

# Science INSIGHTS®

*The Official Journal of the Bono Academy of Science & Education*

<http://www.bonoi.org>

07 October 2013, Volume 3, no. 3



## NEWS

- 57 **Newfound Mount Zion “Mansion”**  
(Jerusalem, ISREAL)  
**Biblical-Era Town Discovered Along Sea of Galilee**  
(Reading, UK)  
**Antibiotic-Resistant Infections is Going Down**  
(Atlanta, USA)
- 58 **The Roots of Creativity**  
(Hanover, USA)  
**New Battery Using Sewage**  
(Stanford, USA)  
**How Much Longer Can Earth Support Life?**  
(Norwich, UK)  
*Science Insights 2013; 3(3): 57-58.*

» Full Text (HTML, PDF)



page 58

## EDITOR'S CHOICE

- 59 **COMPUTER NETWORK:** Sleep Mode and Network Effectiveness  
**MEDICINE:** Air Pollution and Cardiovascular Risk  
**CANCER:** Obesity and Breast Cancer: Role of CCL2  
*Science Insights 2013; 3(3): 59.*

» Full Text (HTML, PDF)



page 59

## PICTURE STATION

- 60 **Ears of Maize, Mochica. (1-800 D.C. Apogee Epoch)**  
*From The Larco Museum, Peru*  
*Science Insights 2013; 3(3): 60.*

» Full Text (HTML, PDF)

## OPINION

- 61 **Is It Feasible of Prophylactic  $\alpha 5$  GABA<sub>A</sub> Receptor Blockade for Preventing POCD?**  
*By Xiaofeng Shen, Yusheng Liu, Shiqin Xu, Rong Shen, Xirong Guo, Fuzhou Wang*  
*Science Insights 2013; 3(3): 61-62.*

» Full Text (HTML, PDF)



## COVER

GABA is the chief inhibitory neurotransmitter in the mammalian central nervous system. It plays a role in regulating neuronal excitability throughout the nervous system. Also GABA activation is considered as the basis of general anesthesia including intravenous and inhalational anesthetics. Meanwhile, cumulating evidence indicated that GABA is the underlying mechanism of post-operative cognitive dysfunction (POCD). Based on these findings, researchers are beginning to focus on GABA as the target to treat POCD, but they ignored the role of GABA in the performance of general anesthesia, especially when the blockade of GABA was given prior to surgery. It is undoubtedly risking our patients in intra-operative awareness. See page 61.

