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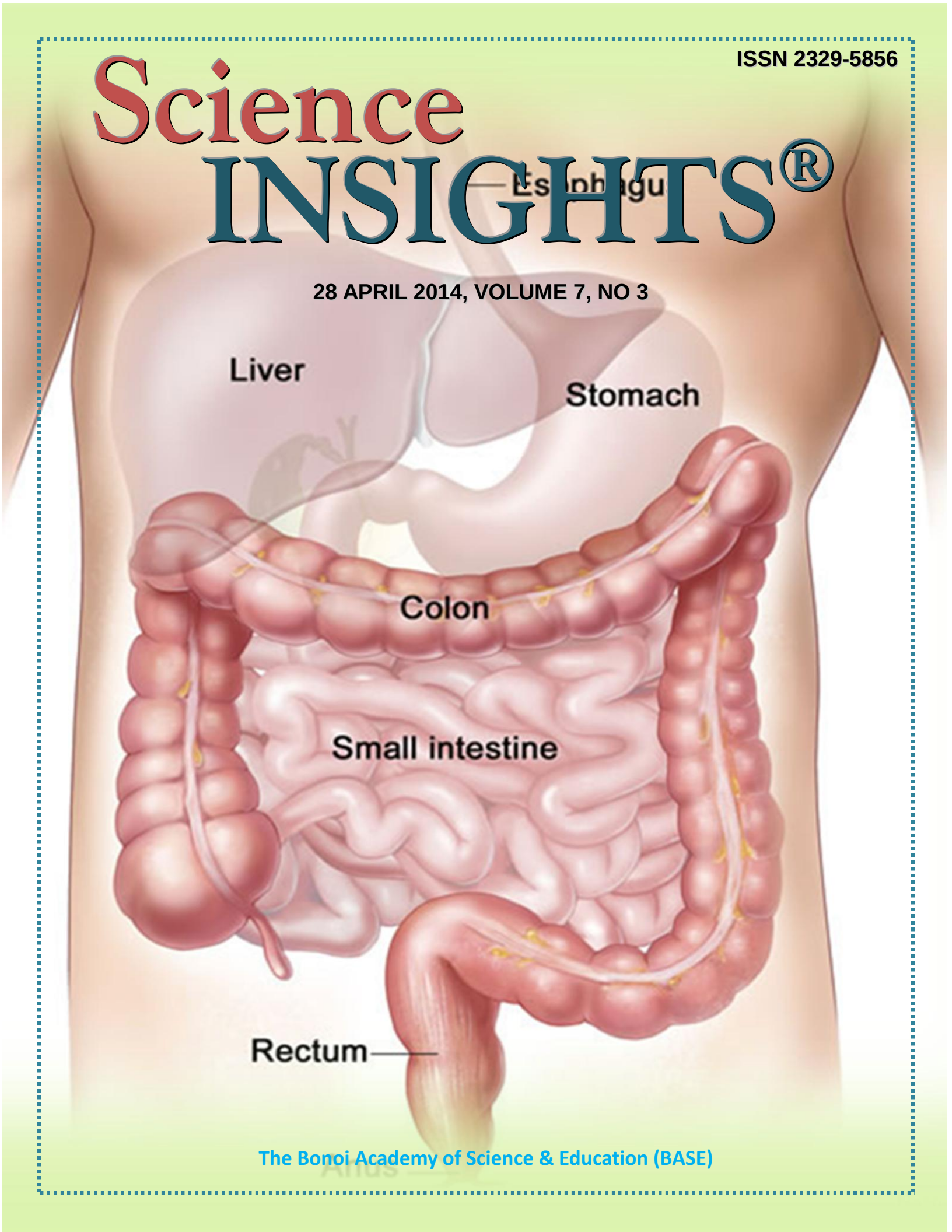

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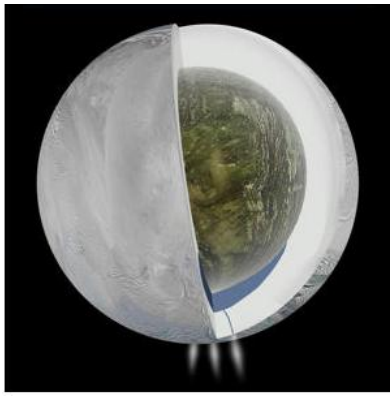
NEWS



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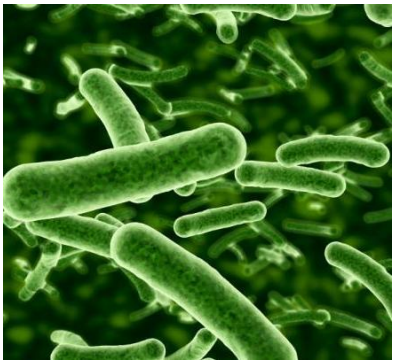
EDITOR'S CHOICE



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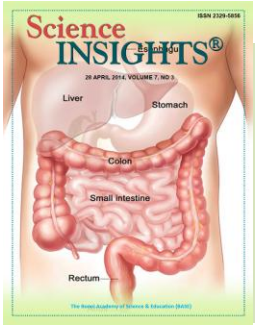
PICTURE STATION

SHORT COMMUNICATION



COVER
The modified procedure with duodenum annular internal drainage is feasible in relieving the symptoms when conservative treatment fails in young adults with SMAS. The new procedure increases surgery time and SSS. However, it potentially reduces the recurrence rate and postoperative complications of duodenal obstruction and antiperistalsis and improves quality of life. Further study will be required for effectiveness and safety of the modified procedure in the people with SMAS with longstanding history. See page 176.

Image: BASE illustrating group

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When life starts,
It is so fresh.
Who knows the future?
Sunny
Rainy
Droughty
Or
……

BASE

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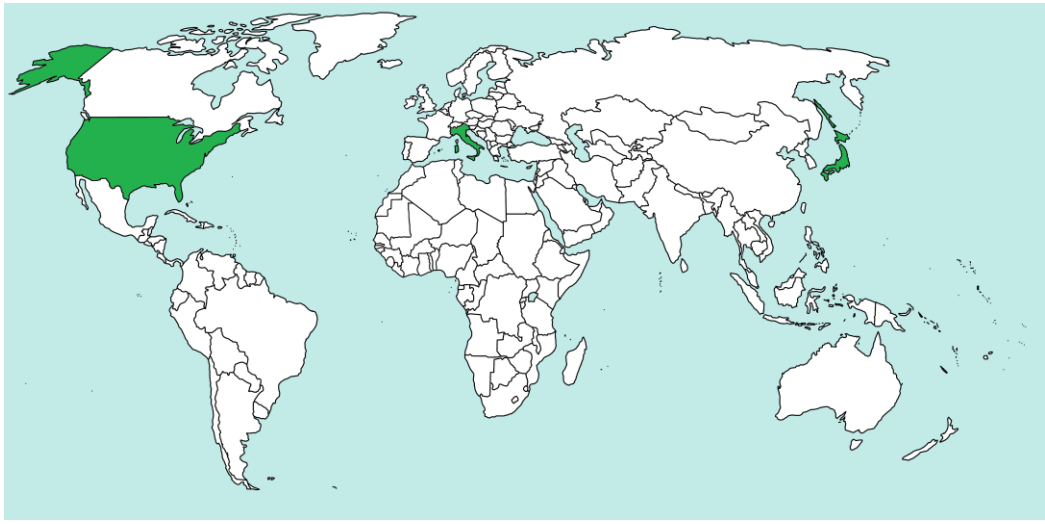
New York, USA
Modern Sharks Aren't So Primitive

