed precisely. In the working world, minor mediocrity now and then may not be a big deal—it's not like it's life or death, right?

But what if you're a healthcare provider?

According to a new study in *JAMA Internal Medicine,* doctors and nurses are, sadly, just like the rest of us. When inspectors roll into town, those healthcare providers straighten up and save more lives. The effect is modest overall, researchers found, but it could make a difference of thousands of lives saved each year.

The study authors, led by researchers at Harvard, hope the findings can motivate us to figure out which corners can and cannot be cut when no one is looking. In other words, the data offers "a window into quality improvement that is likely driven by a small number of key changes during surveys," the authors conclude.

To catch the slack-off level in hospitals, the researchers looked at 30-day mortality outcomes of Medicare patients hospitalized before, during, or after the week when a hospital was getting a routine inspection by The Joint Commission. This is the nonprofit organization that accredits hospitals. The researchers sifted through records on 1,984 general hospitals between 2008 and 2012. They picked out data on 244,787 patient admissions during 3,417 week-long hospital surveys. They then compared that data with that from 1,462,339 admissions in the same hospitals during the three weeks before and after those survey weeks.

Life-saving corners

Overall, they found a 1.5 percent decrease in the mortality rate during inspection weeks compared with normal operating weeks. But the effect was greater in major teaching hospitals, which have their elite reputations on the line as they try to dazzle inspectors. In these hospitals, mortality rates decreased by 5.9 percent. If that decreased rate stretched over an entire year in those hospitals, it would mean around 3,600 fewer deaths, the researchers estimated.

The team wasn't able to figure out precisely what hospitals do differently during inspection weeks that caused the death-rate dips. They didn't see significant changes in the rates of death from certain infections, cardiac arrests, or post-surgery complications. Instead, the authors speculate that the improved mortality rates overall may be due to staff's heightened vigilance and stricter adherence to protocols and procedures.

To have some of those survey-week advantages play out all year long, the authors recommend hospitals look for the biggest changes that occur while their staff is mobilized and alert during inspections. "Observe which aspects of normal day-to-day operations change most dramatically in their institution to meet survey readiness standards (eg, clean environment and proper documentation)," the authors advise. "Those changes may be the best opportunities to identify whether more continual attention could improve patient safety."

JAMA Internal Medicine, *2017. DOI: 10.1001/jamainternmed.2016.9685 (About DOIs).*

http://bit.ly/2o5TkBU

Japanese company develops a solar cell with record-breaking 26%+ efficiency

A group of researchers funded by a Japanese government program develops "industrially compatible" cells.

Megan Geuss - 3/23/2017, 1:28 AM

Solar panels are cheaper than ever these days, but installation costs can still be considerable for homeowners. More efficient solar panels can recapture the cost of their installation more quickly, so making panels that are better at converting sunlight into electricity is a key focus of solar research and development.

The silicon-based cells that make up a solar panel have a theoretical efficiency limit of 29 percent, but so far that number has proven elusive. Practical efficiency rates in the low-20-percent range have been considered very good for commercial solar panels. But researchers with Japanese chemical manufacturer Kaneka Corporation have built a solar cell with a photo conversion rate of 26.3 percent, breaking the previous record of 25.6 percent. Although it's just a 2.7 percent increase in efficiency, improvements in commercially viable solar cell technology are increasingly hard-won.

A solar cell with 26.3 percent efficiency. **Photovoltaic & Thin Film Research Laboratories (Kaneka corporation)**

Not only that, but the researchers noted in their paper that after they submitted their article to Nature Energy, they were able to further optimize their solar cell to achieve 26.6 percent efficiency. That result has been recognized by the National Renewable Energy Lab (NREL).

In the Nature Energy paper, the researchers described building a 180.4 cm^2 cell using high-quality thin-film heterojunction (HJ)—that is, layering silicon within the cell to minimize band gaps where electron states can't exist. Controlling heterojunctions is a known technique among solar cell builders—Panasonic uses it and will likely incorporate it into cells built for Tesla at the Solar City plant in Buffalo, and Kaneka has its own proprietary heterojunction techniques.

