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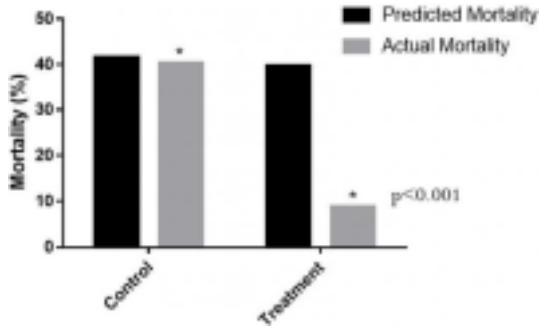
Readily available drug cocktail may help prevent sepsis shock and death

Vitamin C, corticosteroids, and thiamine administered together may help prevent progressive organ failure caused by sepsis, according to a new study in CHEST

GLENVIEW, IL - Sepsis presents a major challenge for health care providers, especially in low-income countries where the mortality rate can exceed 60 percent. Even in advanced medical settings, sepsis is still very dangerous and accounts for over 400,000 deaths annually in the U.S. alone. While new drugs are in development, a group of researchers has determined that a combination of intravenous vitamin C, corticosteroids (a steroid), and thiamine (vitamin B) may be effective in preventing progressive organ dysfunction and reducing the number of deaths from severe sepsis and septic shock. Their findings are published in the June issue of CHEST.



***Predicted (based on APACHE 4 score) and actual hospital mortality in the treatment and control groups.* CHEST**

"New therapeutic approaches to sepsis are desperately required," explained lead investigator Paul E. Marik, MD, Chief, Pulmonary and Critical Care Medicine, Department of Internal Medicine, Eastern Virginia Medical School, Norfolk, VA. "Our results suggest that early use of intravenous vitamin C, together with corticosteroids and thiamine may prove to be effective in preventing progressive organ dysfunction, including acute kidney injury, and reducing the mortality of patients with severe sepsis and septic shock."

In this observational before-and-after study, investigators looked at patients treated with their "metabolic resuscitation protocol" of vitamin C, corticosteroids, and thiamine. After finding early success with three seemingly terminal cases, researchers treated patients with sepsis in their ICU using the cocktail. The team then established a control group by examining medical records of similar patients who had been hospitalized prior to the initiation of the new protocol. They found that patients who received this novel treatment improved much more quickly than those in the control group and had a much lower hospital death rate. In the control group not treated with the protocol, 40 percent of patients died in the hospital versus 9 percent in the treatment group.

Along with fewer deaths, the protocol also reduced the duration of vasopressor use. In the control group, the mean duration for vasopressor use was 54.9 ± 28.4 hours, but in the treatment group, that time was significantly reduced to 18.3 ± 9.8 hours. Also of note, no patient in the treatment group developed progressive organ failure, and the four deaths in the group were not from sepsis but from underlying medical conditions they had before developing sepsis.

Investigators believe that the combination of vitamin C, hydrocortisone and thiamine works synergistically to reverse the pathophysiologic changes of sepsis. Vitamin C is a crucial antioxidant, vital to preserving endothelial function and microcirculatory flow. Predictably, patients with sepsis have very low serum levels of vitamin C that can only be corrected through the administration of intravenous vitamin C. In the study, patients were given 6 g of vitamin C per day, for which no complications or side effects have been reported, along with hydrocortisone doses according to consensus guidelines from the American College of Critical Care Medicine. Thiamine was included to combat thiamine deficiency, which has been linked to an increased risk of death in patients with sepsis.

While other studies have examined the safety and efficacy of these components by themselves, this is the first study to evaluate them together. "We did not test an expensive, proprietary designer molecule, but rather a combination of three cheap and readily available agents with a long safety record in clinical use since 1949," concluded Dr.

Marik. "Due to the inherent safety of the combination of hydrocortisone, vitamin C, and thiamine, we believe that this treatment strategy can be adopted pending the results of further clinical trials. This inexpensive intervention has the potential to reduce the global mortality for sepsis." Dr. Marik also acknowledged all those scientists dating back to 1747, who have done seminal research in this area and on whose work this study concept was based.

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Physician heal thyself: Simple coping strategies for pervasive physician burnout

Obstetricians and gynecologists experience professional burnout rates between 40 to 75 percent

The proverb, "physician heal thyself," is probably more relevant today than it was in biblical times with the fast pace of life, the impact of multitasking and the unending bombardment of information, which have made emotional exhaustion almost certain. And this is especially true for obstetricians and gynecologists who experience professional burnout rates between 40 to 75 percent.

While these numbers may provide a very dismal view of this vital medical specialty, a professor in the Charles E. Schmidt College of Medicine at Florida Atlantic University provides reassuring advice that several simple strategies can blunt, if not eliminate, the risk of professional burnout. Although his advice is targeted to physicians, who have a natural tendency to place the needs of their patients above their own, anyone in any profession can benefit from his insight, which is published in the journal Obstetrics and Gynecology Clinics of North America.

"Burnout is physical or mental collapse that is caused by overwork or stress and all physicians are at risk," said Roger P. Smith, M.D., an obstetrician and gynecologist who is the assistant dean for graduate medical education and a professor in the Department of Integrated Medical Science in FAU's College of Medicine. "Professional burnout is not new, but what is new is the wider recognition of the alarming rates of burnout. Physicians in general have burnout rates that are twice the rate of working adults."

Unlike stress, burnout is characterized by exhaustion, lack of enthusiasm and motivation, and feelings of ineffectiveness, with the added dimensions of frustration or cynicism, resulting in disengagement, demotivation, and reduced workplace efficacy. Burnout is more gradual, progressive, and insidious than stress, making it more likely to go undetected until further along its continuum. It also is associated with an increased risk for physical illness.

Among the medical specialties that experience burnout rates of 40 percent or more are anesthesia, dermatology, emergency medicine, family medicine, internal medicine, obstetrics/gynecology, radiology and surgery. Burnout is associated with poor job satisfaction, questioning career choices, and dropping out of practice, which impact physician workforce and shortage concerns and patient access.

In the article, "Burnout in Obstetricians and Gynecologists," Smith points out that physician burnout is not just an issue in the United States, it is a global issue. Those at highest risk are younger clinicians doing their medical residencies who have burnout rates closer to 75 percent.

Furthermore, unlike earlier studies, a study in 2016 found that women were at greater risk of professional burnout than their male counterparts. Smith cautions that this is of concern because almost 50 percent of practicing obstetricians and gynecologists are women.

"It isn't exactly clear what is driving the gender difference. Other studies suggest that women may experience more family pressure, work-life imbalance or sleep disorders," said Smith. "Sleep disorders are prevalent among physicians, especially among women, in whom rates are between 35 and 40 percent."

So what to do? Well, for starters, when it comes to fatigue, Smith says the solution is easy: sleep. Physicians tend to sleep fewer hours that those in the general population and what is achieved is often not the

type that is restful and restorative. Just reducing the number of hours worked is not sufficient as several studies have previously shown. Rest must result in relaxation and renewal.

"In reality, there are several simple approaches that can be used to reduce stress," said Smith. "Alter it through direct communication, problem solving and time management; avoid it by delegating, know your limits, or simply walk away; and finally, build resistance by changing your perceptions."

Among the helpful tips Smith provides to reduce or eliminate burnout include taking short breaks to rest, singing, or take stock. Vacations, laughing, skilled counseling, exercising as well as hobbies and activities that are enjoyable, all can help to promote resiliency.

"Early diagnosis and intervention are key. Awareness of the symptoms, and some simple stress and fatigue reduction techniques, can reduce the risk of being trapped in the downward spiral of burnout," said Smith. "Whatever route is taken, no physician should feel immune, no physician should feel ashamed or alone, and no physician should feel that reversal isn't possible to escape the personal and professional collapse that is burnout."

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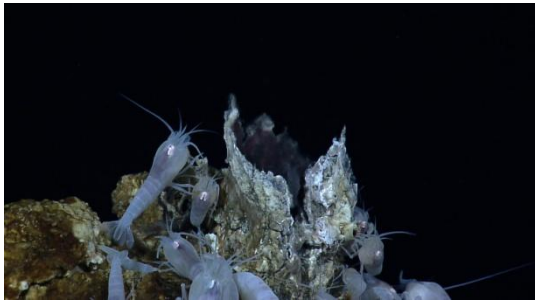
Biodiversity loss from deep-sea mining will be unavoidable

Marine scientists argue biodiversity losses from deep-sea mining are unavoidable and possibly irrevocable

Biodiversity losses from deep-sea mining are unavoidable and possibly irrevocable, an international team of 15 marine scientists, resource economists and legal scholars argue in a letter published today in the journal Nature Geoscience.

The experts say the International Seabed Authority (ISA), which is responsible under the UN Law of the Sea for regulating undersea mining in areas outside national jurisdictions, must recognize this risk. They say it must also communicate the risk clearly to its member states and the public to inform discussions about whether deep-seabed mining should proceed, and if so, what standards and safeguards need to be put into place to minimize biodiversity loss.

"There is tremendous uncertainty about ecological responses to deep-sea mining," said Cindy L. Van Dover, Harvey W. Smith Professor of Biological Oceanography at Duke University's Nicholas School of the Environment. "Responsible mining needs to rely on environmental management actions that will protect deep-sea biodiversity and not on actions that are unproven or unreasonable."