Sharks are usually thought of as primitive creatures, sometimes called "living fossils". But a new study of a 325-million-year-old shark fossil, the most complete of its kind, suggests modern sharks have evolved significantly from their bony ancestors. The ancient fossil has characteristics of both bony fishes and modern sharks. But its gill structures more closely resemble those of bony fishes, challenging the notion that modern sharks have remained unchanged over evolutionary time. Until now, paleontologists studying the evolution of early jawed vertebrates, or gnathostomes, have focused on either cartilaginous fishes (modern sharks and rays) or bony fishes. Modern sharks were thought to have changed very little over evolutionary time. The shark fossil in the study, *Ozarcus mapesae*, was found in Arkansas by husband and wife Royal and Jean Mapes (for whom the species is named), who donated it to the museum. The shark was about 3 feet (90 centimeters) long with very large eyes, and appears to have lived in a shallow, murky inland sea that was also home to giant squidlike creatures. The researchers X-rayed the fossil, first using a CT machine and later using a synchrotron,



which relies on ultra-high-energy X-rays and has become an important tool for paleontology because it doesn't destroy the fossils and provides a level of detail not possible with traditional fossil preparation. The X-ray scans revealed the fossil had complete gill arches, the support structures for the gills that fish use to breathe. These gill arches were arranged in a serial way, more like those of bony fish than modern sharks. The fossil's jaws were also more like those of bony fish. Most modern sharks have jaws that are attached to their skulls by flexible ligaments, whereas bony fish have jaws that are rigidly fused to their craniums.■

SALMON, USA
Hundreds of Earthquakes Strike Central Idaho

Hundreds of low-level and medium-sized earthquakes have struck central Idaho since last month, puzzling geologists who wonder whether the ruptures portend a much larger temblor to come or are merely the rumblings of a seismic fault previously thought to be dormant. The recent earthquake swarm, beginning on March 24 and climaxed by a 4.9 magnitude tremor on Saturday, has produced no reports of injuries or severe damage but has rattled nerves in a region where Idaho's most powerful known quake, measured at 6.9, killed two children in 1983. The Challis tremor knocked pictures and animal mounts from walls, rattled dishes off tables and was felt by residents in neighboring Montana more than 100 miles from the quake's epicenter, officials said. The latest seismic surge, including 100 small to moderate quakes on Monday alone, has galvanized government scientists, who planned to install special seismometers in the area as early as Tuesday to more closely track the activity. The likelihood of a severe earthquake coming on the heels of the recent swarm is low, but much is perplexing about the series of tremors, said Bill Phillips, a geologist with the Idaho Geological Survey at the University of Idaho. Such earthquake swarms typically are associated with the movement of molten rock below ground, which geologists credited for the recent quake cluster at Yellowstone National Park, or they are linked to an active fault, he said on Tuesday. Idaho sits at the center of a seismic belt in the intermountain West that runs from northwestern

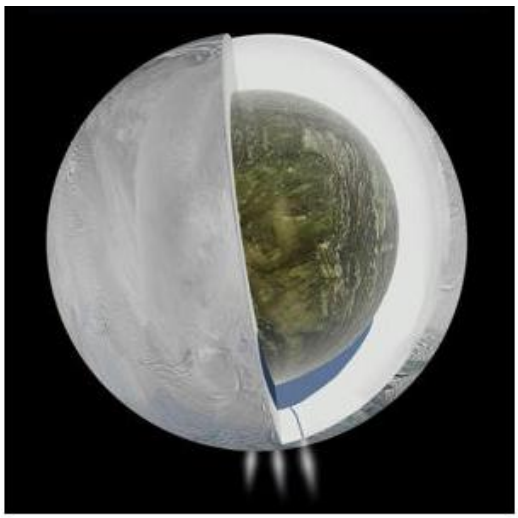
Montana to southern Nevada and contains thousands of faults in the Earth's crust, said Michael Stickney, director of earthquake studies at the Montana Bureau of Mines and Geology.■

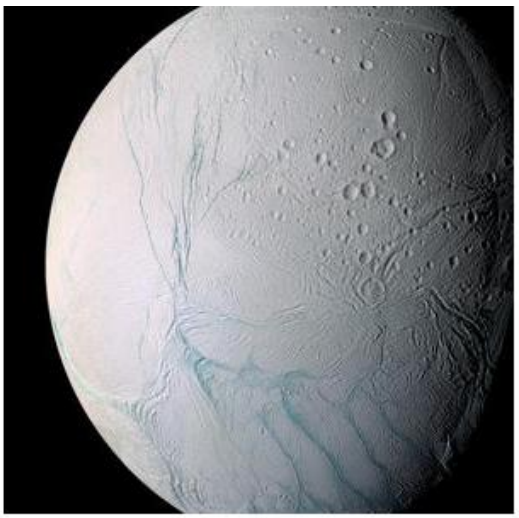
Rhode Island, USA
Woman's Ear Reattached with Help of Leeches

We use various kinds of methods in helping us live better. It is also true in medical science. A pit bull mauling left the 19-year-old with a small laceration on her arm and her left ear entirely torn off, with a stud earring still in place. While plastic surgeons are trained to reattach severed organs, these reattachments are simplest when the cut is clean and sharp – as from a kitchen knife. However, this woman's ear was torn, making the surgery more challenging. Using a microscope and extremely delicate tools, Sullivan and his surgical team found a tiny artery only 0.3 millimeters in diameter and reattached the vessel to the woman's blood supply with three microscopic stiches. The artery brought fresh blood to the woman's reattached ear, but the surgical team couldn't find a vein to drain blood back to the body. So they turned to another technique: leeches. For more than two weeks, the woman recovered in the hospital with leeches attached to her left ear, draining away deoxygenated blood. At first, a leech treatment often alarms patients, Sullivan said, but they often grow to respect the little bloodsuckers for what they can do. Over time, the nursing staff weaned the patient off the leeches by waiting longer and longer periods between replacements. Meanwhile, the ear grew its own veins to drain the reattached tissue. Today, the scar is barely visible. Because the attack affected only the patient's outer ear, or pinna, the injuries did not damage her hearing. The case is reported in the April 17th, 2014, issue of the *New England Journal of Medicine*. In 2004, the Food and Drug Administration (FDA) approved these blood-sucking worms for use in medicine.■

Rome, Itly
Hidden Ocean Found on Saturn's Icy Moon Enceladus

The water ocean on Enceladus is about 10 kilometers deep and lies beneath a shell of ice 30 to 40 km thick, researchers said. Further, it's in direct contact with a rocky seafloor, theoretically making possible all kinds of complex chemical reactions – such as, perhaps, the kind that led to the rise of life on Earth. The new finding, which is published online today (03 April, 2014) in the journal Science, doesn't exactly come out of left field. Rather, it confirms suspicions many researchers have had about Enceladus since 2005, when NASA's Cassini spacecraft first spotted ice and water vapor spewing from fractures near the moon's south pole. The ultra-precise tracking system – NASA's Deep Space Network can tell if Cassini speeds up or slows down by just 1 foot (0.3 meters) per hour – revealed the presence of a "negative mass anomaly" at Enceladus' south pole. In other words, the area harbors less mass than would be expected for a perfectly spherical body. The heat required to keep this water in a liquid state is generated within Enceladus, with much of that energy perhaps coming from tidal interactions between Enceladus and another of Saturn's moons, Dione. The moon's internal energy stores are prodigious; a 2011 study found that Enceladus' south polar region pumps out 15.8 gigawatts of heat-generated power, equivalent to the output of 20 coal-fired power plants. The team's calculations suggest that the moon's ocean covers at least as much area as Lake Superior, the second-largest lake on Earth – though the icy moon's sea is much deeper than Lake Superior and thus holds a great deal more water. The ocean is likely confined to the moon's southern hemisphere, reaching halfway to the equator or so from the pole. But the study team cannot rule out