For this record-breaking solar cell, the Kaneka researchers also placed low-resistance electrodes toward the rear of the cell, which maximized the number of photons that collected inside the cell from the front. And, as is common on many solar cells, they coated the front of the cell with a layer of amorphous silicon and an anti-reflective layer to protect the cell's components and collect photons more efficiently.

After describing the architecture of the solar cell, Kaneka researchers analyzed the energy losses that prevented the cell from reaching that 29-percent efficiency ideal, which could help future solar cell builders optimize their cells to get closer to the limit. Kaneka researchers estimated that overall efficiency was reduced by 0.5 percent due to resistive loss, 1 percent due to optical loss (the way the cell receives light), and 1.2 percent due to extrinsic recombination loss—where a free electron recombines with a positively charged hole rather than going on for current collection.

The paper noted that this solar cell was created using "industrial applicable" processes, like plasma-enhanced chemical vapor deposition (PECVD), which deposits thin films onto a solid wafer from a gas state. While the solar cell may be vapor-ware in the sense that chemical vapor helps create them, the industry-friendly process reduces the likelihood that the high-efficiency architecture will end up as something we'd call vaporware more colloquially. (Thanks folks, I'll be here all night.)

That said, the authors note that "further work is required before the individual cells can be assembled into a commercially available solar panel." But further work seems likely. Kaneka's research was funded by Japan's New Energy and Industrial Technology Development Organization, abbreviated to NEDO, and according to IEEE Spectrum, the company will continue to work with NEDO to bring the levelized cost of solar cells down to $0.06 per kilowatt-hour by 2030.

Nature energy, 2017. DOI: 10.1038/nenergy.2017.32 (About DOIs).

http://bit.ly/2np6sne

New stem cell method produces millions of human brain and muscle cells in days

The results open the door to producing a diversity of new cell types that could not be made before

Wellcome Trust Sanger Institute scientists and their collaborators at the University of Cambridge have created a new technique that simplifies the production of human brain and muscle cells - allowing millions of functional cells to be generated in just a few days. The results published today (23 March) in Stem Cell Reports open the door to producing a diversity of new cell types that could not be made before in order to study disease.

Human pluripotent stem cells offer the ability to create any tissue, including those which are typically hard to access, such as brain cells. They hold huge potential for studying human development and the impact of diseases, including cancer, Alzheimer's, Multiple Sclerosis, and heart disease.

In a human, it takes nine to twelve months for a single brain cell to develop fully. To create human brain cells, including grey matter (neurons) and white matter (oligodendrocytes) from an induced pluripotent stem cell, it can take between three and twenty weeks using current methods. However, these methods are complex and time-consuming, often producing a mixed population of cells.

The new platform technology, OPTi-OX, optimises the way of switching on genes in human stem cells. Scientists applied OPTi-OX to the production of millions of nearly identical cells in a matter of days. In addition to the neurons, oligodendrocytes, and muscle cells the scientists created in the study, OPTi-OX holds the possibility of generating any cell type at unprecedented purities, in this short timeframe.

To produce the neurons, oligodendrocytes, and muscle cells, scientists altered the DNA in the stem cells. By switching on carefully selected genes, the team "reprogrammed" the stem cells and created a large and nearly pure population of identical cells. The ability to produce as many cells as desired combined with the speed of the development gives an advantage over other methods. The new method opens the door to drug discovery, and potentially therapeutic applications in which large amounts of cells are needed.

An author of the study, Dr Ludovic Vallier from the Wellcome Trust Sanger Institute said: "What is really exciting is we only needed to change a few ingredients - transcription factors - to produce the exact

cells we wanted in less than a week. We over-expressed factors that make stem cells directly convert into the desired cells, thereby bypassing development and shortening the process to just a few days."