*Image: BASE illustrating group*

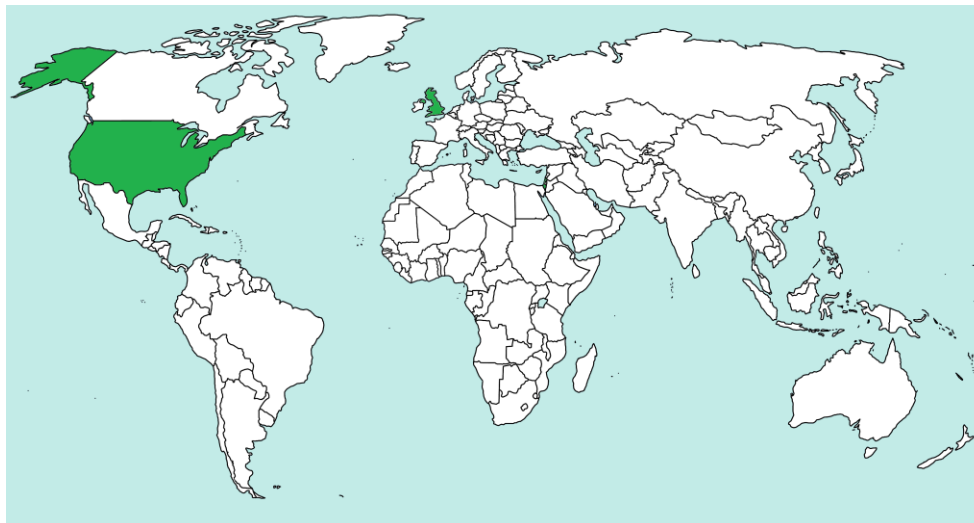
ISSN: 2329-5856

## Jerusalem, ISREAL Newfound Mount Zion “Mansion”

Archaeologists uncovered the remains of a possible mansion that is 2 000 years old during new excavations at Jerusalem’s storied Mount Zion. The building and its contents shed light on the wealthy class of Jerusalem during Jesus’ day. As said by the dig’s co-director James Tabor that if that turned out to be the priestly residence of a wealthy first-century Jewish family, it immediately connected not just to the elite of Jerusalem, but also to Jesus himself. The archaeological finds could add to knowledge about this elite class that researchers have gleaned from the Bible, as well as the writings of Titus Flavius Josephus and later rabbinical texts. The artifacts were discovered this past summer, during a month-long dig, and the findings have yet to be published in a peer-reviewed journal. The team expects to return to the site during the summers of 2014 and 2015. After their archaeological work is complete, the researchers hope the ruins will eventually be open to visitors. It is the Zion, the place where our Lord chosen to be his residence. ■

## Reading, UK Biblical-Era Town Discovered Along Sea of Galilee

A research team led by Ken Dark from the University of Reading in the UK discovered a town that can be dated back more than 2 000 years on the northwest coast of the Sea of Galilee, in Israel’s Ginosar valley. The ancient town may be Dalmanutha, described in the Gospel of Mark as the place Jesus sailed to after miraculously feeding 4 000 people by multiplying a few fish and loaves of bread. The architectural remains and pottery suggest that Jews and those following a polytheistic religion lived side by side in the communi-



ty. In addition, the researchers found that the southern side of the newly discovered town lies only about 500 feet (150 meters) away from another ancient town known as Magdala. After talking to the local people, and trying to identify the source and date of the findings, the researchers determined that many of the architectural remains came from the local area and likely were part of this newly discovered town. The gospel says that after feeding 4 000 people by miraculously multiplying a few fish and loaves of bread, Jesus “got into the boat with his disciples and went to the region of Dalmanutha.



The Pharisees came and began to question Jesus. To test him, they asked him for a sign from heaven. He sighed deeply and said, ‘Why does this generation ask for a sign? Truly I tell you, no sign will be given to it.’ Then he left them, got back into the boat and crossed to the other side.” (Mark 8:10-13, Holy Bible (NIV)). ■

## Atlanta, USA

## Antibiotic-Resistant Infections is Going Down

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a type of antibiotic-resistant bacteria that is difficult to treat, and can be spread around hospitals and nursing homes by health staff. A new study reported some positive news that the number of MRSA cases has declined significantly in the United States. The drop was seen primarily in MRSA infections acquired at hospitals and nursing homes, where most cases are picked up, said Dr. Raymund Dantes, a physician and researcher at Emory University in Atlanta. MRSA can also be spread outside hospitals in the community, in cases that typically involve skin infections. Also the number of community-associated MRSA cases has declined by 5 percent since 2005, according to the study, published on September 16, 2013 in the journal *JAMA Internal Medicine*. The researchers said that the decline of MRSA is likely due to hospital programs that encourage hand washing, and the wider use of sterile techniques to keep catheters and intravenous lines clean. Meanwhile, the number of deaths associated with MRSA has also dropped. In total, there were 80,461 invasive MRSA cases nationwide in 2011, compared with 111,261 MRSA cases in 2005, according to the study. It is good news for all of us. We need

continue to work on this and conquer the invasive strain. ■

## Hanover, USA The Roots of Creativity

It is human being can creatively work. But how does it work? The ability of humans to create art, think rationally or invent new tools has long interested scientists, and a new study reveals how the brain achieves these imaginative feats. Human imagination stems from a widespread network of brain areas that collectively manipulate ideas, images and symbols. Creativity in art, science, music and other fields requires the ability to combine different mental representations to form new ones. For example, if a person is asked to imagine a banana spinning around quickly and getting bigger or smaller, he can do so effortlessly, said study researcher Alex Schlegel, a cognitive neuroscientist at Dartmouth College in Hanover, USA. Previous studies suggested the brain's visual processing areas are also involved in creating imagery. But the new study looked at not only how the brain forms images, but also how it modifies them. The imagination experiment was somewhat unrealistic compared with creative tasks in everyday life. Understanding imagination reveals what makes humans unique among animals, and the findings could ultimately help improve artificial intelligence. Computers are good at a lot of things, but are less adept at seeing patterns or thinking creatively. ■