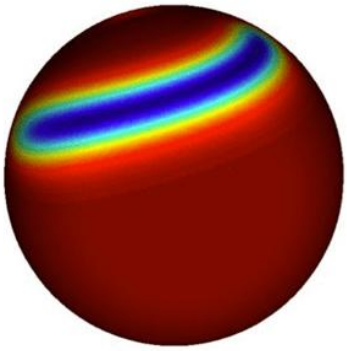
the possibility that it extends globally, said co-author Dave Stevenson of the California Institute of Technology in Pasadena. The gravity measurements also suggest that Enceladus is composed of layers of different materials, with a low-density core consisting of silicate rock underlying the ocean, researchers said. Indeed, the similarities between Europa and Enceladus continue to mount. Late last year, for example, researchers announced the discovery of water-vapor plumes erupting from Europa's south polar region.■

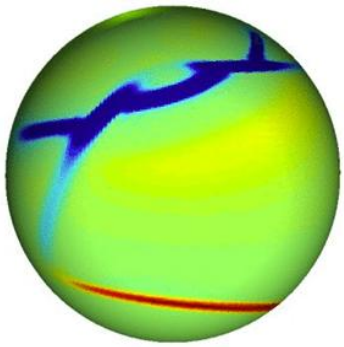
Tokyo, Japan
Baby Volcanic Island Eats Its Older Neighbor

In November 2013, a baby volcanic island rose from the sea out of a volcanic blast in the Bonin Islands about 620 miles (1,000 kilometers) south of Tokyo, on the western edge of the Pacific "Ring of Fire," a hotbed of seismic activity. Named Niijima, the newcomer boiled the sea and spewed steam, ash and lava fragments into the air. Some thought the small black cone, which sprouted just offshore of a larger volcanic island called Nishino-shima, might slip back into the sea, vanishing under pounding waves. But Niijima kept growing. Now a satellite image taken March 30, 2014, by the Operational Land Imager on Landsat 8 shows that Niijima has actually overtaken Nishino-shima. Together, the conjoined islands measure about 3,280 feet (1,000 meters) across, officials with NASA's Earth Observatory said. The landmass has also tripled in height since December, now rising more than 196 feet (60 m) above sea level. The smashed-together islands mark the top of a giant submarine volcano that had not erupted since a major outpouring in 1973 to 1974, according to the Japanese Coast Guard. Lava flows are now most active in the southern portion of the new landmass, and plumes of ash continue to rise, with tiny particles seeding a stream of white cloud puffs overhead.■

New Haven, USA
Why Life on Earth: Right Beneath Your Feet

Why life on earth? We ask this question such a long time, but we still don't know the answer in terms of the so-called scientific point. Scientists are constantly on a mission to untangle how Earth alone among the planets was able to evolve complex life. Scientists know that Earth's past internal movements of the tectonic plates under our feet make our planet one-of-a-kind: they trapped carbon dioxide which helped make our planet habitable. A new study, published in the 06 April, 2014 issue of the journal Nature, may have figured out the mystery of how these plates formed – and why only Earth has them. These are the Earth's major tectonic plates. The arrows show which way the boundaries are moving. Plates cover the entire Earth, and their boundaries play an important role in geologic happenings. The movement of these plates atop a thick, fluid "mantle" is known as plate tectonics and is the source of earthquakes and volcanoes. Plates crash together to make mountains, such as the Himalayas. They leave trenches where one slips beneath the other. They make giant rift valleys and ridges when going their separate ways. The process is actually very important to life on Earth. Several billion years ago, the surface of our Earth began forming into puzzle pieces called plates. This process trapped our atmospheric carbon dioxide into rocks and stabilized our climate, making Earth habitable. How this developed has been a mystery for centuries. But one feature present at all plate boundaries could be the clue needed to crack the mystery: a rock called mylonite. Mylonite rocks show up at every plate boundary and have puzzled scientists since at least the late 1800s. Downwellings cause deformation of the sinking material as it bends downward. In the globe to the right, the blue is a sinking area on the Earth's surface, the beginnings of a plate boundary. In the globe to the right, the sinking from the red globe above has created a convergent boundary, in blue, where plates move together. This pulls on the rest of the Earth's surface, eventually forming a divergent boundary, in red, where plates move away from each other. Once a piece of Earth's surface is enclosed by boundaries, it becomes a moving plate. On Venus, damaged





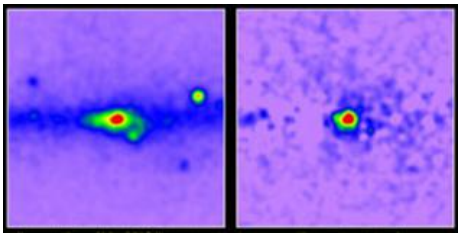
areas of the crust were never able accumulate into boundaries because it was too hot. The weak zones healed relatively quickly and the planet was never able to develop plate tectonics. Venus' plates never trapped CO_2, never cooled, and the impact on the planet's atmosphere makes it uninhabitable.■

Cleveland, USA
New Cholesterol Drugs Effectively Lower LDL Levels

People who have high cholesterol were given fresh hope this week that new, effective cholesterol-lowering drugs could be a reality in the near future. An experimental class of drugs known as PCSK9 inhibtors were presented over the weekend at the annual meeting of the American College of Cardiology, and *The Wall Street Journal* reported Sunday that they were shown to reduce LDL cholesterol levels by two-thirds across a number of different patient groups. Currently, the most commonly used weapon against cardiovascular disease is a group of medicines called statins, drugs that went on the market more than 25 years ago, but statins have a number of complications. Now, both health experts and patients have hope that the new drugs will eventually be able to join the fight against high levels of LDL cholesterol, a risk factor for heart attack and stroke. The results that recently came from the studies of PCSK9 inhibitors were consistent with what health professionals found earlier, and patients who followed the plan for as long as a year didn't suffer any significant safety issues. In the meantime, PCSK9 inhibitors will continue to be tested, and more health professionals and patients are expected to take note of what the future of cholesterol medication could hold. The first step is education and understanding how these inhibitors differ from statins, currently the most widely used drugs ever developed by the pharmaceutical industry. According to the *Journal*, the medicines in question that are hoping to upset that reality are bioengineered antibodies that block PCSK9, a protein that interferes with the liver's ability to remove cholesterol from the blood. In comparison, statins such as Lipitor, Zocor, and Crestor curb cholesterol production. That's where the new drugs and studies come in, and health experts are hopeful. According to *The Wall Street Journal*, in the 901-patient study funded by Amgen, those treated with a 420-milligram dose of a drug called Descartes had a 57 percent reduction in LDL compared with those who took a placebo. Other Amgen studies showed a lowering of LDL in patients with genetically high LDL and among those considered statin-intolerant, leading those studies to be published online by the *New England Journal of Medicine*. It is still not absolutely clear what the future of cholesterol medication holds, but the studies over the weekend show that it might be a bright one.■