Vent shrimp, a species found around hydrothermal vents on the seafloor, which are also rich in commercially valuable polymetallic sulfide deposits. **NOAA Office of Ocean Exploration and Research**

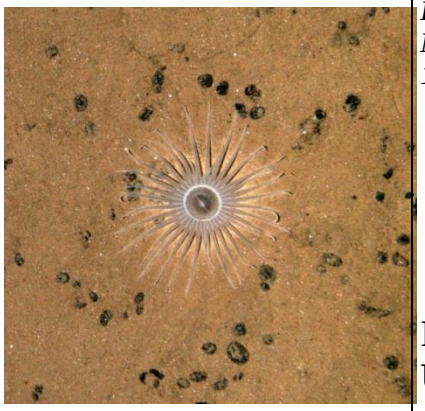
"The extraction of non-renewable resources always includes tradeoffs," said Linwood Pendleton, International Chair in Marine Ecosystem Services at the European Institute of Marine Studies and an adjunct professor at Duke's Nicholas School. "A serious trade-off for deep-sea mining will be an unavoidable loss of biodiversity, including many species that have yet to be discovered."

Faced with this inevitable outcome, it's more important than ever that we understand deep-sea ecosystems and have a good idea of what we stand to lose before mining alters the seafloor forever, said Pendleton, who also serves as a senior scholar in the Oceans and Coastal Policy Program at Duke's Nicholas Institute for Environmental Policy Solutions.

Time is of the essence, the experts stress.

"Undersea deposits of metals and rare earth elements are not yet being mined, but there has been an increase in the number of applications for mining contracts," said Elva Escobar of the National Autonomous University of Mexico's Institute of Marine Sciences and Limnology. "In 2001, there were just six deep-sea mineral exploration contracts; by the end of 2017, there will be a total of 27 projects."

These projects include 18 contracts for polymetallic nodules, six for polymetallic sulfides and four for ferromanganese crusts, Escobar said. Of these, 17 would take place in the Clarion-Clipperton Zone in the Pacific Ocean between Hawai'i and Central America.



Industry estimates that billions of tons of manganese, copper, nickel and cobalt lie on or beneath the seafloor. These metals are used in electrical generators and motors, metal alloys, batteries, paints, and many other products.

A sea anemone, living at a depth of more than 4,000 meters in the Clarion Clipperton Zone of the eastern Pacific, where deep sea mining is likely to occur.
National Oceanography Centre, UK

Some mining proponents have argued that companies could offset the inevitable damage their activities will cause by restoring coastal ecosystems or creating new artificial offshore reefs. "But this is like saving apple orchards to protect oranges," Van Dover said.

"The argument that you can compensate for the loss of biological diversity in the deep sea with gains in diversity elsewhere is so ambiguous as to be scientifically meaningless," said Craig Smith, professor of oceanography at the University of Hawai'i at Manoa.

Deep-sea ecosystems and species can take decades or even centuries to recover from a disturbance, if they recover at all, Van Dover noted.

The scale of some proposed mining operations—the largest of which will cover more than 83,000 square kilometers, an area larger than Maine—and the depths at which some mining is to be conducted (three miles or more below the sea surface) will make reclamation of the affected sites so cost-prohibitive as to be unrealistic, the authors argue. And the approaches needed to perform restorative action are still largely untested.

Deep-sea scientists and legal experts from the United States, Mexico, France, the United Kingdom, the Netherlands, Poland and Australia co-wrote the peer-reviewed correspondence with Van Dover, Pendleton, Escobar and Smith.

Explore further: Abundant and diverse ecosystem found in area targeted for deep-sea mining
More information: Biodiversity loss from deep-sea mining, Nature Geoscience (2017). DOI: 10.1038/ngeo2983

http://bit.ly/2u9Fpxl

UA researchers: Brains evolved to need exercise

Mounting scientific evidence shows that exercise is good not only for our bodies, but for our brains. Yet, exactly why physical activity benefits the brain is not well understood.

In a new article published in the journal Trends in Neurosciences, University of Arizona researchers suggest that the link between exercise and the brain is a product of our evolutionary history and our past as hunter-gatherers.

UA anthropologist David Raichlen and UA psychologist Gene Alexander, who together run a research program on exercise and the brain, propose an "adaptive capacity model" for understanding, from an evolutionary neuroscience perspective, how physical activity impacts brain structure and function.

Their argument: As humans transitioned from a relatively sedentary apelike existence to a more physically demanding hunter-gatherer lifestyle, starting around 2 million years ago, we began to engage in complex foraging tasks that were simultaneously physically and mentally demanding, and that may explain how physical activity and the brain came to be so connected.

"We think our physiology evolved to respond to those increases in physical activity levels, and those physiological adaptations go from your bones and your muscles, apparently all the way to your brain," said Raichlen, an associate professor in the UA School of Anthropology in the College of Social and Behavioral Sciences.

"It's very odd to think that moving your body should affect your brain in this way -- that exercise should have some beneficial impact on brain structure and function -- but if you start thinking about it from an evolutionary perspective, you can start to piece together why that

system would adaptively respond to exercise challenges and stresses," he said.

Having this underlying understanding of the exercise-brain connection could help researchers come up with ways to enhance the benefits of exercise even further, and to develop effective interventions for age-related cognitive decline or even neurodegenerative diseases such as Alzheimer's.

Notably, the parts of the brain most taxed during a complex activity such as foraging -- areas that play a key role in memory and executive functions such as problem solving and planning -- are the same areas that seem to benefit from exercise in studies.

"Foraging is an incredibly complex cognitive behavior," Raichlen said. "You're moving on a landscape, you're using memory not only to know where to go but also to navigate your way back, you're paying attention to your surroundings. You're multitasking the entire time because you're making decisions while you're paying attention to the environment, while you are also monitoring your motor systems over complex terrain. Putting all that together creates a very complex multitasking effort."

The adaptive capacity model could help explain research findings such as those published by Raichlen and Alexander last year showing that runners' brains appear to be more connected than brains of non-runners.

The model also could help inform interventions for the cognitive decline that often accompanies aging -- in a period in life when physical activity levels tend to decline as well.

"What we're proposing is, if you're not sufficiently engaged in this kind of cognitively challenging aerobic activity, then this may be responsible for what we often see as healthy brain aging, where people start to show some diminished cognitive abilities," said Alexander, a UA professor of psychology, psychiatry, neuroscience and physiological sciences. "So the natural aging process might really be part of a reduced capacity in response to not being engaged enough."

Reduced capacity refers to what can happen in organ systems throughout the body when they are deprived of exercise.

"Our organ systems adapt to the stresses they undergo," said Raichlen, an avid runner and expert on running. "For example, if you engage in exercise, your cardiovascular system has to adapt to expand capacity, be it through enlarging your heart or increasing your vasculature, and that takes energy. So if you're not challenging it in that way -- if you're not engaging in aerobic exercise -- to save energy, your body simply reduces that capacity."

In the case of the brain, if it is not being stressed enough it may begin to atrophy. This may be especially concerning, considering how much more sedentary humans' lifestyles have become.

"Our evolutionary history suggests that we are, fundamentally, cognitively engaged endurance athletes, and that if we don't remain active we're going to have this loss of capacity in response to that," said Alexander, who studies brain aging and Alzheimer's disease as a member of the UA's Evelyn F. McKnight Brain Institute. "So there really may be a mismatch between our relatively sedentary lifestyles of today and how we evolved."

Alexander and Raichlen say future research should look at how different levels of exercise intensity, as well as different types of exercise, or exercise paired specifically with cognitive tasks, affect the brain.

For example, exercising in a novel environment that poses a new mental challenge, may prove to be especially beneficial, Raichlen said.

"Most of the research in this area puts people in a cognitively impoverished environment. They put people in a lab and have them run on a treadmill or exercise bike, and you don't really have to do as much, so it's possible that we're missing something by not increasing novelty," he said.

Alexander and Raichlen say they hope the adaptive capacity model will help advance research on exercise and the brain.

"This evolutionary neuroscience perspective is something that's been generally lacking in the field," Alexander said. "And we think this might be helpful to advance research and help develop some new specific hypotheses and ways to identify more universally effective interventions that could be helpful to everyone."

http://nyti.ms/2uu82F6

Fire May Be the Only Remedy for a Plague Killing Deer and Elk

Mark D. Zabel wants to set some fires.

Carl Zimmer

Dr. Zabel and his colleagues are developing plans to burn plots of National Park Service land in Arkansas and Colorado. If the experiments turn out as the researchers hope, they will spare some elk and deer a gruesome death.

Across a growing swath of North America, these animals are dying from a mysterious disorder called chronic wasting disease. It's caused not by a virus or bacterium, but a deformed protein called a prion.

When ingested, prions force normal proteins in the animal's body to become deformed as well. Over the course of months, prions can gradually wreck the animal's nervous system, ultimately killing it.

This year is the 50th anniversary of the discovery of chronic wasting disease. In the September issue of Microbiology and Molecular Biology Reviews, Dr. Zabel, an immunologist at Colorado State University, and his former graduate student Aimee Ortega survey what scientists have learned about the slow-spreading plague. It makes for ominous reading. "There's a lot that we still don't know and don't understand about the disease," Dr. Zabel said in an interview.

Once chronic wasting disease gets a foothold, it can spread relentlessly. It's now documented in 24 states, and continues to expand into new ranges. In some herds, as many as half of the animals carry prions.

Direct contact, it turns out, may not be the only way in which prions are transmitted. Sick animals and cadavers spread prions across the landscape. Plants and soil may remain coated with deformed proteins for years, perhaps even decades. Dr. Zabel now suspects that the only way to rid the land of them is to set controlled fires.