OPTi-OX has applications in various projects, including the possibility to generate new cell types which may be uncovered by the Human Cell Atlas. The ability to produce human cells so quickly means the new method will facilitate more research.

Joint first author, Daniel Ortmann from the University of Cambridge, said: "When we receive a wealth of new information on the discovery of new cells from large scale projects, like the Human Cell Atlas, it means we'll be able to apply this method to produce any cell type in the body, but in a dish."

Mark Kotter, lead author and Clinician from the University of Cambridge, said: "Neurons produced in this study are already being used to understand brain development and function. This method opens the doors to producing all sorts of hard-to-access cells and tissues so we can better our understanding of diseases and the response of these tissues to newly developed therapeutics."

Matthias Pawlowski et al. (2017) Inducible and deterministic forward programming of human pluripotent stem cells. Stem Cell Reports. DOI: 10.1016/j.stemcr.2017.02.016

http://bit.ly/2nWAC2O

Major breakthrough in the manufacture of red blood cells

Researchers have generated the first immortalised cell lines which allow more efficient manufacture of red blood cells.

The team, from the University of Bristol and NHS Blood and Transplant, were able to manufacture red blood cells in a more efficient scale than was previously possible.

The results, published in Nature Communications, could, if successfully tested in clinical trials, eventually lead to a safe source of transfusions for people with rare blood types, and in areas of the world where blood supplies are inadequate or unsafe.

Previously, research in this field focused on growing donated stem cells straight into mature red blood cells. However that method presently produces small numbers of mature cells and requires repeat donations.

The world-leading team in Bristol have now developed a robust and reproducible technique which allows the production of immortalised erythroid cell lines from adult stem cells. These premature red cells can be cultured indefinitely, allowing larger-scale production, before being differentiated into mature red blood cells.

Dr Jan Frayne, from the University of Bristol's School of Biochemistry, said: "Previous approaches to producing red blood cells have relied on various sources of stem cells which can only presently produce very limited quantities. By taking an alternative approach we have generated the first human immortalised adult erythroid line (Bristol Erythroid Line Adult or BEL-A), and in doing so, have demonstrated a feasible way to sustainably manufacture red cells for clinical use from in vitro culture.

"Globally, there is a need for an alternative red cell product. Cultured red blood cells have advantages over donor blood, such as reduced risk of infectious disease transmission."

Prof Dave Anstee, Director at the NIHR Blood and Transplant Research Unit in Red Cell Products, which is a collaboration between the University of Bristol and NHS Blood and Transplant, said: "Scientists have been working for years on how to manufacture red blood cells to offer an alternative to donated blood to treat patients.

"The first therapeutic use of a cultured red cell product is likely to be for patients with rare blood groups because suitable conventional red blood cell donations can be difficult to source.

"The patients who stand to potentially benefit most are those with complex and life-limiting conditions like sickle cell disease and thalassemia, which can require multiple transfusions of well-matched blood. The intention is not to replace blood donation but provide specialist treatment for specific patient groups."

The cells were cultured at the University of Bristol and at NHS Blood and Transplant's Filton site.

NHS Blood and Transplant needs to collect 1.5 million units of blood each year to meet the needs of patients across England and the ongoing need for life saving blood donations remains. It would be many years before manufactured cells could be available on a large scale.

NHS Blood and Transplant announced plans for in-man trials of manufactured blood in 2015. This first trial will not use Bel-A cells. The first trial, due to start by the end of 2017, will use manufactured red cells from stem cells in a normal blood donation.

The research was funded by The Department of Health, The Wellcome Trust, NHS Blood and Transplant, BrisSynBio via a BBSRC/EPSRC Synthetic Biology Research Centre Grant, National Institute for Health Research Blood and Transplant Unit (NIHR BTRU) in Red Blood Cell Products at the University of Bristol in Partnership with NHS Blood and Transplant (NHSBT). The research is available to view online here: http://www.nature.com/articles/ncomms14750

http://bit.ly/2njQ4Tq

Nearly Two-Thirds of Cancers Are Due to Random DNA 'Mistakes'

Cancer is caused by mistakes in DNA, and a new study finds that in most cancer cases, these mistakes are completely random; they're not due to heredity or environmental factors, but rather the result of random errors.