Cambridge, USA
Mysterious Dark Matter Spotted at Milky Way's Center

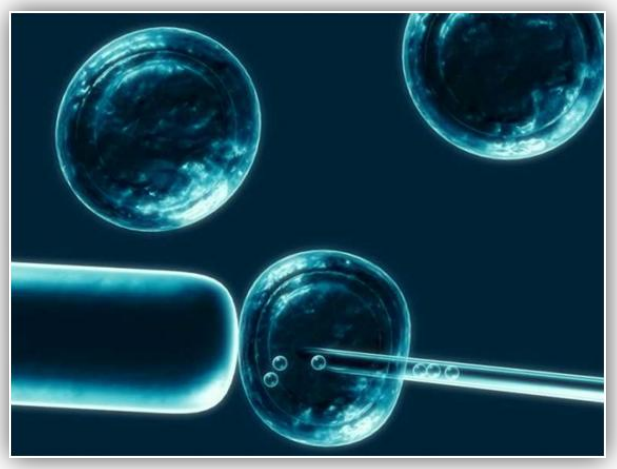
Astronomers have perhaps their best lead to date about the nature of dark matter, the strange and invisible stuff that dominates the material universe. The center of our Milky Way galaxy generates more high-energy gamma rays than can be explained by conventional sources such as supernova remnants and fast-spinning, super-dense neutron stars known as pulsars, a new study suggests. The "excess" may be produced by the annihilation of colliding dark matter particles. Dark matter, which is thought to make up more than 80 percent of the matter in the universe, is so named because it apparently neither absorbs nor emits light, making it impossible to observe directly with telescopes. But its gravity does affect the "normal" stuff we can see and touch, providing one way to hunt dark matter down. Gamma rays, the most energetic light in the universe, also provide another potential detection method. Many scientists think dark matter is primarily composed of Weakly Interacting Massive Particles, or WIMPs. Theory suggests that some types of WIMPs



annihilate when they collide with each other, while others generate a fast-decaying secondary particle when they interact. In either case, the idea goes, gamma rays are produced. In the new study, researchers used data from NASA's Fermi Gamma-ray Space Telescope to make maps of the Milky Way's center in gamma-ray light. The study team is not claiming to have found a smoking gun for dark matter; additional data from other observing projects, the LHC and/or direct-detection experiments would be required to validate their interpretation, they stress. The new study has been submitted to the journal *Physical Review D*.■

Los Angeles, USA
Stem Cells Breakthrough Provides new Hope

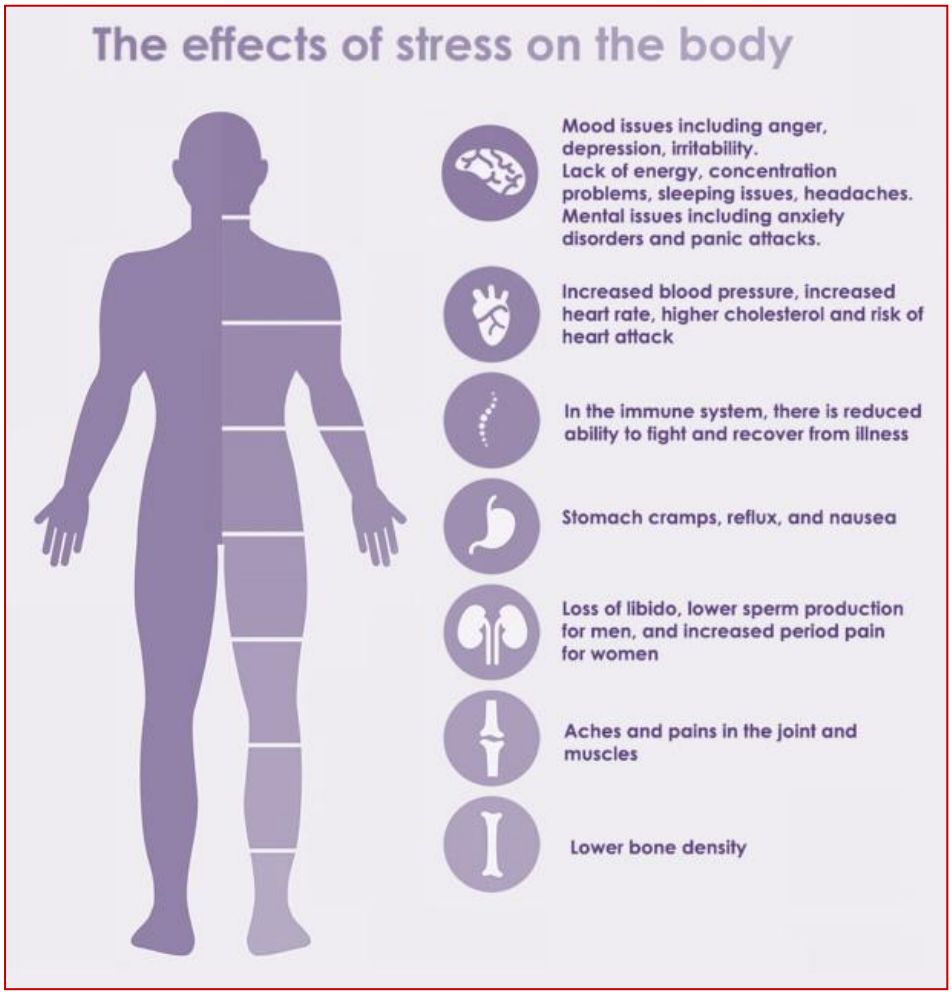
Scientists at the Research Institute for Stem Cell Research in Los Angeles have provided new hope in a breakthrough stem cell research paper published last Thursday. The new study documents the successful duplication of adult stem cells using the subject's own DNA. The team, led by researcher Young Gie Chung, was able to turn skin cells extracted from an adult male into a hallow ovum, the ovum then multiplies and divides creating an embryo. While some scientists say the discovery is "not-earth-shattering," others are more hopeful, saying nuclear transfer may be the first step in using stem cells ethically to cure degenerative diseases. The process was developed as part of a scientific initiative to pursue therapeutic cloning, as opposed reproductive cloning. Researchers leading the study removed skin cells from the subject, fusing them to an empty ovum using a jolt of electricity. With this new method, researchers hope to perfect a way to use the subject's own DNA to create cells that can fight a variety degenerative diseases. The process was successful using skin cells of two men ages 35 and 75. The technique for this latest breakthrough in human stem cell research was first used in 1996 to clone Dolly the sheep, but this study marks the first time the method has been used on humans in order to create stem cells from adults. This stem cell breakthrough could provide new hope to those with degenerative diseases. Somatic cell nuclear transfer, or SCNT, could lead to the ability to regrow any type of human organs and tissue for regenerative purposes. Last year, a team of scientists used this method to create stem cells from the skin of babies but it was unclear whether it would be successful with adult cells. Years ago, when scientists were beginning to explore the therapeutic potential of stem cells, the only way to create them was to harvest cells from an embryo with the same DNA as the subject, meaning scientists had to clone an embryo that matched the patient. The approach led to ethical debates, and scientists began to explore the use of induced cells as an alternative. However, there was some doubt that induced cells would be as flexible in treatment as those harvested from an embryo, and now it seems the SCNT method may offer yet another alternative through the creation of early embryos from adults. The new findings could lead to tissue-transplant for a number of diseases such as Parkinson's disease, heart disease, spinal cord injury, and multiple sclerosis. Despite the potential of the SCNT method of stem cell production, this recent breakthrough may reignite ethical debates about creating human embryos for experimental purposes, largely because scientists could theoretically employ the same technique to produce cloned babies. More than 15 states have laws against human cloning, and about 7 states have banned cloning for both reproductive and therapeutic purposes. The SCNT method cannot produce a human clone, even if the embryo is implanted into a womb, but since the embryos in the study still contain human DNA further research could make it possible for scientists to perfectly clone the original subject, a process officially banned by the United Nations following the 1997 controversy over Dolly the sheep. While some worry that the techniques in the SCNT cloning process are the first step to cloning a baby with the same genetic makeup as the donor, others find new hope for curing degenerative diseases in this latest stem cell breakthrough.■




Who feeds us?