It was at Colorado State University, in 1967, that wildlife biologists first observed some captive mule deer developing a strange new disease. The animals lost weight and awareness of their surroundings. The symptoms slowly worsened until the mule deer died.

"They're not hard to pick out at the end stage," Dr. Zabel said. "They have a vacant stare, they have a stumbling gait, their heads are drooping, their ears are down, you can see thick saliva dripping from their mouths. It's like a true zombie disease."

It wasn't until much later that researchers discovered that chronic wasting disease belongs to a small group of conditions caused by prions. But other prion diseases are known only to affect livestock or people, not wildlife.

Scrapie, for example, is a deadly disease that afflicts sheep. A number of studies indicated that bone meal contaminated with scrapie prions passed the prions to cows. The cows developed a prion disease of their own, called bovine spongiform encephalopathy, nicknamed mad cow disease.

In rare cases, people who ate beef from the sick cows developed prions in their own brains. As of 2016, 231 people had died from the condition worldwide.

Scientists long suspected that deer and related species developed chronic wasting disease by picking up scrapie from sheep flocks kept at Colorado State University. The disease then turned up in other states and Canada as animals were shipped to private game farms.

But Dr. Zabel now believes that the birth of chronic wasting disease may be more complicated.

Prions are misfolded versions of a naturally occurring molecule called cellular prion protein. Experiments carried out in Dr. Zabel's lab suggest that cellular prion protein in deer and related species may be unusually prone to misfolding.

"We were able to generate a new prion," Dr. Zabel said. "Maybe this is a spontaneous disease."

That result might explain a startling finding last year: researchers came across a prion-riddled reindeer in Norway, the first time chronic wasting disease had been found in Europe. Since then, two more have been found, and Norway in April approved the culling of over 2,000 reindeer to stop the spread.

Dr. Zabel and other scientists are trying to figure out how chronic wasting disease has become so successful. One factor is how the prions spread through an animal's body. They aren't limited to the brain in deer, elk or moose. The prions also sweep through lymph nodes and the spleen.

As a result, Dr. Zabel and his colleagues have found, infected animals can release huge numbers of prions. "We found it in urine, in saliva and in feces," he said.

Other members of a herd can get sick by making direct contact with a shedding animal. But the way the disease is spreading across North America suggests that the prions is are also using other routes to get to new hosts.

If deer got sick only by direct contact, for example, you would expect the outbreak to be most severe in the Midwest, where populations are densest. But some of the worst outbreaks are in the Rocky Mountains, where there are fewer animals.

Mathematical models suggest that animals are getting sick from prions in the environment. In additional to the prions shed while a sick animal is alive, its cadaver can release another bounty of deformed proteins onto the ground.

Some studies suggest that these prions can end up on grass and other plants, which are then eaten by healthy animals. Some prions in the soil may bind to minerals. It's possible that animals may sometimes pick them up if they eat bits of dirt.

Compared with viruses or bacteria, prions are impressively rugged. In a forest or on a prairie, a prion may be able to hang around for years, still able to infect a new animal. As herds migrate along the same route year after year, the supply of prions in the environment may keep increasing.

Scientists have also found genes that give some animals resistance to prions. It's hoped that resistant animals will reproduce enough to maintain the populations of herds.

Still, Dr. Zabel worries, the supply of prions in the environment someday might push many herds past a tipping point. "That could result in herd decimation and population declines," he said.

Dr. Zabel is also concerned about the potential threat chronic wasting disease might someday pose to humans.

So far, there have not been any documented cases in which people got sick from eating meat from sick animals. "That doesn't mean it won't happen," Dr. Zabel warned.

His own experiments showing how easily cellular prion proteins can fold into a dangerous shape suggest that prions may have a potential to become more harmful. "We may just be in the early stages," he said.

In their review, Dr. Zabel and Ms. Ortega write that researchers have found a number of ways to fight prions. Researchers have found they can rid surgical instruments of prions in an ozone bath, for example.

But such treatments are impractical in the wild.

Instead, Dr. Zabel and his colleagues hope to test controlled burns. While the fires won't be hot enough to destroy the prions, they might kill off enough prion-laden plants to lower the odds of healthy animals getting sick.

The researchers will test this hypothesis by seeing if the prevalence of chronic wasting disease drops after they set their fires.

Dr. Zabel said he has encountered some stiff skepticism about his plan. But he still thinks it is the only plausible way to put a brake on the prions. "If you eliminate the plants that have prions on the surface, that would be a huge step forward," he said. "I really don't think it's that crazy."

http://nyti.ms/2tAxTih

The Lab Says It's Cancer. But Sometimes the Lab Is Wrong.

It was the sort of bad news every patient fears. Merlin Erickson, a 69-year-old retired engineer in Abingdon, Md., was told last year that a biopsy of his prostate was positive for cancer.

By GINA KOLATA JUNE 26, 2017

Mr. Erickson, worried, began investigating the options: whether to have his prostate removed, or perhaps to have radiation treatment. But a few days later, the doctor called again. As it turned out, Mr. Erickson did not have cancer. The lab had mixed up his biopsy with someone else's. "Obviously, I felt great for me but sad for that other gentleman," Mr. Erickson said.

The other gentleman was Timothy Karman, 65, a retired teacher in Grandy, N.C. At first, of course, he had been told he was cancer-free. The phone rang again a few days later with news of the mix-up and a diagnosis of cancer. Ultimately he had his prostate removed. "I said, 'Mistakes happen,'" Mr. Karman said.

They may be happening more often than doctors realize. There is no comprehensive data on how often pathology labs mix up cancer biopsy samples, but a few preliminary studies suggest that it may happen to thousands of patients each year.

Fortunately, there is now a high-tech solution: a way to fingerprint and track each sample with the donor's own DNA. But it costs the patient about $300 per sample, and labs have been slow to adopt it, saying that the errors are rare and the test too expensive, and that they have plenty of checks in place already to avoid mix-ups.

Dr. John Pfeifer, vice chairman for clinical affairs in the pathology and immunology department at Washington University School of Medicine in St. Louis, who has studied the problem, is not quite so sanguine.

"All the process improvement in the world does not get rid of human errors," he said. "Millions get biopsies every year. Is society going to say, 'Yeah, mistakes happen but we're not going to look for them?'"

The fingerprinting method, offered by Strand Diagnostics, is simple: A doctor gets a DNA sample by swabbing inside a patient's mouth. It is sent directly to Strand with a bar code identifying the patient.

That bar code is also used to label the patient's biopsy. If it shows cancer, the pathologist sends the biopsy cells to Strand. The lab matches the DNA from the swab to that of the biopsy cells.

If these DNA fingerprints did not match, that signaled a lab mix-up. That was how pathologists discovered that samples from Mr. Erickson and Mr. Karman had been switched.

Despite the best efforts of pathologists to avoid these mix-ups, hints of trouble have been turning up for years. In 2011, researchers conducting a large clinical trial reported that two men who were found to have prostate cancer - and who had their prostates removed - did not have the disease at all. Instead, their biopsy samples had been mishandled. (A third mix-up was caught before any action was taken.)

The researchers then performed a rigorous DNA analysis of more than 10,000 biopsies taken during the period. Twenty-seven were mislabeled. Among 6,733 blood samples, 31, or 0.5 percent, had been switched.

The percentage of errors may not be high. But each one may lead a patient down a life-altering path, to a grueling treatment that was unnecessary, or to the neglect of a cancer that may or may not prove deadly.

Pathologists see lab mix-ups routinely, but often the mistake is obvious - a sample supposed to be from a brain actually is from a lung, for example. "You say, 'O.K., yeah, there's been a mistake,'" Dr. Pfeifer said. "I don't know many pathologists who haven't had that occur."

But what about mix-ups that are not so obvious - two lung tissue samples that are switched, or two breast samples? Dr. Pfeifer turned to

DNA fingerprinting to determine how often such samples are mixed up at Washington University. He found a few errors. One man's lung tissue was cancerous, but DNA analysis showed the lung cells were not his.

Another patient had a liver biopsy that showed cancer, but the cells were from somebody else. Still another man was mistakenly thought to have advanced aggressive prostate cancer; again, DNA showed the tissue was somebody else's.

To really get an idea of the frequency of these mix-ups nationwide, however, Dr. Pfeifer needed a large database.

Ted Schenberg, the chief executive at Strand, offered to supply the data: more than 13,000 biopsy results from men evaluated for prostate cancer at a number of laboratories.

Dr. Pfeifer agreed to review data, although he knew the company had a significant financial interest in the outcome. To minimize conflicts of interest, Mr. Schenberg would not pay him to do the work and would not be involved in the analysis.

Dr. Pfeifer documented two types of errors in this large sample: an "absolute switch," in which one patient's tissue was mixed up with another's. And a "partial switch" in which some of one patient's cells ended up mixed in with cells from someone else.

"Every lab had both of these errors," Dr. Pfeifer said. In general, the rates were low 0- .26 percent of samples were absolute switches, and 0.67 percent were partial switches.

But the rates were slightly higher among independent labs, including large commercial companies that handle huge numbers of specimens: 0.37 percent were absolute switches, and 3.14 percent were contaminated.

Remedying these infrequent errors is a costly endeavor. Most private insurers are willing to cover the testing; it's far less expensive than paying for unnecessary treatment, or treatment late in the course of a disease that should have been identified sooner.