By Sara G. Miller, Staff Writer | March 23, 2017 06:55pm ET

The mistakes, or mutations, cause cancer to happen because even a tiny error in DNA can make cells multiply out of control, the study said. Scientists had thought these mutations resulted mainly from two things: Either the mutation was inherited, or it was caused by outside factors that can damage DNA, such as cigarette smoke or ultraviolet radiation, the researchers wrote.

But a third cause — random mistakes — actually accounts for two-thirds of these mutations, said the new study, published today (March 23) in the journal Science.

When a cell divides, it copies its DNA, so that each of the new cells will have its own version of the genetic material. But each time this copying happens, it creates an opportunity for a mistake to occur. And in some cases, these mistakes can lead to cancer.

This means that cancer "will occur no matter how perfect the environment," senior study author Dr. Bert Vogelstein, a pathologist at the Sidney Kimmel Comprehensive Cancer Center at Johns Hopkins University, said in a statement.

In the new study, the researchers wanted to calculate what percentage of cancers were due to heredity, the environment and random mistakes. The scientists developed a mathematical model that incorporated data from registries of cancer patients around the world and data from DNA sequencing.

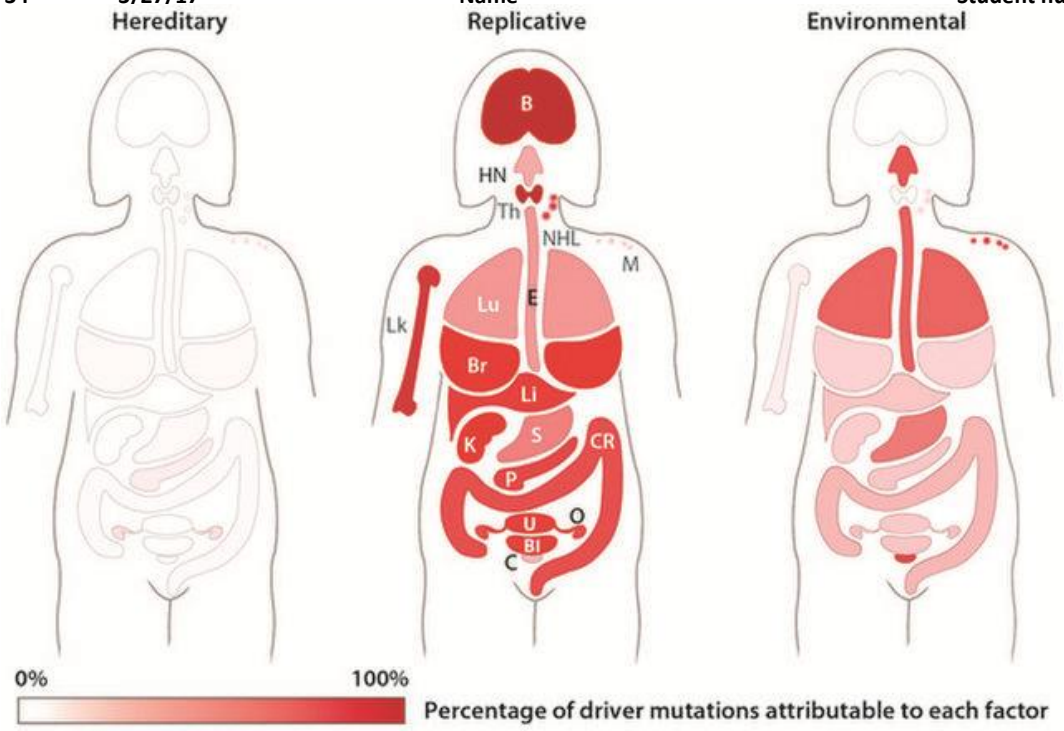
Random error

About 66 percent of cancers were due to random mistakes, 29 percent of cancers were due to environmental factors or people's lifestyles, and 5 percent of cancers were due to inherited mutations, the study found. This result, the researchers noted, lined up somewhat with an estimate from Cancer Research UK that 42 percent of cancers could be prevented with changes to lifestyle.