STRESS AND ENDOCRINOLOGY

Stress and Epigenetics: Early-Life Stress Reduces DNA Methylation of the Pomc Gene



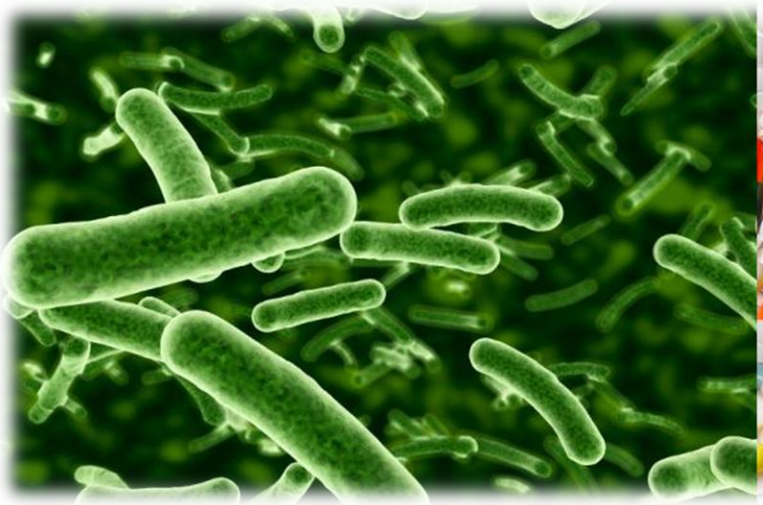
Stress is everywhere. You cannot grow up if without stress in terms of its beneficial effects. How excessive stressful responses would cause irreversible changes that marked in our genetic traits through various manners. It would be much more significant when the stress encountered in our early life. A recent study led by Dr. Yonghe Wu from Max Planck Institute of Psychiatry, Germany, reported that the environmental cues can be translated into stable changes, cellular memory, in neuroendocrine cells. In their study, male mice were investigated and they demonstrated that early-life stress (ELS) increases the vulnerability thresholds for stress-related diseases such as major depression and anxiety by inducing alterations in the structure and function of neural circuits and endocrine pathways. The authors previously found that the epigenetic mechanisms contributed significantly to the long-term programming of the hypothalamo-pituitary-adrenal axis activity following ELS exposure in male mice. In the study, ELS comprising daily separation of pups from their dams on postnatal days 1-10 was observed to up-regulate the expression of the pituitary proopiomelanocortin (Pomc) gene; POMC serves as a prohormone for ACTH, a key mediator of the adrenocortical response to stress. Detailed analysis revealed that the increase in Pomc mRNA levels results from a reduction in DNA methylation at a critical regulatory region of the Pomc gene; interestingly, this change occurs with some delay after ELS and persists for up to 1 year. Using a Pomc-expressing pituitary cell line (AtT20), we confirmed a role for DNA methylation in restraining Pomc expression under resting conditions: specifically, we show that CpG site-specific methylation of the Pomc promoter represses Pomc mRNA transcription. Further, they showed that high-affinity binding of methyl-CpG binding protein-2 to the distal promoter of Pomc, suggesting that methyl-CpG binding protein-2 acts in association with the chromatin modifiers histone deacetylase 2 and DNA methyltransferase 1 to repress Pomc gene expression. This kind of epigenetic changes in the context of stress makes it possible that once the early epigenetic marks activated when they were in adulthood, the would-be diseases were awaiting there. It is not merely in the endocrine, but also in other systems.■

Endocrinology 2014;155:1751

MEDICINE

What Effect of Antibiotics on Children's Growth?

Antibiotics play an essential role in preventing severe infections and saving thousands and millions of life. We all used or are using different types of antibiotics. We, however, don't know what impact of antibiotic administration on the children's growth. A new study systematically reviewed and analyzed the data of previous studies headed by Dr. Amee R Manges from University of British Columbia, Canada concluded that antibiotics have a growth promoting



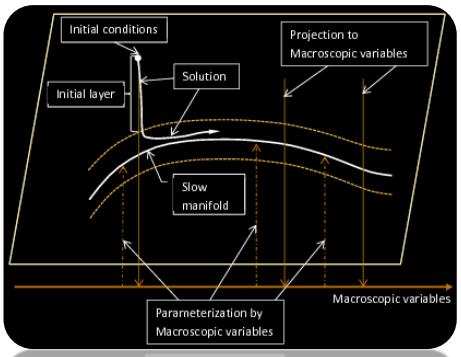
effect in prepubertal children in low and middle income countries. This effect was more pronounced for ponderal than for linear growth. The antibiotic growth promoting effect may be mediated by treatment of clinical or subclinical infections or possibly by modulation of the intestinal microbiota. Better definition of the mechanisms underlying this effect will be important to inform optimal and safe approaches to achieving healthy growth in vulnerable populations. The growth promoting effects of antibiotics were first observed in animals in the 1940s. Small daily doses of broad spectrum antibiotics have been found to improve average daily weight gain in farm animals by as much as 73 percent. In the meta-analysis, the authors pooled the data from 10 randomized controlled trials representing 4316 children, across a variety of antibiotics, indications for treatment, treatment regimens, and countries. In random effects models, antibiotic use increased height by 0.04 cm/month (95% confidence interval 0.00 to 0.07) and weight by 23.8 g/month (95% confidence interval 4.3 to 43.3). After adjusting for age, effects on height were larger in younger populations and effects on weight were larger in African studies compared with other regions. These data demonstrated that the evidence from a diverse set of randomized controlled trials show that antibiotic use in prepubertal children from undernourished populations in low and middle income countries leads to clinically relevant growth gains, particularly for weight. Larger growth gains are associated with antibiotic use in studies with a high prevalence of HIV infection and severe acute malnutrition. The growth gains show the co-benefits of antibiotic treatment in high risk populations, and provide proof of concept that treatment of infections or modulation of the intestinal microbiota can have beneficial growth effects; however, more research is needed to better understand the mechanisms involved.■

BMJ 2014;348:g2267

MATHEMATICS

Hilbert's 6th Problem: Exact and Approximate Hydrodynamic Manifolds for Kinetic Equations

Hilbert's sixth problem is to axiomatize those branches of physics in which mathematics is prevalent. It occurs on the widely cited list of Hilbert's problems in mathematics that he presented in the year 1900. The question was as described that "Mathematical Treatment of the Axioms of Physics. The investigations on the foundations of geometry suggest the problem: To treat in the same manner, by means of axioms, those physical sciences in which already today mathematics plays an important part; in the first rank are the theory of probabilities and mechanics." Hilbert gave the further explanation of this problem and its possible specific forms: "As to the axioms of the theory of probabilities, it seems to me desirable that their logical investigation should be accompanied by a rigorous and satisfactory development of the method of mean values in mathematical physics, and in particular in the kinetic theory of gases. Boltzmann's work on the principles of mechanics suggests the problem of developing mathematically the limiting processes, there merely indicated, which lead from the atomistic view to the laws of motion of continua." A study by Drs. Alexander N. Gorban from University of Leicester, UK, and Ilya Karlin from ETH Zürich, Switzerland, solved the question. As they summarized that the problem of the derivation of hydrodynamics from the Boltzmann equation and related dissipative systems is formulated as the problem of a slow invariant manifold in the



space of distributions. They reviewed a few instances where such hydrodynamic manifolds were found analytically both as the result of summation of the Chapman-Enskog asymptotic expansion and by the direct solution of the invariance equation. These model cases, comprising Grad's moment systems, both linear and nonlinear, are studied in depth in order to gain understanding of what can be expected for the Boltzmann equation. Particularly, the dispersive dominance and saturation of dissipation rate of the exact hydrodynamics in the short-wave limit and the viscosity modification at high divergence of the flow velocity are indicated as severe obstacles to the resolution of Hilbert's 6th Problem. Furthermore, the authors reviewed the derivation of the approximate hydrodynamic manifold for the Boltzmann equation using Newton's iteration and avoiding smallness parameters, and compare this to the exact solutions. Additionally, the authors discussed the problem of projection of the Boltzmann equation onto the approximate hydrodynamic invariant manifold using entropy concepts. Finally, a set of hypotheses is put forward where we describe open questions and set a horizon for what can be derived exactly or proven about the hydrodynamic manifolds for the Boltzmann equation in the future.■