Medicare, on the other hand, does not cover DNA fingerprinting of biopsies, and many of patients receiving cancer biopsies are older. (Legislation introduced in Congress in May would require the program to cover the service, but only for prostate biopsies.)

Consumers may request DNA fingerprinting themselves, but there is no guarantee that the pathology lab to which their biopsies are sent will offer the service.

Recently, a group of researchers led by Dr. Kirk Wojno, a pathologist at the Comprehensive Urology and Comprehensive Medical Center in Royal Oak, Mich., decided to address the financial obstacles to widespread DNA testing of biopsies, in this case specifically for prostate cancer.

Unnecessary treatments and lawsuits come with a high price tag, the researchers concluded. There are about 806,000 prostate biopsies a year in the United States. Lab mix-ups of these biopsies alone cost the nation about $879.9 million per year. That figure includes cost of lawsuits that result from mix-ups.

The cost of doing DNA fingerprinting, Dr. Pfeifer argues, "is well within the range of costs we see with other clinical testing."

"You can make an argument that for prostate cancer you should probably do this for every patient at the time of initial diagnosis," he added. "By extension, you probably have the same situation for other diseases."

But other experts are not convinced the test is worth the cost.

While mix-ups do happen, pathologists have put a series of steps in place to try to avoid them, including 26 requirements for labeling containers and identifying patients, and ordering tests, said Dr. Raouf Nakhleh, vice chair of the College of American Pathologists' Council on Scientific Affairs and a professor of pathology at the Mayo Clinic in Jacksonville, Fla.

"We get paid $125 to process a specimen and produce a diagnosis," he said. He turns to DNA fingerprinting only when he suspects a mix-up — for example, a clinical exam is at odds with a pathology report.

Dr. Jennifer Hunt, who chairs the Department of Pathology at the University of Arkansas for Medical Sciences, also objects to the cost. “It’s related to finances,” she said. “And the risk of error is extraordinarily low.”

Dr. Sanford Siegel of Chesapeake Urology used to feel the same way. But in 2015, a new patient had a blood test that indicated he might have prostate cancer. He had a biopsy, which confirmed it. The man had his prostate removed - only to learn he had been the victim of a lab mix-up. His reaction, as Dr. Siegel recalled? “I am calling a lawyer.” After that, Chesapeake Urology made the DNA test mandatory.

http://bbc.in/2tApPOt

Tick saliva 'gold mine' blocks killer heart condition

The saliva from ticks could be used to treat a dangerous kind of heart disease that can cause sudden death in young people, scientists say.

Proteins in the saliva were found to be excellent at stopping inflammation of the heart, which can cause myocarditis and lead to heart failure.

Oxford University researchers say ticks are a "gold mine" for new drugs. And there is potential they could be used to treat other diseases, such as stroke and arthritis, they said.

But all the research has so far been done in the lab, so it is likely to be many years before the drugs are used on humans.

Under cover

Ticks are experts at biting without being noticed. This means ticks can feed on animals and humans for eight to 10 days without there being any pain or inflammation.

Writing in Scientific Reports, scientists say this is a result of proteins in the saliva preventing inflammation by neutralising chemicals called chemokines in the host.

This is also important in people with myocarditis, a condition where chemokines are released in the heart and cause inflammation to the heart muscle.

The problem is difficult to spot and can lead to dilated cardiomyopathy and heart failure in a third of people, with some then needing a heart transplant.

The researchers have now identified new proteins in tick saliva that appear to block the effect of particular chemokines that cause heart problems.

Prof Shoumo Bhattacharya, BHF professor of cardiovascular medicine at the University of Oxford, who led the research, said: "Myocarditis is a devastating disease, for which there are currently very few treatments.

"With this latest research, we hope to be able to take inspiration from the tick's anti-inflammatory strategy and design a life-saving therapy for this dangerous heart condition.

He added: "We may also be able to use the same drugs to treat other diseases where inflammation plays a big part, such as heart attack, stroke, pancreatitis, and arthritis."

Tick milking

Tick saliva can contain up to 3,000 proteins, depending on the tick species.

To avoid having to milk the ticks for their saliva using a tiny tube - the way it used to be done - scientists now grow tick saliva proteins in yeast, from synthetic genes. This way they can make very large amounts. They now hope their "bug to drug" pipeline will lead to new treatments for a range of other diseases.

Prof Jeremy Pearson, associate medical director at the British Heart Foundation, said: "They may not be pretty, but these little creatures could hold the secret to better treatments for a whole range of diseases.

"There's a long way to go, but tick saliva looks like an exciting, albeit unconventional, area of research."

http://bit.ly/2scm8KC

The dust storm microbiome

Airborne dust carried in dust storms affects the health of people and ecosystems alike

Israel is subjected to sand and dust storms from several directions: northeast from the Sahara, northwest from Saudi Arabia and southwest from the desert regions of Syria. The airborne dust carried in these storms affects the health of people and ecosystems alike. New research at the Weizmann Institute of Science suggests that part of the effect might not be in the particles of dust but rather in bacteria that cling to them, traveling many kilometers in the air with the storms.

Some of these bacteria might be pathogenic - harmful to us or the environment - and a few of them also carry genes for antibiotic resistance. Others may induce ecosystem functions such as nitrogen fixation. Prof. Yinon Rudich and his research group, including postdoctoral fellow Dr. Daniela Gat and former research student Yinon Mazar, in Weizmann's Earth and Planetary Sciences Department investigated the genetics of the windborne bacteria arriving along with the dust.

"In essence, we investigated the microbiome of windborne dust," says Rudich. "The microbiome of a dust storm originating in the Sahara is different from one blowing in from the Saudi or Syrian deserts, and we can see the fit between the bacterial population and the environmental conditions existing in each area."

The researchers found that during a dust storm the concentration of bacteria and the number of bacterial species present in the atmosphere rise sharply, so people walking outdoors in these storms are exposed to many more bacteria than usual.

Rudich and his team then explored the genes in these bacteria, checking for antibiotic resistance -- a trait that can arise owing to elevated use of antibiotics but also naturally, especially in soil bacteria. Antibiotic resistance has been defined by the World Health Organization as one of the primary global health challenges of the twenty-first century, and its main driver is the overuse of antibiotics. But bacteria can pass on the genes for antibiotic resistance, so any source of resistance is concerning. How many different genes for antibiotic resistance come to Israel from the various dust storms, and how prevalent are these genes?

Rudich says that the study enabled the researchers to identify a "signature" for each source of bacteria based on the prevalence of antibiotic resistant genes, which revealed whether the genes were local or imported from distant deserts. "We found that as more 'mixing' occurs between local dust and that which comes from far off, the lower the contribution of the imported antibiotic resistance genes." In other words, antibiotic resistance coming from Africa or Saudi Arabia is still a very minor threat compared to that caused and spread by human activity, especially animal husbandry. Also participating in this research were Dr. Eddie Cytryn of the Volcani Center and Prof. Yigal Erel of the Hebrew University of Jerusalem.

City air not set to improve

Urban air pollution is attributed, to a large extent, to emissions from transportation. Prof. Rudich and Staff Scientist Dr. Michal Pardo-Levin ask how these sources contribute to air pollution. Their findings show that pollution that does not come from the combustion engine but rather is released from the friction of the vehicle's tires on the road and from braking systems can lead to serious health effects upon inhalation. That means that even if we manage to significantly reduce our cars' tailpipe emissions, city air will still be polluted, to a large extent, with these other substances. And since the friction of tires and brakes are necessary for driving, reducing their emissions could be much harder.

Prof. Yinon Rudich's research is supported by the Helen and Martin Kimmel Award for Innovative Investigation; the Dr. Scholl Center for Water and Climate, which he heads; the Sussman Family Center for the Study of Environmental Sciences, which he heads; the de Botton Center for Marine Science; the Adelis Foundation; the Henri Gutwirth Fund for Research; the estate of David Levinson; and the estate of Olga Klein Astrachan.

http://bit.ly/2sd1o5s

No detectable limit to how long people can live

New study finds no evidence that maximum lifespan has stopped increasing

Emma Morano passed away last April. At 117 years old, the Italian woman was the oldest known living human being.

Super- centenarians, such as Morano and Jeanne Calment of France, who famously lived to be 122 years old, continue to fascinate scientists and have led them to wonder just how long humans can live. A study published in Nature last October concluded that the upper limit of human age is peaking at around 115 years.

Now, however, a new study in Nature by McGill University biologists Bryan G. Hughes and Siegfried Hekimi comes to a starkly different conclusion. By analyzing the lifespan of the longest-living individuals from the USA, the UK, France and Japan for each year since 1968, Hekimi and Hughes found no evidence for such a limit, and if such a maximum exists, it has yet to be reached or identified, Hekimi says.

"Far into the foreseeable future"

"We just don't know what the age limit might be. In fact, by extending trend lines, we can show that maximum and average lifespans, could continue to increase far into the foreseeable future," Hekimi says.

Many people are aware of what has happened with average lifespans. In 1920, for example, the average newborn Canadian could expect to live 60 years; a Canadian born in 1980 could expect 76 years, and today, life expectancy has jumped to 82 years. Maximum lifespan seems to follow the same trend.