Some types of cancer, such as brain and prostate cancer, are nearly entirely attributable to random mistakes, the study said. The researchers found that random mistakes had caused more than 95 percent of these cancer cases that were looked at in the study.

For some other cancers, however, environmental factors play a large role, the study found. For example, environmental factors, primarily smoking, caused 65 percent of all lung cancers in the study, the researchers found. Just 35 percent of lung cancers were due to random mistakes, the investigators found.

A single mutation in a cell is unlikely to cause cancer, Vogelstein noted, speaking in a podcast produced by Johns Hopkins. Rather, the more mutations there are, the more likely it is that the cell will turn cancerous, he said.



In this image, the researchers used red coloring to indicate the percentage of cancers that are attributed to inherited mutations (left), random mistakes (center) and environmental factors (right) in women. For each organ, the color represents what percentage is attributable to each factor, ranging from white (0 percent) to red (100 percent). The cancers are identified as: B, brain; Bl, bladder; Br, breast; C, cervical; CR, colorectal; E, esophagus; HN, head and neck; K, kidney; Li, liver; Lk, leukemia; Lu, lung; M, melanoma; NHL, non-Hodgkin lymphoma; O, ovarian; P, pancreas; S, stomach; Th, thyroid; U, uterus. **C. Tomasetti et al,. Science (2017)**

Thus, mutations from random mistakes are enough to cause cancer by themselves in some cases, Vogelstein said. But in others, a combination of random mistakes, plus mistakes due to environmental factors eventually turns the cell cancerous, he said. For example, skin cells have a baseline level of mutations due to random mistakes, and exposure to ultraviolet light can add even more mutations, leading to cancer, he said.

Cristian Tomasetti, an assistant professor of biostatistics also at Johns Hopkins, likened the three causes of mutations to typos that occur while using a keyboard. Some of those typos may be the result of the typist being tired or distracted; these can be thought of as the environmental factors, Tomasetti said on the podcast. And if the keyboard the typist is using is missing a key, that's a hereditary factor, Tomasetti said.

But even in a perfect environment, where the typist is perfectly rested and using a perfectly working keyboard, typos will still occur, Tomasetti said. And these represent the random mistakes.

What the study means for prevention

There are prevention strategies for cancers caused by environmental factors or inherited genes: A smoker can quit smoking to help lower his or her risk of lung cancer, and a woman who finds that she carries the breast cancer BRCA mutation may opt to have a preventative mastectomy.

These "primary prevention" strategies are considered the best way to reduce deaths from cancers, the researchers wrote in the study.

Such primary prevention is not possible for cancers caused by random mutations, but still, "secondary prevention" can help save lives, the authors wrote. Secondary prevention refers to early detection of cancer, according to the study.

"We need to focus more on early detection, because these are not mutations" that can be avoided, Tomasetti said on the podcast.

http://bbc.in/2np6I5s

Africa health: Rotavirus vaccine could save 500,000 children a year

Hopes are growing for a new, inexpensive, heat-proof vaccine to protect against a disease which kills 1,300 children a day following a successful trial in Niger.

The vaccine was found to be almost 67% effective in preventing gastroenteritis caused by rotavirus, the most common cause of severe

diarrheal disease in the world. The two existing vaccines require refrigeration and can be costly. The new drug would be half the price.

Medecins Sans Frontieres medical director Micaela Serafini described the vaccine, called BRV-PV, as "a game changer".