Stanford, USA

## New Battery Using Sewage

What is the “real” recycle? US scientists may have found a new way to produce clean energy by way of dirty water. The engineers have developed a more efficient method to use microbes to harness electricity from wastewater. They hope their technique could be used in wastewater treatment facilities and to break down organic pollutants in the “dead zones” of oceans and lakes where fertilizer runoff has depleted oxygen, suffocating marine life. For now the team from Stanford University have started small, with a prototype about the size of a D-cell battery, consisting of two electrodes plunged into a bottle of wastewater, filled with bacteria. As the bacteria consume the organic material, the microbes cluster around the negative electrode, throwing off electrons, which are captured in turn by the positive electrode. Although over the past dozen years, researchers have tried different approaches for transforming these microbes into bio-generators, and finally it has been proven difficult to harness this energy efficiently, it is now simple and efficient, and can harness about 30% of the potential energy in the wastewater. This gives a hope for the sustainable development. Yes, we can! ■

## Norwich, UK How Much Longer Can Earth Support Life?

Could we stand on the earth forever? What will happen when the earth going to “die”? Who knows? May be you can get the answer from the Revelation. A new study said that our earth could continue to host life for at least another 1.75 billion years, as long as nuclear holocaust, an errant asteroid or some other disaster doesn't intervene. But even without such dramatic doomsday scenarios, astronomical forces will

eventually render the planet uninhabitable. Somewhere between 1.75 billion and 3.25 billion years from now, Earth will travel out of the solar system's habitable zone and into the “hot zone”. Closer to the sun, in the “hot zone” the Earth's oceans would evaporate. The



researcher Andrew Rushby from the University of East Anglia in the United Kingdom said in a statement that anatomically modern humans had only been around for the last 200 000 years, so you could see it takes a really long time for intelligent life to develop. Rushby *et al.* evaluated the amount of time available for the evolution of life on other planets using a new developed tool: a model that predicts the time a planet would spend in its habitable zone. They calculated that Earth's habitable-zone lifetime is as long as 7.79 billion years. ■

### SCIENCE INSIGHTS

[www.bonoi.org](http://www.bonoi.org)

ISSN: 2329-5856

## COMPUTER NETWORK

### Sleep Mode and Network Effectiveness

How to maintain the network working effectively under an energy-saving mode? The overwhelming increasing in internet traffic challenges the network infrastructures of Internet Service Providers. One of the consequences is the energy consumption increase of network devices. A research team led by Dr. Antonio Cianfrani from University of Roma and Consorzio Nazionale Interuniversitario per le Telecomunicazioni, Italy reported their work focused on a strategy to minimize the impact of energy saving techniques on the performance of an Internet Service Provider network. The authors studied the problem of putting in sleep mode links of a backbone network, while limiting the number of times each device changes its power state, i.e. full power mode or sleep mode. Their aim was to limit the number of network configurations. The researchers tackled the problem both analytically and by simulations. They first presented a model, based on random graph theory, to compute the links energy saving given a traffic variation, QoS requirements, and the number of allowed network configurations. The same analysis was then repeated over two realistic case studies, and with realistic algorithms to choose the set of links in sleep mode. Results showed that the energy savings with few configurations (two or three per day) are close to the maximum one, in which a new configuration was applied for each traffic matrix. In further, the investigators showed that few configurations per day limit the number of overhead messages required for exchanging information about the device state. Finally, as the authors concluded that a practical implementation of sleep mode strategies for network operators was to define, on the basis of typical traffic trend, few configurations to be activated in specific time instants. This is an informative era, and also we need live sustainably.