It's impossible to predict what future lifespans in humans might look like, Hekimi says. Some scientists argue that technology, medical interventions, and improvements in living conditions could all push back the upper limit. "It's hard to guess," Hekimi adds. "Three hundred years ago, many people lived only short lives. If we would have told them that one day most humans might live up to 100, they would have said we were crazy."

http://bit.ly/2sd1vOm

Antiviral inhibits epidemic SARS, MERS and animal coronaviruses

New antiviral drug candidate inhibits a broad range of coronaviruses

A new antiviral drug candidate inhibits a broad range of coronaviruses, including the SARS and MERS coronaviruses, a multi-institutional team of investigators reports this week in Science Translational Medicine. The findings support further development of the drug candidate for treating and preventing current coronavirus infections and potential future epidemic outbreaks.

Coronaviruses are a genetically diverse family of viruses that infect birds and mammals, with most coronavirus strains limited to infecting only certain hosts. Human coronaviruses, for example, cause up to 30 percent of common colds.

In the last 15 years, however, coronaviruses have demonstrated their ability to jump into new species. Zoonotic (animal) coronaviruses have infected humans, causing severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS), severe diseases with high mortality rates ranging from 10 percent for SARS to 40 percent for MERS. The MERS-coronavirus continues to cause new infections in the Middle East.

"There's a real concern that the MERS coronavirus could escape broadly when millions of people visit Saudi Arabia for the Hajj," said Mark Denison, M.D., Craig-Weaver Professor of Pediatrics and professor of Pathology, Microbiology and Immunology at Vanderbilt University School of Medicine. But to date, there has been no effective antiviral drug for any known coronavirus, Denison noted.

Denison and his team at Vanderbilt have studied the basic biology of coronaviruses for more than 20 years. In an effort to find chemical tools that would allow them to probe viral replication, graduate student Brett Case screened a series of compounds selected and provided by Gilead Sciences.

Case demonstrated that one of the compounds was highly active against coronaviruses in cultured cells. The finding was a surprise, Denison said, because compounds in the same class (nucleoside analogs) have normally failed to inhibit coronavirus replication.

The compound, called GS-5734, is currently in clinical development for treatment of Ebola virus disease.

Denison's longtime collaborator Ralph Baric, Ph.D., at the University of North Carolina and his team demonstrated that GS-5734 inhibits SARS-coronavirus and MERS-coronavirus replication in multiple in vitro systems, including cultures of primary human airway epithelial cells, which are the cells infected by respiratory coronaviruses.

The researchers also showed that GS-5734 was effective against a circulating human coronavirus, bat coronaviruses, and bat coronaviruses that are considered "prepandemic" because they can infect cultured human cells.

Using a mouse model of SARS, the investigators demonstrated that both prophylactic (before infection) and early therapeutic (soon after infection) administration of GS-5734 reduced viral load in the lungs and improved respiratory functions.

"This compound shows broad activity against a variety of human and animal coronaviruses and represents an exciting potential therapeutic for a family of viruses prone to emergence from animal reservoirs," Denison said.

Denison and his team at Vanderbilt will continue to use the compound "as a probe to try to understand the biology of the virus, how and why this drug works, and to identify new targets for inhibiting coronaviruses," he said.

"This is an exciting example of how pursuing fundamental research to understand the mechanisms of virus replication and pathogenesis can lead to an important compound with therapeutic potential."

The research also illustrates the power of long-term collaborations and of public-private partnerships, Denison said. Denison and Baric have collaborated for 17 years to study coronavirus biology. Their efforts to identify coronavirus antiviral drugs in cooperation with Gilead Sciences have been supported by the Antiviral Drug Discovery and Development Center, which is funded by the National Institutes of Health (grant AI109680) and directed by Richard Whitley, M.D., at the University of Alabama at Birmingham.

Timothy Sheahan, Ph.D., and Amy Sims, Ph.D., are co-first authors of the Science Translational Medicine paper. Sims and author Rachel Graham, Ph.D., completed their doctoral degrees as students in Denison's lab before joining the Baric team at UNC.

Additional support for the research was provided by NIH grants (AI108197, AI109761) and by the Cystic Fibrosis and Pulmonary Diseases Research and Treatment Center at UNC.

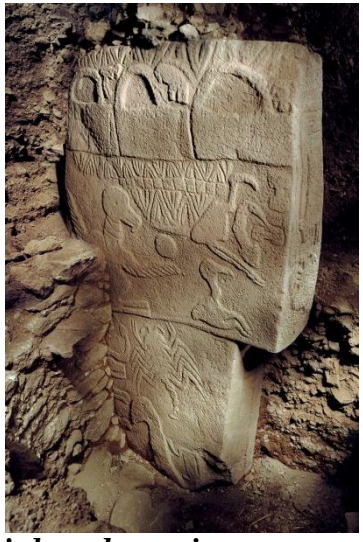
http://bit.ly/2uvrqRZ

Remains from "skull cult" discovered at world's oldest stone monuments

At Göbekli Tepe in Turkey, a 11,500-year-old monument was decorated with human skulls.

Annalee Newitz - 6/29/2017, 7:45 AM

The monumental rock pillars of Göbekli Tepe date back over 11,000 years and tower over a small hill in Turkey. Excavated just a couple of decades ago, these mysterious structures are part of the world's oldest known monumental religious complex. The pillars are covered in hundreds of images, including carvings of humans and dangerous animals like snakes and scorpions. Surrounded by nested, winding walls, these pillars suggest a complex spiritual worldview shared by hunter-gatherers in the region who added to it for roughly 1,600 years. Now, a team of archaeologists has revealed that decorated human skulls were part of the Göbekli Tepe rituals.



A pillar from Göbekli Tepe is covered in images of birds and scorpions.

German Archaeological Institute

German Archaeological Institute paleopathologist Julia Gresky and her colleagues write in in Science Advances about excavating bone fragments that suggest an ancient "skull cult" at the site. Though it

sounds like something out of a pirate movie, a skull cult is simply an archaeological term that describes the ritualistic or religious alteration of multiple skulls.

Gresky and her colleagues found three skulls scored with deep cuts made by sharpened stones. The carvings bisect the center of the face, continuing up the forehead and all the way around to the back of the skull. One skull, painted with red ochre, also had a hole drilled in the top. A likely explanation is that the skull cultists were tying the skulls with cords, then threading another cord through holes in the skull, in order to suspend them from the stones.

None of these individuals died from their skull carvings. Evidence suggests the skulls were defleshed and carved shortly after the individuals died. There's no telling whether the skulls belonged to venerated ancestors or were trophies from defeated enemies.

There are almost no other human remains at Göbekli Tepe, making this find particularly remarkable. Archaeologists have uncovered hundreds of small bone fragments at the site, but the area was not used as a burial ground. Instead, it was likely a ritual location used by nomadic groups during special events, rites of passage, or celebrations. People built the monumental structures during a period in history when humans rarely lived in settled communities, and many anthropologists believe the place offers a rare look at pre-agricultural belief systems.

Gresky and her fellow researchers point out that carvings of headless people and severed heads are common themes on pillars at Göbekli Tepe. Some images show animals holding human heads, while others show headless men (we know they are men because they have erections, a common representation during this period in human history). It's likely these decorated skulls were part of a worldview elaborated in these stone carvings.

We may never know what the builders of Göbekli Tepe believed, but we can now imagine the sacred space they created in more detail. As people entered the space, winding between walls, they would have seen actual human skulls hanging beside representations of what those skulls meant to them.

Science Advances, 2017. DOI: 10.1126/sciadv.1700564 (About DOIs)

http://bit.ly/2ssHbMR

Brain-Infecting 'Rat Lungworm' Spreads in Florida

***A parasitic worm that can infect people's brains has been found throughout Florida, according to a new study*.**

By Rachael Rettner, Senior Writer

The researchers found the parasite, called rat lungworm, living in rats and snails in five Florida counties in both the central and northern parts of the state. Rat lungworm was previously found in southern Florida, and the new study is one of the first to show the extent of the parasite's spread across the state.

The rat lungworm is a parasite that lives in rats and snails. Here, adult rat lungworms (the noodle-like organisms in the center of the photo) emerge from the pulmonary artery of a rat. **Heather Stockdale Walden**

The researchers warned that the parasite, which is typically found in the tropics and only recently appeared in the continental United States, will likely continue to expand its range in this country. They said that the parasite's apparent ability to thrive in areas outside its historical range is "alarming," and as average temperatures rise with climate change, the parasite will likely spread into more temperate areas.

The parasite carries out its life cycle in rats, snails and slugs, according to the Centers for Disease Control and Prevention (CDC). People can become infected if they eat raw or undercooked snails or slugs, or if they eat contaminated produce.

In people, rat lungworm, or *Angiostrongylus cantonensis*, can infect the brain and cause meningitis, according to the CDC. Infected people

may experience headaches, neck stiffness, nausea, vomiting, and abnormal sensations in their arms and legs. Most people fully recover without treatment, but in rare cases, the infection can cause neurological problems or death, the CDC said.

Although human cases of rat lungworm have yet to be reported in Florida, the researchers called for increased awareness of this parasite to help prevent infection and properly identify infected patients.

"The parasite is here in Florida and is something that needs to be taken seriously," Heather Stockdale Walden, an assistant professor in the Department of Infectious Diseases and Pathology at the University of Florida College of Veterinary Medicine, who led the study, said in a statement.Human cases of rat lungworm have occurred in Hawaii for more than 50 years, but it wasn't until the mid-1980s that the parasite appeared in the continental United States, showing up in rats in New Orleans. (The rats likely arrived on ships from areas already inhabited by the parasite.) Since then, rat lungworm has shown up in Louisiana and Texas. Previous studies have found the parasite in snails in Florida, but these studies were small.