"It's a vaccine that fits much more with what we believe are the needs in Africa," she told the Thomson Reuters Foundation.

More than 500,000 children die each year from dehydration and complications of rotavirus, particularly in sub-Saharan Africa, according to the World Health Organization. But the current vaccines are difficult to transport and administer as they must be refrigerated at all times. A vaccine which does not need to be refrigerated would be able to reach children in even the most remote areas.

"This trial brings a vaccine which is adapted to African settings to those who need it most," said Sheila Isanaka, assistant professor of nutrition at Harvard University and co-author of the study in the New England Journal of Medicine.

"When the vaccine becomes widely available in Africa, it will help protect millions of the most vulnerable children." BRV-PV, which is manufactured in India and licensed there, needs final World Health Organisation approval before it can be used worldwide.

http://bit.ly/2ojxlXl

Deadly, drug-resistant Candida yeast infection spreads in the US

An emerging fungus could become the latest hospital-acquired infection we have to worry about.

By Chelsea Whyte

On 16 March, the US Centers for Disease Control and Prevention (CDC) reported that 53 people in the US have been taken ill with *Candida auris* – most of them in New York state. A further 27 healthy carriers of the fungus have been identified in three states where clinical cases were detected.

People at highest risk are those with weak immune systems including premature babies, people with diabetes, people on dialysis, and those who have had recent transplants or other invasive surgery.

Unlike most common yeast infections, *C. auris* doesn't usually cause thrush, but results in bloodstream, wound or ear infections instead – triggering organ failure in the worst cases.

Although information isn't available for all patients, the death rate could be as high as 60 per cent. However, because patients usually contract the infection while hospitalised with other major illnesses, it's difficult to be sure whether any deaths can be attributed solely to *C. auris*.

Global spread

C. auris was first identified in Japan in 2009. Since then, infections have also been reported in countries including Canada, Colombia, Germany, India, Israel, Kenya, Kuwait, Norway, Pakistan, Spain, South Africa, South Korea, the United Kingdom and Venezuela. Between May 2013 and August 2016, the first 13 cases were reported in the US. Since then, the number of infections has tripled, signalling a spike in reported cases.

Some strains of the fungus are resistant to all three major classes of antifungal drugs. "It's pretty difficult to find new antibiotics. It's harder to find new antifungals," says David Denning at the University Hospital of South Manchester, UK.

Humans and fungi share many common metabolic pathways, so lots of agents that kill fungi are too toxic for human use. "*C. auris* has the potential to be a really difficult problem," Denning says.

However, he stresses that the majority of people don't need to worry about becoming infected. "The ordinary person coming into the hospital to have a hernia operation or have a breast lump or their diabetes checked is not at risk. Neither are patients out in the community."

Few drug manufacturers are currently focusing on developing antifungal compounds, but Denning says some promising oral and

intravenous treatments are being developed in the UK, Japan and Sweden. It remains to be seen whether they will work against this stubborn infection.

http://bit.ly/2nk6NWC

How our species got smarter: through a rush of blood to the head

Size of the carotid canals indicates increasing blood flow to the brain

March 24, 2017 by Roger S. Seymour, The Conversation

Anthropologists have been curious about the evolution of human intelligence for many decades. The main lines of research have involved archaeological finds concerning the use of fire, tools and so on. But what about looking for evidence in fossil skulls, the place where the brain resided?

Hominin skull casts (L-R) Australopithecus afarensis, Homo habilis, Homo ergaster, Homo erectus, Homo neanderthalensis. **Roger Seymour/South Australian Museum, Author provided**

The volume of the human brain increased to be about three and a half times larger than our Australopithecus ancestors 3 million years ago.

It is generally assumed that intelligence is correlated with brain size, and the reason for this is that the number of nerve cells in mammalian brains seems to be directly related to brain size.