Bull Amer Math Soc 2014; 51:187

LANGUAGE

Goals of Collegiate Learners and the Standards for Foreign Language Learning

Second language, a widely spread term, has become far more easily acceptable than any time ever. However, how to reach the optimal goal in second language learning is a hot topic discussed by the linguistic personnel. A new study conducted by Drs. Sally Sieloff Magnan, Dianna Murphy and Narek Sahakyan published a monograph issue in the journal of *The Modern Journal of Language* described the goals of collegiate learners and the standards for foreign language learning. In this study, a total of eight chapters were included and the authors detailed the five issues they raised. As abstracted that with a mixed method design, the study includes responses from 16,529 students at 11 postsecondary institutions across the United States, with interviews from 200 students at two of these institutions. The first research to examine learner perspectives with regard to the Standards, this study considers (a) whether college students have goals consistent with the Standards, (b) whether they expect to reach these goals during their formal language study, (c) whether these goals and expectations differ for first-year and second-year language students, (d) whether they differ for students of more and less commonly taught languages, (e) whether students understand the Standards and see the five goal areas as interrelated or in terms of hierarchies of priorities, and (f) how the Standards might encourage student reflection, especially regarding the relationships among language, culture, and thought. With the aim of promoting critical thinking about the Standards and their possible application at the college level, the monograph details the history of the framework, with discussion of its limited acceptance and use in postsecondary instruction, and considers what student perceptions tell us about how the Standards might fit with assumptions and characteristics of communicative language teaching and literacy-based approaches to language learning. In this discussion, the monograph examines shortcomings in the Standards framework, as seen through the lens of student perceptions.■

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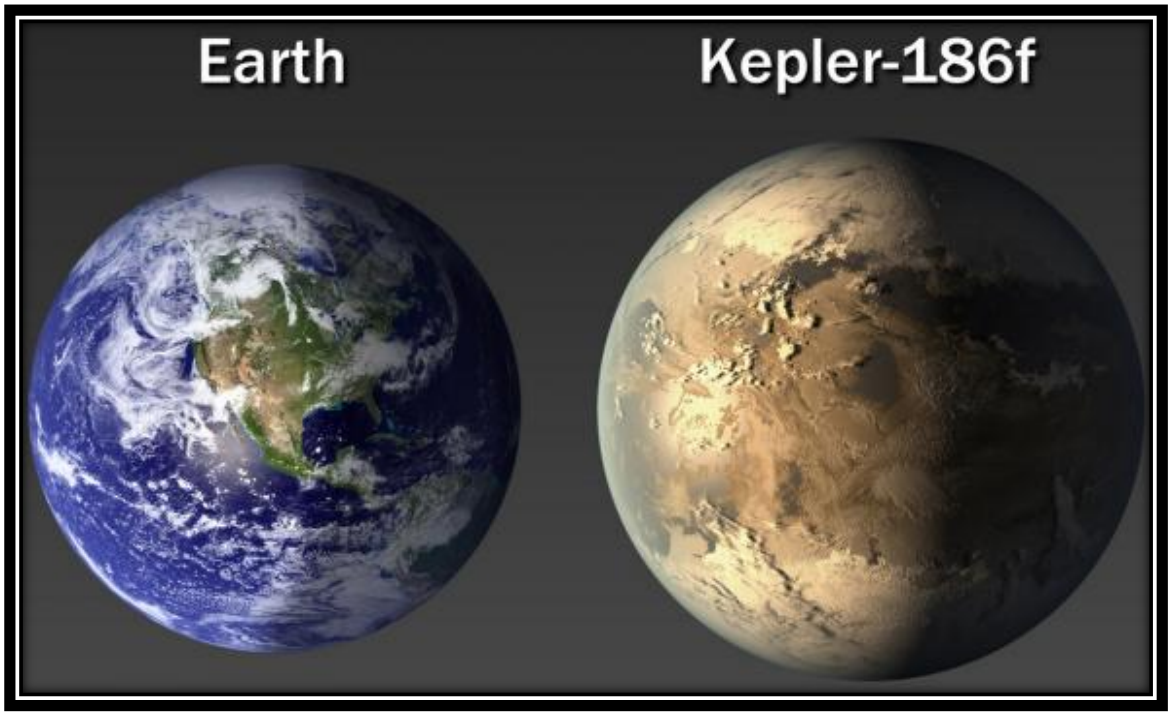
BASE


Working like a worker bee?
Relax yourself.....

Habitable Exoplanets: Kepler-186f

By NASA



Habitable Exoplanets: Kepler-186f, By NASA

On 18 April, 2014, scientists announced the discovery of Kepler-186f, a planet 492 light years away in the Cygnus constellation. Kepler-186f is special because it marks the first planet almost exactly the same size as Earth orbiting in the “habitable zone,” the distance from a star in which we might expect liquid water-and perhaps life. What did not make the news, however, is that this discovery also slightly increases how much credence we give to the possibility of our own near-term extinction. This is because of a concept known as the Great Filter. The Great Filter is an argument that attempts to resolve the Fermi Paradox: why have we not found aliens (or why have they not found us), despite the existence of hundreds of billions of exosolar systems in our galactic neighborhood in which life might evolve? As the namesake physicist Enrico Fermi noted, it seems rather extraordinary that not a single extraterrestrial signal or engineering project has been detected (UFO conspiracy theorists notwithstanding). This apparent absence of thriving extraterrestrial civilizations suggests that at least one of the steps from humble planet to interstellar civilization is exceedingly unlikely. The absence could be because intelligent life is extremely rare, or because intelligent life has a tendency to go extinct. This bottleneck for the emergence of alien civilizations from any one of those billions of planets is referred to as the Great Filter.■


Love the Wave
Love the Earth

Duodenogastrojejunum Annular Internal Drainage for Superior Mesenteric Artery Syndrome: A Modified Staveley's Surgery

Gang Wei,[*] Xi Zhang,[†] Bixiang Zhang,[‡] Yingtian Zhang,[†] Xiaoping Chen,[‡] Wen Liu [†,Δ]

INTRODUCTION: Superior mesenteric artery syndrome (SMAS) is caused by acute or chronic compression of the third part of the duodenum in the aortomesenteric angle. Staveley's duodenojejunostomy (DJ) is an option when conservative management fails. In current case study, we reported a modified technique in treating the young patients who presented with a long-term history of intractable SMAS.
METHODS: Twelve patients presented with history of supper abdominal pain, nausea, distension and postprandial vomiting as well as weight loss. The finding of a significant narrowing of aortomesenteric angle and substantial duodenal compression established by endoscopic ultrasound and contrast-enhanced spiral CT, was in good agreement with a diagnosis of SMAS. Conservative treatment including enteral feeding failed to relieve the symptoms. Five cases were performed by traditional DJ and the other seven patients were applied with a modified DJ by duodenum-gastro-jejunum annular internal drainage. The patient health-related quality of life was evaluated by EQ-5D and SF-12 in all the cases within 1-yr and 3-yr follow ups.
RESULTS: There was no marked intra-abdominal hemorrhage, anastomotic leakage, postoperative infection and stromal hemorrhage / ulcers in all cases. There was no difference with respect to the intraoperative blood loss and urine output, and postoperative emerging time of negative fluid balance between the DJ and modified DJ groups. Compared to the traditional DJ, the modified procedure had an increased operation time (2.67 ± 0.29 vs 1.83 ± 0.29, P=0.03) and surgical stress score (SSS) (0.19 ± 0.02 vs 0.14 ± 0.01, P=0.02). Within postoperative one-month, sixty percent (3 cases) of DJ group had recurrent vomiting and epigastric pain and one patient need reoperation. During the 1-year and 3-year follow-ups, the recurrence cases of intermittent abdominal pain, distension and nausea were two and one respectively in DJ group. The patients in both groups showed increased weight gains in the follow ups. The patients with the modified DJ surgery showed not reflux gastritis, anastomotic ulcer and stricture with a complete relief of symptoms and a relatively higher SF-12 (PCS) compared to the DJ surgery (1-yr: 30.5 ± 3.1 vs 36.9 ± 3.2, P=0.04; 3-yr: 32.1 ± 3.1 vs 38.9 ± 3.2, P=0.04).
CONCLUSION: The case study showed that the modified procedure with duodenum annular internal drainage is feasible in relieving the symptoms when conservative treatment fails in young adults with SMAS. The new procedure increases surgery time and SSS. However, it potentially reduces the recurrence rate and postoperative complications of duodenal obstruction and antiperistalsis and improves quality of life. Further study will be required for effectiveness and safety of the modified procedure in the people with SMAS with longstanding history.■