In the new study, the researchers analyzed more than 1,500 samples from rats and snails in 18 counties throughout Florida. The investigators found that samples from five counties — Alachua, Leon, St. Johns, Orange and Hillsborough — tested positive for the parasite. But the parasite is likely even more widespread than what was found in the study, the researchers said.

That's because, for certain species, the researchers had only a limited number of samples. The scientists may have had more positive results if they tested more samples from these species, the researchers said. "The reality is that it is probably in more counties than we found it in, and it is also probably more prevalent in the southeastern U.S. than we think," Walden said.

The parasite didn't seem to be picky about the types of snails it infects, either, said study co-author John Slapcinsky, the collections manager of invertebrate zoology at the Florida Museum of Natural History. The researchers found the parasite in both native and non-native snail species.

To prevent infection with rat lungworm, the researchers recommended washing produce, teaching children not to eat raw snails and washing hands after handling snails. The CDC advises against eating raw or undercooked snails and slugs.

The study was published May 18 in the journal PLOS ONE.

http://bbc.in/2udiKk6

Opt-out organ donation system in Scotland planned

The Scottish government is to bring forward legislation to provide an opt-out system for organ donation.

Public Health Minister Aileen Campbell said there would be legislation for a "soft opt-out" system, aimed at increasing donation rates. A government consultation found 82% of respondents in favour of the move.

MSPs considered such a system during the previous parliamentary term, but ultimately rejected it due to concerns over some specific details of the plan. At that point ministers said there were "merits" to an opt-out system, and launched a consultation with a view to pursuing their own legislation.

More than 800 responses were gathered, including a petition with 18,500 signatures backing the move. The British Medical Association (BMA) has also endorsed a soft opt-out system.

At present, anyone who wants to donate their organs after death currently has to "opt in" to the system through the donor card scheme. Currently, 45% of the Scottish population have joined the register.

A soft opt-out system - like that introduced in Wales in 2015 - would allow parts of an adult's body to be used in transplants in the absence of express permission. However the wishes of families and next of kin would continue to be respected, so removal of organs would not go ahead without their support.

Ms Campbell said the move was intended as part of a "long-term culture change in attitudes", with a "package of measures" expected

from the government. She said: "I can confirm that we intend to bring forward legislation to introduce a soft opt-out system.

"This will build on the significant improvements already made as a result of the donation and transplantation plan for Scotland. That progress is testament to the great many people who work tirelessly to facilitate organ and tissue donation and transplantation.

"We should not forget that organ donation is a gift, which can only occur as a result of tragic circumstances and every donor and their family has made a selfless decision which has enabled others to live.

"We need to continue doing what we can in order to help reduce the numbers of people in Scotland waiting for transplants. Moving to an opt out system of organ and tissue donation will be part of the long term culture change in attitudes to encourage people to support donation."

'Important legislation'

BMA Scotland welcomed the move, with chairman Dr Peter Bennie saying the field of organ transplantation had "not yet reached its full life-saving and life-transforming potential".

He said: "The whole transplant community has worked tremendously hard to increase donation rates but we believe that more can be done.

"As doctors it's difficult to see our patients suffering and dying when their lives could be saved or dramatically improved by a transplant. We look forward to contributing to this important legislation."

Former Labour MSP Anne McTaggart, who brought forward the member's bill in the previous parliament, said she was "so pleased" that the government had "finally seen sense".

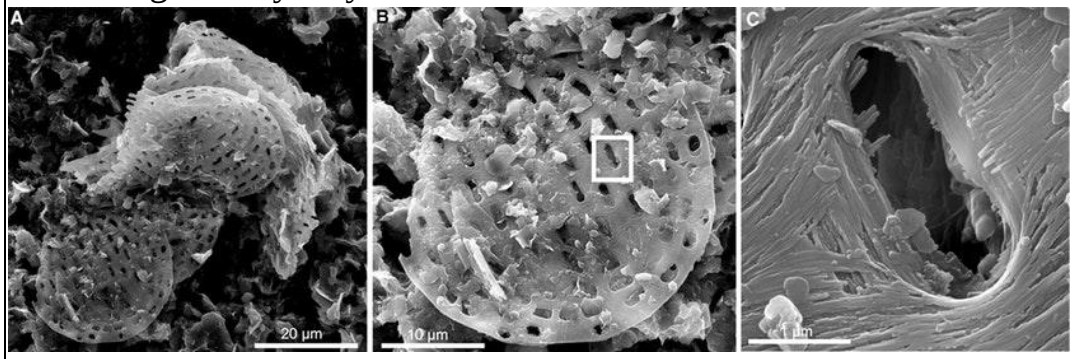
She said: "This legislation could have been passed more than a year ago but sadly petty party politics blocked a change in the law at the time. That failure has cost lives. "This turnaround is to be welcomed and I am ecstatic for all those awaiting transplants, organ donation recipients and their families today."

http://bit.ly/2tDISHv

Precursor of teeth and bones discovered in 810-million-year old fossils

Single-celled fossils found in Canada show the earliest evidence of a tissue-hardening process known as biomineralisation, writes Andrew Masterson.

Hardened types of tissue are found in a huge number of animal phyla – think bones and teeth in mammals, shells in molluscs – but when the ability to create such useful structures first evolved has long been something of a mystery.



Progressively more zoomed scanning electron micrographs of the single-celled microfossils, showing at right the hydroxyapatite filaments. **Cohen et al.**

Until now. Research published in the journal *Science Advances* reveals convincing evidence that tissue-hardening, known as "biomineralisation", was occurring in a single-celled organism as early as 810 million years ago.

Scientists led by Phoebe Cohen of Williams College in Williamstown, Massachusetts, US, found evidence of mineralisation in minute fossils lodged in a rock formation called the Fifteenmile Group, in the Ogilvie Mountains in the Yukon region of Canada.

The fossils are of eukaryotic cells – regarded as the first complex organisms. Every living thing except bacteria and archaea is made of eukaryotes – cells that feature discrete organelles – including a nucleus – contained within membranes.

To make their discovery, Cohen and colleagues studied unicellular fossils found in a large slab of mud, slate and limestone.

Looking at the samples through a high-resolution microscope the team found signs of long, thin mineralised fibres – shapes that indicated a biological rather than geological origin.

Dating placed the fossils at around 810 million years old, placing them pretty much in the middle of the Neoproterozoic Era, which ran from about 1000 million years ago to the dawn of the Paleozoic Era about 550 million years later.

At that time, Fifteenmile area would have been under the ocean. Cohen and her colleagues suggest that the water would have been high in dissolved calcium phosphate – a necessary compound for the advent of hardened tissue.

The chemical load, the researchers write, may have provided the "opportunity for eukaryotes to explore biomineralisation for what may have been the first time in Earth's history."

http://bit.ly/2seY8q7

Cocoa and chocolate are not just treats -- they are good for your cognition

Italian researchers review the available literature and come to a promising conclusion: Cocoa can be seen as a dietary supplement to protect human cognition and can counteract different types of cognitive decline

A balanced diet is chocolate in both hands - a phrase commonly used to justify ones chocolate snacking behavior. A phrase now shown to actually harbor some truth, as the cocoa bean is a rich source of flavanols: a class of natural compounds that has neuroprotective effects.

In their recent review published in Frontiers in Nutrition, Italian researchers examined the available literature for the effects of acute and chronic administration of cocoa flavanols on different cognitive domains. In other words: what happens to your brain up to a few hours after you eat cocoa flavanols, and what happens when you sustain such a cocoa flavanol enriched diet for a prolonged period of time?

Although randomized controlled trials investigating the acute effect of cocoa flavanols are sparse, most of them point towards a beneficial effect on cognitive performance.

Participants showed, among others, enhancements in working memory performance and improved visual information processing after having had cocoa flavanols. And for women, eating cocoa after a night of total sleep deprivation actually counteracted the cognitive impairment (i.e. less accuracy in performing tasks) that such a night brings about. Promising results for people that suffer from chronic sleep deprivation or work shifts.

It has to be noted though, that the effects depended on the length and mental load of the used cognitive tests to measure the effect of acute cocoa consumption. In young and healthy adults, for example, a high demanding cognitive test was required to uncover the subtle immediate behavioral effects that cocoa flavanols have on this group.

The effects of relatively long-term ingestion of cocoa flavanols (ranging from 5 days up to 3 months) has generally been investigated in elderly individuals. It turns out that for them cognitive performance was improved by a daily intake of cocoa flavanols.

Factors such as attention, processing speed, working memory, and verbal fluency were greatly affected. These effects were, however, most pronounced in older adults with a starting memory decline or other mild cognitive impairments.

And this was exactly the most unexpected and promising result according to authors Valentina Socci and Michele Ferrara from the University of L'Aquila in Italy.

"This result suggests the potential of cocoa flavanols to protect cognition in vulnerable populations over time by improving cognitive performance. If you look at the underlying mechanism, the cocoa flavanols have beneficial effects for cardiovascular health and can increase cerebral blood volume in the dentate gyrus of the

hippocampus. This structure is particularly affected by aging and therefore the potential source of age-related memory decline in humans."

So should cocoa become a dietary supplement to improve our cognition?

"Regular intake of cocoa and chocolate could indeed provide beneficial effects on cognitive functioning over time. There are, however, potential side effects of eating cocoa and chocolate. Those are generally linked to the caloric value of chocolate, some inherent chemical compounds of the cocoa plant such as caffeine and theobromine, and a variety of additives we add to chocolate such as sugar or milk."