How to reach the balance between energy-saving and faster and more effective network is the goal and also a challenge. Yes, we can be there. ■  
*Computer Networks* 2013, 57(15): 2931

## MEDICINE

### Air Pollution and Cardiovascular Risk

Air pollution is the direct result from industrialization. For better life, we need industry, but we also need pay for the cost. A newly released systematic review led by Dr Nicholas L Mills from the University of Edinburgh, UK analyzed the association between air pollution and cardiovascular risk and found air pollution has a close temporal association with heart failure hospitalization and heart failure mortality. In this study, the authors investigated the association between daily increases in gaseous (carbon monoxide, sulphur dioxide, nitrogen dioxide, ozone) and particulate (diameter <2.5



$\mu\text{m}$  [PM2.5] or  $<10 \mu\text{m}$  [PM10]) air pollutants, and heart failure hospitalizations or heart failure mortality. For study, the researchers identified that heart failure hospitalization or death was associated with increases in carbon monoxide (3.52% per 1 part per million; 95% CI 2.52-4.54), sulphur dioxide (2.36% per 10 parts per billion; 1.35-3.38), and nitrogen dioxide (1.70% per 10 parts per billion; 1.25-2.16), but not ozone (0.46% per 10 parts per billion; -0.10 to 1.02) concentrations. Meanwhile, the study also found that

the strongest associations were seen on the day of exposure, with more persistent effects for PM2.5. For the study itself, it did not give us the causality and biological mechanisms for the association between air pollution and cardiovascular risk, but it is certain that air pollution is a pervasive public health issue with major cardiovascular and healthcare economic consequences presenting a key target for national and international public health intervention. ■

*The Lancet* 2013; 382:1039

## CANCER

### Obesity and Breast Cancer: Role of CCL2

Obesity is one of the leading health concerns over the world, and it is regarded as a key risk factor for multiple morbidities. A new study published by Dr. Charlotte Kuperwasser, of Tufts University School of Medicine, USA revealed that during obesity, adipocytes within human and mouse breast tissues recruit and activate macrophages through a previously uncharacterized CCL2/IL-1 $\beta$ /CXCL12 signaling pathway. Activated macrophages in turn promote stromal vascularization and angiogenesis even before the formation of cancer. Obesity is associated with chronic adipose tissue inflammation, but chronic inflammation is a potent tumor promoter of many cancers. From the results, the researchers concluded that inhibition of inflammation can limit macrophage infiltration and angiogenesis during early tumor development. Besides, given that tumorigenesis was almost entirely prevented in mice following macrophage ablation, development of drugs that specifically target this phagocytic population may have substantial therapeutic benefits in the treatment of obesity and/or prevention of breast cancer in obese women. ■

*Cancer Research* 2013; 73: 6080

# Ears of Maize

Mochica. (1-800 D.C. Apogee Epoch) – Peru



**Treasure from Ancient Peru**  
 From The Larco Museum, Pueblo Libre, Lima, Peru

**SCIENCE INSIGHTS**

[www.bonoi.org](http://www.bonoi.org)  
 ISSN: 2329-5856

# Is It Feasible of Prophylactic $\alpha 5$ GABA<sub>A</sub> Receptor Blockade for Preventing POCD?

Xiaofeng Shen \*, Yusheng Liu \*, Shiqin Xu \*, Rong Shen †, Xirong Guo †, Fuzhou Wang \*‡Δ

**GAMMA-AMINO BUTYRIC ACID (GABA) is the chief inhibitory neurotransmitter in the mammalian central nervous system (CNS). It plays a role in regulating neuronal excitability throughout the nervous system. Also GABA activation is considered as the basis of general anesthesia including intravenous and inhalational anesthetics. Meanwhile, cumulating evidence indicated that GABA is the underlying mechanism of post-operative cognitive dysfunction (POCD). Based on these findings, researchers are beginning to focus on GABA as the target to treat POCD, but they ignored the role of GABA in the performance of general anesthesia, especially when the blockade of GABA was given prior to surgery. It is undoubtedly risking our patients in intra-operative awareness. Our exploratory data also verified our hypothesis in which the GABA inhibition would reduce the efficacy of inhalational anesthetics.**

\*: Department of Anesthesiology and Critical Care Medicine, Nanjing Maternity and Child Health Care Hospital, Nanjing Medical University, Nanjing 210004, China