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Keywords: Superior mesenteric artery syndrome – Duodenojejunostomy – Duodenum-gastro-jejunum annular internal drainage

IN 1974, Akin named the disease "duodenal vascular compression syndrome", also known as superior mesentery artery syndrome (SMAS). Main pathological change is the obstruction of the horizontal part of duodenum which passes through the aortomesenteric vascular angle. The SMA is normally around with fat and lymphatic tissues, which prevents the part of duodenum excessive compressed. It has been recognized that any condition that narrows the aortomesenteric angle to approximately 6 – 16 degrees can lead to compression of the duodenum between the abdominal aorta and the superior mesenteric artery with resultant epigastric pain and frequent vomiting (1-3). In addition, frequent attack for a long period can also lead to duodenal antiperistalsis to result in vomiting and weight loss.

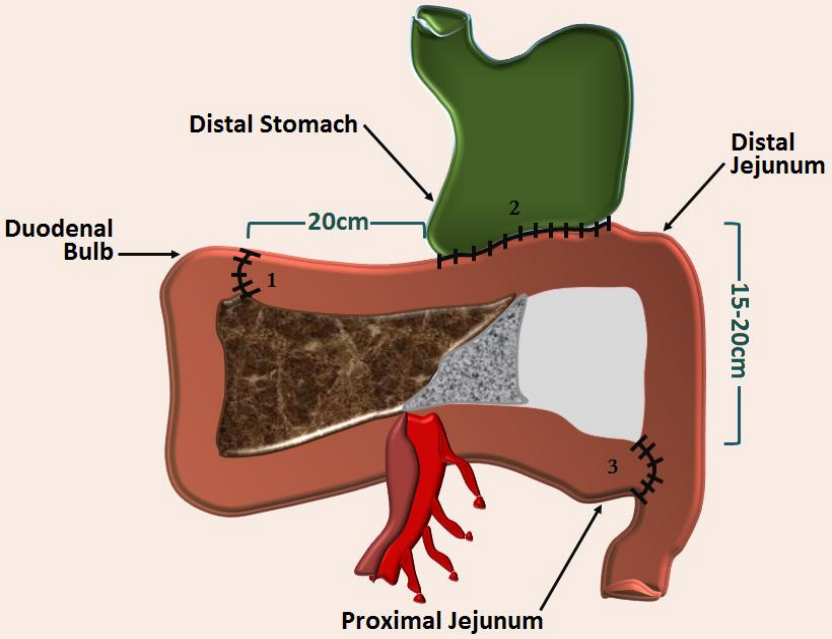
Several surgical procedures have been developed and the common characteristic of these surgical concepts is to perform a small-bowel bypass-procedure and to accompany the disruption of the physiologic intestinal continuity. For example, lysis of Treitz ligament - a feasible and safe technique (4), is chosen to treat the SMAS caused by shortage of duodenal-jejunum suspensory ligament. Subtotal gastrectomy and gastrojejunostomy can alleviate clinical symptoms if peptic ulcer is accompanied. In 1919, Staveley firstly applied side-to-side duodenojejunostomy with proximal jejunum 10cm away from Treitz ligament-the anastomotic diameter > 5 cm (5). This method is advantageous owing to not only little injury but also simple procedure. Recently there have been a few reports of laparoscopic duodenojejunostomy, and minor operative injury and faster recovery are the advantages (6-9). A developed operation offers an improved anastomotic approach through Roux-en-Y anastomosis. Recurrent rate is approximately 20%-30% after duodenojejunostomy. The possible reasons are unresolved duodenal antiperistalsis, the forming blind loop between anastomosis and duodenal obstructed region causing gastrointestinal contents stasis – blind loop syndrome, And duodenal cyclic muscles being resected at the area of anastomosis affecting its peristalsis. However, our clinical investigation and recent data showed that duodenal antiperistalsis and incomplete relief of symptoms exist after the procedure in those with longstanding history of SMAS. A recent study by Pourhassan et al showed a new surgical approach in performing a successful transposition of the superior mesenteric artery into the infrarenal aorta with 5-0 poly-dioxanone suture in a single-stitch technique (3). It consists of removal of the compressing from SMA, thus avoiding contact and compression of the duodenum. However, the proficient skill of vascular suturing and perioperative management in vascular surgery is indispensable for surgeons. Moreover, the postoperative antiperistalsis still exists. Consequently, ideal surgical procedure must aim at alleviating the obstruction of horizontal duodenum and improving antiperistalsis simultaneously. The purpose of our study is to elucidate the safety and efficacy of a new surgical procedure to solve both the obstruction of horizontal duodenum and antiperistalsis.

METHODS

From March 2003 to September 2011, a total of 12 patients, diagnosed as superior mesenteric artery (SMA) syndrome by gastrointestinal barium meal X-ray examination, sonography and CT-angiography – the SMA-aortic angle decreased by 60% (normal range from 30 ° to 45 °)(1, 7-9) and underwent surgical therapy, were analyzed retrospectively. Written informed consent was obtained from the patients' family before enrollment and they had the right to withdraw before operation day. All the information of patients kept private and informed consent forms were approved by the Ethics Committee for Clinical Pharmacology at Tongji Medical College. Relevant animal experiments had not been run before. In the current study, all patients were applied total prenteral nutrition support. It is implemented at first followed by enteral nutrition through nasointestinal catheter when ileus relieves. After the catheter enters the duodenum, the patient should need a knee-chest position to make the rotated bottom of the catheter pass through the horizontal part of duodenum and enter jejunum. Intravenous hyperalimentation with high caloric nutrition had been infused by infusion pump continuously over 18 h daily.

There were 4 patients to run duodenojejunostomy (DJ) and the other 4 cases to be treated by duodenum-gastro-jejunum annular internal drainage (**Figure 1**) during the first operation. The jejunum 10-15cm away from Treitz ligament was cut off, and then distal gastrectomy was performed. End-to-end anastomosis was established between the distal jejunum and duodenal bulb. Then

Figure 1. The Modified Duodenojejunostomy Procedure



1=Anastomosis between duodenal bulb and distal jejunum;
2=Anastomosis between distal stomach and distal jejunum;
3=Anastomosis between distal jejunum and proximal jejunum.

end-to-side anastomose was brought 15-20 cm below away the gastro-jejunostomy anastomosis between the proximal jejunum and distal jejunum.

Surgical invasion was evaluated by surgical stress score (SSS) (10, 11), calculated by the following formula: -0.342+0.0139X_1+0.0392X_2+0.352X_3. X_1 represents blood loss/body weight (g/kg); X_2 represents operation time (h); X_3 indicates extent of skin incision (0 indicates a minor incision for laparoscopic or thoracoscopic surgery including laparoscopic-or thoracoscopic-assisted surgery; 1 indicates laparotomy or thoracotomy alone; 2 represents laparotomy and thoracotomy). In order to further health-related quality of life evaluation through the clinical intervention process, we exerted EuroQol-5 Dimensions questionnaire (EQ-5D) and SF-12. EQ-5D tracked the health status with five dimensions including mobility, self-care, usual activities, pain / discomfort and anxiety / depression and there were three levels in each dimension questionnaire. SF-12 questionnaire was designed to perform the physical components summary (PCS) and mental health component summary (MCS). The translated version of EQ-5D and SF-12 were recently recommended in the analysis of quality of life among the Asian (12-15).