Nonetheless, the scientists are the first to put their results into practice: "Dark chocolate is a rich source of flavanols. So we always eat some dark chocolate. Every day."

This research was published in the Research Topic "Chocolate and Health: Friend or Foe?". This Topic gathered papers covering the functional properties of cocoa, to unravel the pro and cons of cocoa in relation to human health.

http://bit.ly/2sut1Lx

Why does acupuncture work?

New La Biomed study finds it elevates nitric oxide, leading to pain reduction

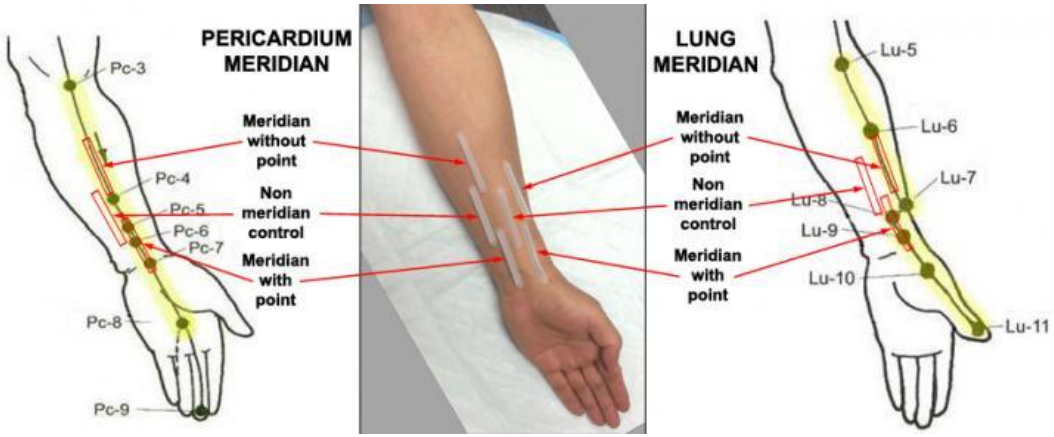
LOS ANGELES - The use of acupuncture to treat pain dates back to the earliest recorded history in China. Despite centuries of acupuncture, it's still not clear why this method of applying and stimulating tiny needles at certain points on the body can relieve pain.

Recent studies have raised additional questions, with some finding acupuncture reduced chronic pain while others showed that acupuncture has little, if any, impact on pain.

A new study from LA BioMed researchers offers some answers for why acupuncture may help and why clinical trials have produced mixed results.

The researchers found the proper use of acupuncture (with the reinforcement method or coupled with heat, which is often used in acupuncture treatments) can lead to elevated levels of nitric oxide in the skin at the "acupoints" where the needles were inserted and manipulated.

They noted that nitric oxide increases blood flow and encourages the release of analgesic or sensitizing substances, which causes the skin to feel warmer and contributes to the beneficial effects of the therapies.



An LA BioMed study found acupuncture and heat elevate nitric oxide levels on the skin, leading to increased circulation and the release of analgesic substances. This photo depicts the biocapture device used to measure the elevated nitric oxide levels; the meridian lines and related acupuncture points, and the LU11 acupoint in which a heat stimuli was applied. **Evidence-based Complementary and Alternative Medicine**

"Our lab has developed a painless, non-invasive biocapture device that can sample human biomolecules over specific skin regions," said Sheng-Xing Ma, MD, PhD, an LA BioMed lead researcher and corresponding author of the study published in Evidence-based Complementary and Alternative Medicine, Volume 2017.

"With this tool, we were able to obtain the first evidence that nitric oxide is released from the human skin surface at a higher level with the proper acupuncture methodology and the use of heat."

Dr. Ma said several acupuncture clinical trials by conventional researchers have produced negative results, finding little difference in

pain relief between the use of acupuncture and "sham acupuncture," in which needles are manufactured and/or inserted unsystematically.

He said these studies have puzzled the acupuncture community and led many to question whether the proper acupuncture methodologies were used.

For the latest study, the LA BioMed researchers used a low force and rate/reinforcement method of acupuncture. They gently inserted acupuncture needles into the skin of 25 men and women, aged 18-60 years, and delicately twisted the needles for two minutes or until they achieved a sensation of "de qi" (soreness, numbness, distension or pain). They then manipulated the needles using gentle amplitude and moderate speed for two minutes every five minutes for a total of 20 minutes.

They also applied electrical heat for 20 minutes and found elevated levels of nitric oxide at the acupoints. To further validate their findings, they conducted the test with high-frequency and force, which is known as a reduction method, and found nitric oxide levels over the areas of the skin region were reduced.

Dr. Ma said his team will continue to explore the differences in these two acupuncture techniques to determine the effectiveness of each in pain relief and better understand the cellular and molecular mechanisms involved.

"Based on traditional Chinese medicine, acupuncture reinforcement is attained by slowly twisting or rotating the needle with gentle force or by heat," Dr. Ma said.

"Reduction is attained by rapidly twisting or rotating the needle with great force. Reinforcement results in local feeling of warmness, but reduction causes a local feeling of coldness."

In addition to Dr. Ma, LA BioMed researchers Paul C. Lee, Thomas L. Anderson, Xi-Yan Li and Isabelle Z. Jiang participated in the study. Funding was provided by National Institutes of Health Grant Nos. AT002478, AT004504 and AT004620 from the National Center for Complementary and Alternative Medicine. See the study here: https://doi.org/10.1155/2017/4694238

http://bit.ly/2t4ZeYf

Survey: Pain patients overwhelmingly prefer medical marijuana over opioids

Of those who used both opioids and cannabis, 92% say they prefer the latter.

Beth Mole - 6/29/2017, 10:14 PM

When patients have a choice between opioids and medical marijuana for a painful condition, an overwhelming majority say they prefer marijuana, that it works just as well, and has fewer side effects, a new survey finds.

Though the survey, involving 2,897 medical cannabis patients, didn't track actual drug use or efficacy, the findings fits with previous data. Decades of research suggest marijuana is effective for pain treatment. And recent studies have found that in states with medical marijuana availability, there are fewer opioid overdose deaths and doctors fill fewer opioid prescriptions.

The authors of the new survey, led by Amanda Reiman of the University of California, Berkeley, say the data furthers the need to examine marijuana as a "viable substitute for pain treatment," particularly in light of the devastating opioid epidemic now gripping the country. The Centers for Disease Control and Prevention reports that opioids killed more than 33,000 Americans in 2015, and it estimates that 91 people in the US die each day from the highly addictive drugs.

Though people using marijuana can develop use disorders, it is virtually impossible to die of an overdose—no marijuana overdose deaths have ever been reported to the Drug Enforcement Administration. "A society with less opioid dependent people will result in fewer public health harms," the authors of the new study note.

For their survey, the researchers partnered with (but were not paid by) HelloMD, an online community for medical cannabis patients. Of the

2,897 patients recruited for the survey, 63 percent were using marijuana for pain-related conditions, such as fibromyalgia, back pain, and arthritis. About 30 percent, or 841 patients, also reported using an opioid currently or in the past six months.

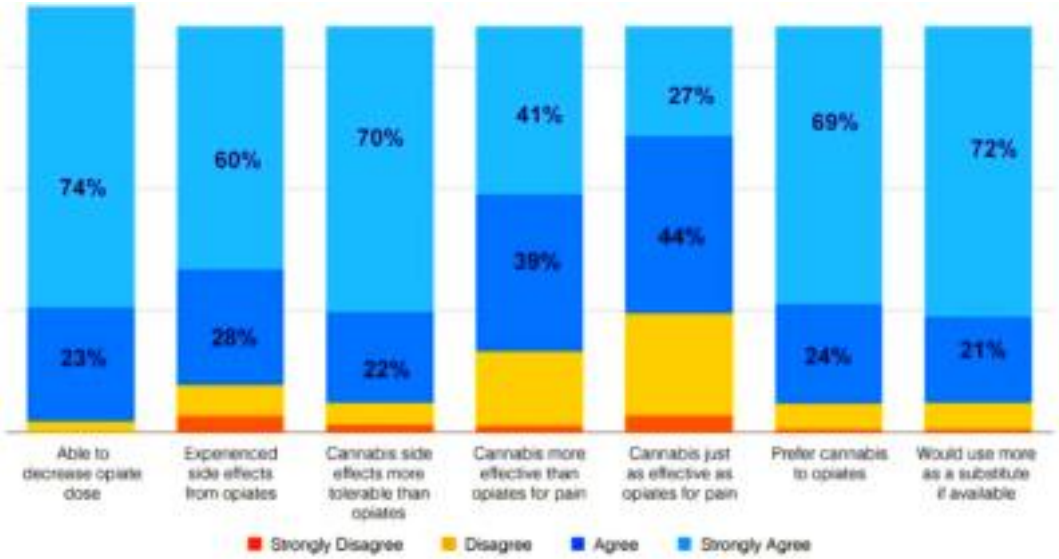


FIG. 2. Use of cannabis as a substitute/in conjunction with opioid-based pain medication ($n = 828$).

Of those 841, 92 percent agreed or strongly agreed with the statement that they preferred cannabis over opioids for their condition. And 93 percent agreed or strongly agreed that they were more likely to pick cannabis over opioids if both were readily available. Most also said that cannabis was just as effective at relieving pain as opioids, with 71 percent agreeing or strongly agreeing with the statement. Last, 97 percent agreed or strongly agreed that they could cut down on opioid use if cannabis was available.