†: Institute of Pediatrics, Nanjing Maternity and Child Health Care Hospital, Nanjing Medical University, Nanjing 210004, China

‡: Division of Neuroscience, Bono Academy of Science and Education, Winston-Salem, NC 27103, USA

Δ: Correspondence to: Dr. Fuzhou Wang, No. 123, Tianfei Xiang, Mochou Rd., Nanjing 210004, China

Tel: +86-25-5222 6112 Fax: +86-25-8420 0723

Email: zfwang50@njmu.edu.cn

Received: 12 July 2013

Revised: 20 August 2013

Accepted: 26 August 2013

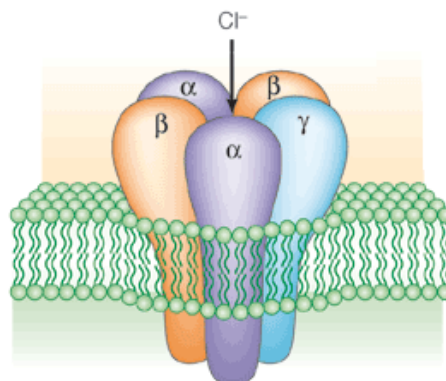
SCIENCE INSIGHTS 2013; 3(3):61-62.

**Keywords:** Gamma-aminobutyric acid – post-operative cognition dysfunction – minimum alveolar concentration

ZUREK et al. (1) reported that  $\alpha 5$  GABA<sub>A</sub> receptor involves in the development of postanesthetic memory deficits and they used inverse agonist of  $\alpha 5$  GABA<sub>A</sub> receptor to mice before or after isoflurane anesthesia, and found the deficit in short-term memory was fully reversed by the inverse agonist and also the mice lacking of *Gabra5* gene displayed no short-term memory deficits 24 hours after isoflurane, so the authors suggested  $\alpha 5$  GABA<sub>A</sub> receptor can be targeted to restore isoflurane-induced memory dysfunction. The interesting finding of this study gives us the hope to avoid, at least reduce the risk of cognition impairment from inhalational anesthetics, but we still concerned whether or not it is feasible and reliable if  $\alpha 5$  GABA<sub>A</sub> receptor was focused on as the therapeutic target prophylactically showed

by the same group in their previous study (2).

General anesthesia and increasing age are two major risk factors of post-operative cognition dysfunction (POCD) (3), even the authors did not investigate the influence of age on this topic, but we still raised some other issues as follows: 1) they merely gave one minimum alveolar concentration (MAC) of



isoflurane or sevoflurane and lasted for 1 hour, this regimen omitted the role of time and dosage of anesthetics on cognition; 2) although the genetically modified animals were used, we do not know the exact changing characteristic yet of the expression of  $\alpha 5$  GABA<sub>A</sub> receptor in the central nerve system; 3) given the essential role of GABA<sub>A</sub> receptors in general anesthesia (4), we proposed that the interventions targeting on GABA<sub>A</sub> receptors would finally affect anesthetic efficacy or/and effectiveness. Even the authors did not find change in MAC after delivering of L655,708, but we detected and found the onset and awake time of anesthesia of isoflurane and sevoflurane were changed by this drug in rats at different MACs (Figure 1). Therefore, if we used these kinds of drugs before anesthesia, is it good for us and our patients when the onset and awake time of an-

BASE BASE BASE BASE BASE

esthesia shifted? This issue should be explored in further and an ascertained answer should be given because such drug may increase the risk of intraoperative awareness through attenuating general anesthesia-associated GABA inhibition. ■