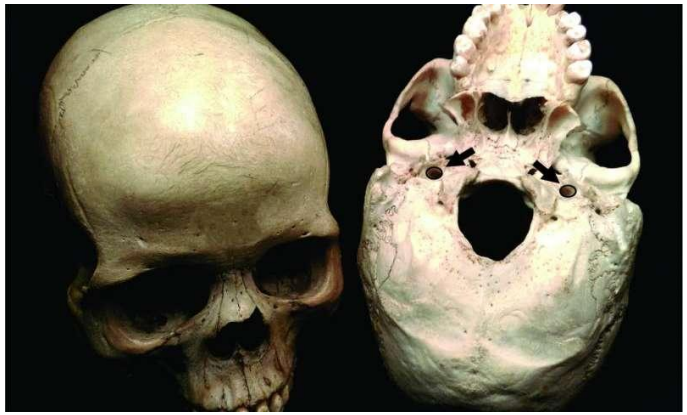
Our research focused on the rate of blood flow to the brain, which relates closely to metabolic rate because the blood supplies the essential oxygen. If blood flow to your brain is stopped, you will pass out within seconds.

Normally you have about 7 millilitres of blood flowing to your brain each second. Remarkably, this rate changes little, regardless of whether you are awake, asleep or solving mathematical problems.

The brain's plumbing

The blood flow to the cognitive part of the brain, the cerebrum, comes through two internal carotid arteries, one on the right and one on the left. The size of these arteries is related to the rate of blood flow through them.

Just as a plumber would install larger water pipes to accommodate a higher flow rate to a larger building, the blood circulatory system continually adjusts the sizes of blood vessels to match the rate of blood flow inside them. This in turn is related to the oxygen demand of the organ.



The arrows on the human skull (right) show two internal carotid artery foramina, the size of which indicates the rate of blood flow to the cerebrum. Edward Snelling. **Sourced from the Raymond Dart Collection of Human Skeletons, School of Anatomical Sciences, Faculty of Health Sciences, University of the Witwatersrand, Author provided**

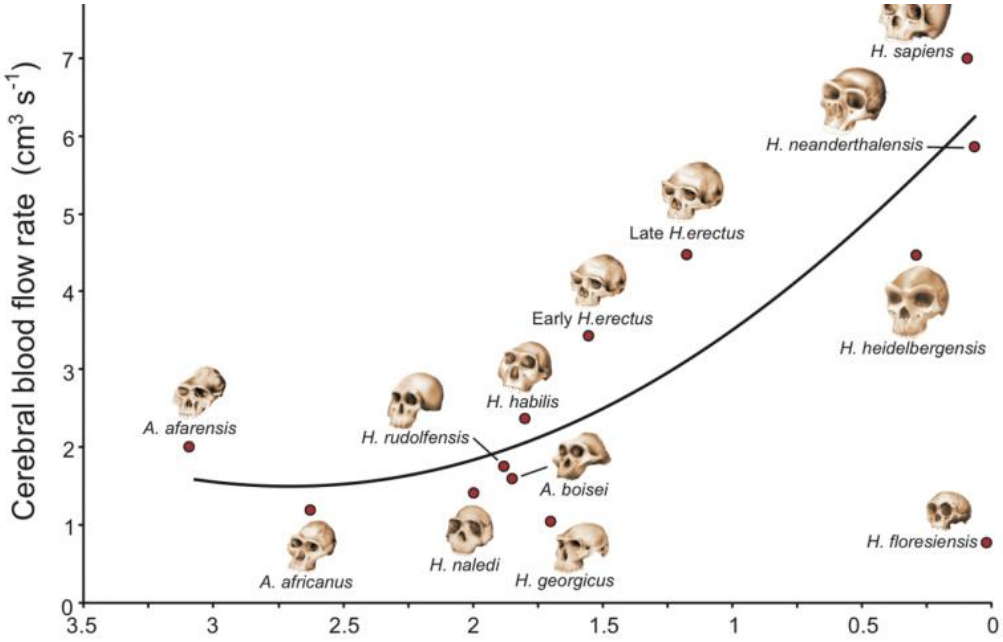
If we can measure the size of the large arteries that supply an organ such as the brain, we can calculate the average rate of blood flow with

some accuracy. This principle has been known for a century and its beauty lies in its simplicity.