The researchers found similar results when they asked about non-opioid pain medication use (see data above).

The survey has limitations. It's pulling from a self-selected group of cannabis users, for one, so they may be biased. The survey data also doesn't include actual drug use data or efficacy, just perceptions, which may be skewed. Researchers need more data to make firm conclusions. But with the data available, the authors suggest that "providing the patient with the option of cannabis as a method of pain treatment alongside the option of opioids might assist with pain relief in a safer environment with less risk."

Cannabis and Cannabinoid Research, 2017. DOI: 10.1089/can.2017.0012 (About DOIs).

http://bit.ly/2svqZ4o

Japan reveals plans to put a man on moon by 2030

Japan has revealed ambitious plans to put an astronaut on the Moon around 2030 in new proposals from the country's space agency.

This is the first time the Japan Aerospace Exploration Agency (JAXA) has said it aims to send an astronaut beyond the International Space Station, an agency spokeswoman told AFP on Friday.

The idea is to first join a NASA-led mission in 2025 to build a space station in the moon's orbit, as part of a longer-term effort by NASA to reach Mars.

Tokyo hopes that contributing to the multinational mission and sharing Japanese technology will land it a coveted spot at the station, from which it could eventually send an astronaut to the Moon, the spokeswoman said. The plan was presented at an education ministry panel this week, with a more formal blueprint expected next year, according to public broadcaster NHK.

The announcement comes as China and India develop their space programmes. In November, China's Shenzhou-11 spacecraft returned to Earth, bringing home two astronauts from the rising power's longest-ever orbital mission.

Beijing has also unveiled illustrations of a Mars probe and rover it aims to send to the Red Planet at the end of the decade.

NASA and other global space agencies are working hard on sending astronauts to Mars by the 2030s.

In March, the US Congress passed a bill—signed by President Donald Trump—directing NASA to send a manned mission to Mars in 2033.

http://bit.ly/2sfx1eG

CDC warns against eating placenta—in case you needed another reason

Oregon mom's organ pills packed with infectious bacteria, which spread to the baby.

Beth Mole - 6/30/2017, 10:50 PM

Some eat it raw, others cook it. Some make it into jerky, and others grind the cooked, dried remains into a brown powder and fill capsules. However it's done, eating the placenta after childbirth is thought to ward off postpartum depression and boost milk production, among other things. There is no solid scientific evidence backing these benefits, though, and cooking it reduces the nutritional content. Nevertheless, the practice of eating the fetus-nourishing organ has strayed from the fringe in recent years, with celebrities such as January Jones and Kim Kardashian joining in. In a December 2015 blog post, Kardashian went through her thought process, noting anecdotes of other women who had good experiences. "So," she wrote, "I thought, why not try it? What do I have to lose?"

As it turns out, the answer is the health of your newborn, according to the Centers for Disease Control and Prevention. In a new case report published in the agency's Morbidity and Mortality Weekly Report, researchers caution against the practice, noting that the commercial and at-home preparation methods could leave your DIY organ supplements contaminated with infectious pathogens.

At least that was the case for one Oregon mother. In September of 2016, the healthy woman, who gave birth to a healthy baby after an uncomplicated pregnancy, watched (likely in horror) as her newborn's health quickly deteriorated. Shortly after birth, the baby showed signs of respiratory distress, was admitted to the neonatal intensive care unit, and was found to have a life-threatening blood infection—diagnosed as late-onset group B Streptococcus agalactiae (GBS) bacteremia. After an 11-day course of antibiotics in the hospital, the baby improved and went home.

A dangerous dose

But not five days later, the baby arrived in another hospital, again with a GBS infection. Puzzled as to why the infection recurred, the doctors there started asking questions and found that the mother was taking placenta pills. She had hired a company—which the researchers only identify as "Company A"—to make pills for her. The company notes on its website that it cleans, slices, and dehydrates placentas at 115°F–160°F (46°C–71°C), then grinds and places them into about 115–200 gelatin capsules, stored at room temperature.

The researchers note that this process may not heat the organ to a high enough temperature or for long enough to reduce pathogens. For instance, when cooking meat at just 130°F, it takes around two hours to kill off Salmonella.

When the researchers examined the pills, they found that they were packed with not just placenta powder but GBS as well. Using whole genome sequencing at CDC labs, researchers found that the GBS strains in the pills were genetically indistinguishable from the GBS infecting the baby.

GBS is commonly found in and on adults, but it usually doesn't cause infections. In newborns with undeveloped immune responses, however, it can wreak havoc. And the strain of GBS found in this case was particularly nasty; it had virulence factors that allowed it to easily slip through the intestinal lining and into the bloodstream—and potentially cross the blood-brain barrier.

The doctors speculate that ingesting the bacteria-crammed capsules elevated the GBS levels in the mother's intestines and/or on her skin. And those bolstered bacteria were then able to transfer to the baby.

"The placenta encapsulation process does not per se eradicate infectious pathogens; thus, placenta capsule ingestion should be avoided," the researchers conclude. "Clinicians should inquire about a history of placenta ingestion in cases of late-onset GBS infection and educate mothers interested in placenta encapsulation about the potential risks."

http://bit.ly/2udNktM

Looters strip Greek mountains of wild tea, rare plants

Bands of impoverished Albanians are making regular cross-border forays, illegally harvesting herbs and medicinal plants

By COSTAS KANTOURIS

THESSALONIKI, Greece (AP) -- In the rugged, herb-scented mountains of northwestern Greece, where the border with Albania is a snaking invisible line, trouble is brewing over tea - the wild herbal variety.

Greek authorities and conservationists say bands of impoverished Albanians are making regular cross-border forays, illegally harvesting donkey-loads of herbs and medicinal plants. They mostly pick mountain tea - also called ironwort - hawthorn and even primrose, but they are also destroying rare and endangered species in the process.

The looters then sell the herbs for export to pharmaceutical or cosmetics companies, a business that nets Albanian wholesalers tens of millions annually.

It's illegal in Greece to pick more than a tiny quantity of wild herbs for personal use in traditional infusions. That ban doesn't exist in Albania, one of Europe's poorest nations. But, more significantly, the plants are usually uprooted in the looters' haste to pick as much as possible and be off undetected. This stops natural regeneration, threatens delicate ecosystems and leaves entire mountainsides denuded.

Albanians contend the herbs are there and the Greeks don't pick them, so why shouldn't somebody profit?

Christos Toskos, an environmentalist in Greece's Kastoria border area, says the depredations have increased over the past five years, with incursions now coming on a daily basis.

"There is very large destruction in areas covering thousands of acres," he said.

Vassilis Filiadis, who grows his own herbs in Kastoria, lamented the fate of an old wild ironwort patch in the Grammos mountains.

"It covers about 3 square kilometers (740 acres). In past years, the mountain tea grew there like a sea. The plants formed waves," he told The Associated Press. "I went this year and was shocked, it's all been uprooted."

Greece's flora is among the richest in Europe, with about 6,500 native plant species.

In targeted operations over the last few months, Greek police have arrested at least ten Albanians and seized dozens of kilograms of herbs.

In one case in late June, three people were caught with 136 kilograms (300 pounds) of ironwort loaded on two horses and a donkey.

Albanian exporters pay illegal gatherers up to 6 euros ($6.80) a kilogram (2.2 pounds) for ironwort and 7 euros a kilogram for hawthorn, Greek officials say.

"They illegally enter Greece and quickly gather the plants to avoid being seen," said Brigadier-General Panagiotis Ntziovaras, head of police for the border region of western Macedonia.

Those caught have been given suspended prison sentences of one or two months and been deported.

Many poor Albanians are crossing the mountains into Greece this year because of an herb shortage in Albania due to freezing temperatures last winter, said Filip Gjoka, president of Albania's Association of Medicinal & Aromatic Plants and owner of an herb and spice trading company.

He said they sometimes take whole families and camp in the mountains with their horses or mules.

"There are a lot of herbs in Greece, where they are not collected due to labor force shortages or lack of interest," Gjoka told the AP. "We here collect those herbs, and these people take the risks to support their families. They can bear a few months of jail since there are no other jobs."

In 2016, 24 Albanian companies exported some 17,000 tons of medicinal and aromatic plants and herbs - 186 varieties - worth a total of $40 million. They process only about 30 percent of that amount in five factories and export the rest raw.

The U.S. is a main importer, while others include France, Germany, Spain and even Australia.

Kastoria agriculturalist Dimitris Natos said the international market for herbs, particularly for use in cosmetics and foods, is expanding rapidly.

"Annual turnover growth is in the double digits, at around 15 percent," he said.

Gjoka said the Albanian companies employ 10,000 workers and another 80,000 people as independent contractors for whom seasonal herb picking is their only source of income.

Eleni Maloupa, director of Greece's Institute of Breeding and Plant Genetic Resources in Thessaloniki, says some of the 14 kinds of ironwort that grow in Greece are threatened with extinction and there is a blanket ban on their collection, even in small quantities.

She said Greek and Albanian authorities should cooperate to solve the problem, as Greece has already done with neighboring Macedonia.

"The increased arrests may perhaps discourage (illegal harvesters) but I believe we should use all available means, such as drones or cameras, to control the border and illegal plant picking," she said.

Llazar Semini in Tirana, Albania, and Nicholas Paphitis in Athens, Greece, contributed to this story.