Continuous variables such as age, body weight, BMI, albumin and transthyretin were reported as mean ± SD and categorical variables as number (n). Between-groups differences were assessed using t test or Fisher exact test as appropriated and $P < 0.05$ indicated significant differences.

RESULTS

Preoperative Clinical Characteristics

Baseline characteristics of the two groups were similar with respect to age, sex, weight, body mass index (BMI), serum albumin, hemoglobin and transthyretin (**Table 1**).

Primary Outcomes

The perioperative characteristics of the patients were displayed in **Table 2**.The mean volume of blood loss and urine output in the both groups, were not significantly different. The mean surgery time in the DJ group was significantly lower than the modified DJ group (1.83 ± 0.29 vs 2.67 ± 0.29, P=0.03). The higher surgical stress score was found in the modified DJ group (0.14 ± 0.01 vs 0.19 ± 0.02, P=0.02). Two of 4 patients who were performed side-to-side duodeno-jejunostomy vomited frequently two weeks after surgery, but only one of two patients alleviated after conservative therapy such as acupuncture, gastrointestinal decompression and parenteral nutrition. The other one had to been run Roux-en-Y duodenojejunostomy. Unfortunately, the latter vomited frequently owing to duodenal antiperistalsis one month after the second surgery. The emerging time of negative fluid balance was similar between the groups. No significant complications were found in intra-abdominal hemorrhage, upper gastrointestinal hemorrhage, anastomotic leakage, incision infection, intra-abdominal infection and postoperative ileus in both groups. Recurrence of nausea/vomiting and pain occurred in DJ but not modified DJ with the duodenum-gastro-jejunum annular internal drainage.

Secondary Outcomes

The postoperative clinical profiles of patients were delineated in **Table 3.** The duration of follow-up included 1-year and 3-year and overall recurrence rates were 40% (2/5) and 30% (1/5) respectively in DJ group. In the

Table 1. General characteristics of the subjects at baseline.

Characteristic	DJ group (N=5)	Modified DJ group (N=7)
Age (yr)	23.33 ± 5.50	26.00 ± 3.00
Male	2	2
Female	3	5
Weight (kg)	43.33 ± 8.5	43.58 ± 7.50
BMI (kg/m^2)	17.23 ± 4.6	17.42 ± 5.98
Duration of symptom (month)	24.6 ± 6.2	25.7 ± 7.9
Cause	Congenital	Congenital
ASA PS level		
I	2	3
II	3	4
Hgb (g/L)	106.33 ± 11.15	108.28 ± 12.77
Alb (g/L)	37.67 ± 2.50	37.0 ± 1.00
Transthyretin (mg/L)	251.67 ± 21.03	242.00 ± 19.67

DJ, duodenojejunostomy. DGJ, duodenuo-gastro-jejunum annular internal drainage. ASA PS, American society of anesthesiologists physical status classification. Alb, albumin. Hgb, hemoglobin.

Table 2. Perioperative outcomes by DJ or DGJ procedures.

Characteristic	DJ group (N=5)	Modified DJ group (N=7)	P value
Intraoperative			
Surgery time(h)	1.83 ± 0.29	2.67 ± 0.29	0.033
Blood loss (ml)	166.67 ± 28.87	216.67 ± 28.87	0.065
Blood transfusion (n)	0	0	n/a
Urine output (ml/H)	283.33 ± 28.87	316.67 ± 28.87	0.071
SSS evaluation	0.14 ± 0.01	0.19 ± 0.02	0.024
Postoperative event (30 days)			
Intra-abdominal hemorrhage (n)	0	0	n/a
Upper gastrointestinal hemorrhage (n)	0	0	n/a
Duration of negative fluid balance (h)	18.74 ± 4.55	20.18 ± 6.94	0.07
Anastomotic leakage (n)	0	0	n/a
Infection (n)	0	0	n/a
Ileus (n)	0	0	n/a
Anastomotic ulcer (n)	0	0	n/a
Anastomotic stricture (n)	0	0	n/a
Reflux gastritis (n)	0	0	n/a
Recurrent nausea/vomiting (n)	3	0	0.023
Recurrent distension/epigastric pain (n)	3	0	0.023
Reoperation (n)	3	0	0.023

DJ, duodenojejunostomy. DGJ, duodenuo-gastro-jejunum annular internal drainage. ASA PS, American Society of Anesthesiologists' physical status classification. Infection occurred in incision or intra-abdominal field.

Table 3. Postoperative outcomes in 1-year and 3-year follow ups after surgery.

Event	1-year			3-year		
	DJ group (N=5)	Modified DJ group (N=7)	P value	DJ group (N=5)	Modified DJ group (N=7)	P value
BW (kg)	51.92 ± 6.11	54.94 ± 5.75	0.072	52.17 ± 6.51	56.44 ± 5.29	0.068
BMI (kg/m^2)	19.66 ± 4.43	20.83 ± 3.61	0.081	19.99 ± 4.71	21.52 ± 3.55	0.066
Anastomotic ulcer (n)	0	0	n/a	0	0	n/a
Anastomotic stricture (n)	0	0	n/a	0	0	n/a
Reflux gastritis (n)	0	0	n/a	0	0	n/a
Recurrent nausea or vomiting (n)	2	0	0.038	1	0	0.047
Recurrent distension or epigastric pain (n)	2	0	0.038	1	0	0.047
EQ - 5D index (0-1) score	0.60 ± 0.06	0.64 ± 0.07	0.082	0.63 ± 0.06	0.67± 0.07	0.089
SF-12						
PCS	30.5 ± 3.1	36.9 ± 3.2	0.04	32.1 ± 3.1	38.9 ± 3.2	0.04
MCS	44.1 ± 4.5	45.1 ± 4.6	0.092	46.7 ± 4.9	47.7 ± 4.4	0.098

EQ-5D, EuroQol-5 dimensions questionnaire; PCS, the physical component summary score; MCS, mental health component summary score.

modified DJ group, 7 patients to run duodenuo-gastro-jejunum annular internal drainage recovered well without associated complications such as anastomotic ulcer, anastomotic stricture, reflux gastritis and malnutrition.

DISCUSSION

In young adults with acute and subacute episodes of SMAS, conservative treatments are recommended. The gastrointestinal decompression, correction of dehydration and electrolyte imbalance, nutrition support therapy and acupuncture should be performed especially when the cause is confirmed (16). Most of the patients with chronic symptoms require surgical intervention. Surgical indications include: (i) failure of nonsurgical treatment, (ii) emaciation associated with reduced intake for a long period and no weight gain, (iii) conspicuous dilation of duodenum, and (iv) concomitant peptic ulcer. Clinical history of the eight patients in the study was from 25.1 ± 7.2 months, and they were executed surgical procedure after conservative treatment proved failure.

Our preliminary results showed that laparoscopic duodenojejunostomy obtained relief of symptoms and weight gain in the 3-year follow up. However, duodenum annular internal drainage is the preferred surgical procedure for the patient with the history of more than 2 years and violent antiperistalsis. The modified procedure was safe and the 5 patients tolerated oral feeds and diet. After discharged on postoperative one-week, the patient remained well and asymptomatic during follow-up at 3 years. The current preliminary study showed this procedure is feasible and effective in young adults with the following indications (i) over 2 years history; (ii) recurrent vomiting with no relief when position is alternated; (iii) duodenal bulb and descending segment seem dilated significantly with violent antiperistalsis, and pyloric channel opens in barium meal X-ray examination, and (iv) recurrence after duodenojejunostomy.

Compared to traditional DJ, the new procedure increases surgery time and causes high SSS. However, it potentially reduces the recurrence rate and complications of duodenal obstruction and antiperistalsis after duodenojejunostomy surgery and resultant quality of life. Further study will be required for effectiveness and safety in future investigation of the modified procedure in the people with SMAS with longstanding history.■

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Conflict of Interests

None

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FREEDOM

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