Size matters

My eureka moment occurred when I realised that the size of an artery can be gauged by the size of the hole in a bone that it passes through.

This meant that the rate of blood flow to the brain could be measured by the sizes of the carotid canals in fossil skulls from human evolution. It was a nice idea, but it took the enthusiasm of my student Vanya Bosiocic to turn it into a piece of research. She travelled to museums in Australia and in South Africa, gaining access to priceless fossil hominin skulls to make the measurements. We found that the size of the carotid canals increased much faster than expected from brain size in 12 species of our human ancestors over a period of 3 million years.



Evolution of blood flow to the brains of human ancestors. The data reveal an increasing rate of blood flow among hominin species over 3 million years.: **Royal Society Open Science/Roger Seymour, Vanya Bosiocic, Edward Snelling/Skull illustrations by Vivi Hu., CC BY**

While brain size was increasing 3.5 times, blood flow rate surprisingly increased sixfold, from about 1.2ml per second to 7ml per second.

This indicates that our brains are six times as hungry for oxygen as those of our ancestors, presumably because our cognitive ability is greater and therefore more energy-intensive.

Because the number of nerve cells (neurons) in human brains seems to be roughly as expected for a larger primate brain, our discovery implies that the brain's substance is more active, probably because there are more connections between the neurons. Each connection, called a synapse, operates to transmit electrical impulses from one cell to another, usually by the release of a chemical substance from one cell that stimulates or inhibits the production of impulses in another cell.

The cycling of the substances between impulses costs a tiny amount of energy. But considering that the brain contains 80 billion nerve cells and each one has thousands of synapses with other cells, the energy cost mounts up.

The human computer

The human body allocates 20-25% of its total resting metabolic rate to the brain, compared with 8-10% in other primates and a mere 3-5% in other mammals. Thus we view the brain as a rather energy-hungry supercomputer.

This analogy with an electrical computer is a good one. The greater a computer's capacity, the more electrical power is required to keep it running, and the larger the electrical supply cables need to be. It is the same with the brain. The higher the cognitive function, the higher the metabolic rate, the greater the blood flow and the larger the arteries.

The evolution of the human brain is unique among animals. We have looked at the size of the carotid arteries in 34 species of living primates that represent evolution toward the great apes and hominins.

Among these representatives of primate evolution, both body size and brain size increased, but body size increased faster. The blood flow to primate brains increased roughly in proportion to brain size. Only in

the hominins do we see that blood flow increased faster than brain size, which indicates that the brain was not only developing in size, but in usage as well. And that shows our ancestors were getting smarter.

http://wb.md/2nBNmee

Morning Report: Fish Oil and Heart Disease--AHA Science Advisory

Hello. I'm Dr Arefa Cassoobhoy, a practicing internist and a medical editor for Medscape and WebMD. Welcome to our "1-minute" news story for primary care.

Arefa Cassoobhoy, MD, MPH

The Latest on Fish Oil and Heart Disease

A new science advisory from the American Heart Association clarifies the benefits of fish-oil supplements for heart disease. Patients with a recent heart attack or heart failure may benefit from omega-3 polyunsaturated fatty acid supplementation.One large study showed that fish oil reduced mortality by 9% in patients with heart failure without preserved left ventricular function. Based on another trial, treatment with fish oil is not indicated to prevent heart disease in those with diabetes or prediabetes. However, there's no consensus for those at high cardiovascular risk. Also, there's no recommendation for primary prevention of heart disease in the general population.

For now, clinicians can recommend fish oil, a relatively safe treatment, for patients with heart disease or a diagnosis of heart failure.

For Medscape and WebMD, I'm Dr Arefa Cassoobhoy.