**CONFLICT OF INTEREST**

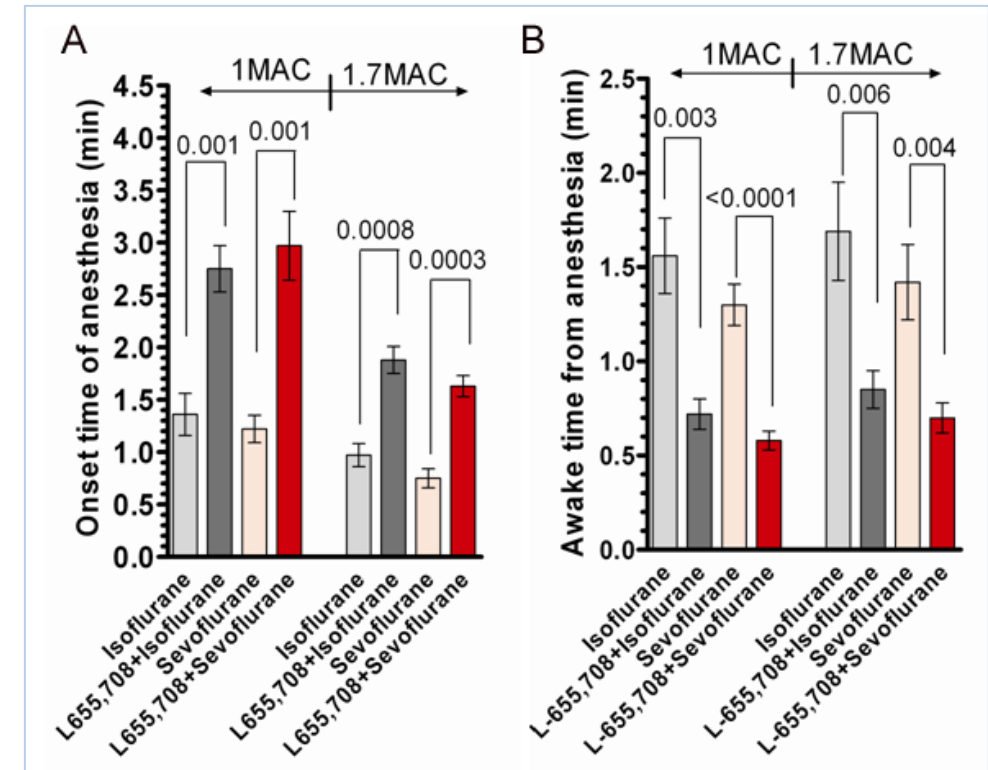
None

**ACKNOWLEDGEMENTS**

This work was supported in part by the National Natural Scientific Foundation of China (NSFC, 30901397, 81271242, and 81371248), and Nanjing Outstanding Young Scientist Grant (201208009).

**REFERENCES**

1. Zurek AA, Bridgwater EM, Orser BA. Inhibition of  $\alpha 5$   $\gamma$ -Aminobutyric Acid Type A Receptors Restores Recognition Memory After General Anesthesia. *Anesth Analg* 2012; 114:845-55.
2. Saab BJ, Maclean AJ, Kanisek M, Zurek AA, Martin LJ, Roder JC, Orser BA. Short-term memory impairment after isoflurane in mice is prevented by the  $\alpha 5$   $\gamma$ -aminobutyric acid type A receptor inverse agonist L-655,708. *Anesthesiology* 2010; 113:1061-71.
3. Ramaiah R, Lam AM. Postoperative cognitive dysfunction in the elderly. *Anesthesiol Clin* 2009; 27:485-96.



**Figure 1. Changes in anesthesia time of onset and awake.** After approval by the institutional ethical committee of Animal Care and Use, 10-week old Sprague-Dawley rats were anesthetized with isoflurane and sevoflurane, and the onset time and awake time from anesthesia were recorded after giving L655,708 *i.p.*, an inverse agonist of  $\alpha 5$  GABA<sub>A</sub> receptor, 30 min before anesthesia. L655,708 considerably prolonged the onset time of both anesthetics at both 1MAC and 1.7 MAC (A), and also L655,708 shortened the awaking time from anesthesia markedly (B). Data are presented as mean  $\pm$  standard error of mean (SEM). n = 6 per group. ■

4. Brown EN, Purdon PL, Van Dort CJ. General anesthesia and altered states of arousal: a systems neuro-

science analysis. *Annu Rev Neurosci* 2011; 34:601-28. ■



**SCIENCE INSIGHTS**  
[www.bonoi.org](http://www.bonoi.org)  
 ISSN: 2329-5856