

NO.603

CHINA SCIENCE AND TECHNOLOGY

NEWSLETTER

The Ministry of Science and Technology
People's Republic of China

NO.603

December 10, 2010

IN THIS ISSUE

- * International Conference on Chinese Medicine
 - * China-US Study "C4 Rice"
 - * Transporter's Protein Structure Analyzed
 - * Leonurine Effective for Treating Stroke
 - * Acupuncture: an Intangible Cultural Heritage
 - * New Supercomputing Center in Changsha
 - * World's Largest Diseases Repository
-

INTERNATIONAL COOPERATION

International Conference on Chinese Medicine

The Third International Conference of Traditional Chinese Medicine, jointly sponsored by 15 Chinese government agencies, including Ministry of Science and Technology, Ministry of

Health, State Administration of Traditional Chinese Medicine, and Sichuan Provincial Government, was held November 25-26, 2010 in Chengdu. Some 2,000 representatives from 21 countries and regions, including the United States, Britain, Germany, the Netherlands, Japan, Korea, Laos, and Myanmar, attended the meeting. 29 domestic provinces and Hong Kong SAR also sent their representatives to be part of the event. WANG Weizhong, Chinese Vice-Minister of Science and Technology, and senior officials from the Ministry of Health and the State Administration of Chinese Traditional Medicine made remarks at the opening ceremony.



Under the theme of "Traditional Chinese Medicine: Innovation and Development ", the event was made up of three major components, including an innovation forum, themed sub-meetings, and S&T shows. The meeting has received more than 1,300 papers, and 1,037 of them have been incorporated in the proceedings. 8 specialists made keynote speeches at the meeting, with 350 presentations given at sub-meetings or themed events, covering the latest findings and developments in the areas of TCM policy, resources, science, technology, health, education, and industry. During the meeting, biomedical talks have led to the signing of 60 accords for intentions of cooperation that are worth RMB 7 billion.



China-US Study "C4 Rice"

Not long ago, researchers at the Institute of Computational Biology, part of CAS Shanghai Institute of Life Sciences and the Boyce Thompson Institute launched a joint research to change the photosynthesis process of paddy rice, in an attempt to raise the yield of the crop. The project, financed by the Bill & Melinda Gates Foundation, is expected to raise the rice yield by 40% to 50%.

According to ZHU Xinguang, a research fellow at the Institute of Computational Biology, some crops, such as corn and sorghum, enjoy a photosynthesis process that is much efficient, compared with other crops such as wheat. As a result, the former produces a yield that is much higher than the latter under the same condition. Scientists also found that the so-called "C4 plants" such as corn is innately built with one more set of "biological equipment", compared with "C3 plants" such as rice. The additional "equipment" is able to gather carbon dioxide molecules around RUBISCO, facilitating carbon dioxide fixation, and improving the efficiency of photosynthesis.

Last April, the Gates Foundation secured an investment to start a "C4 rice" project that will last for 15 years. If succeeded, the project will raise the rice yield by 40% to 50%. Meanwhile, it will enhance the efficiency of fertilizer and water application, and reduce the crops' dependence on fertilizers and water.

A Quantitative Study of Carbon Budget

A study team, led by JIN Zhangdong at Chinese Academy of Sciences Institute of Earth Environment, in collaboration with the scientists at Columbia University and University of Cambridge, have quantified the interactions between ocean, land, and atmosphere and associated exchange flux since the last glacial period, through a systematic study of benthic foraminifera B/Ca and $\delta^{13}\text{C}$ system and a comparison with terrestrial records,

Results indicate that deep-sea-released CO_2 was preferentially stored in the atmosphere during the early deglacial period (17.5 to 14.5 thousand years ago), whereas a substantial portion of CO_2 released from oceans was absorbed by the terrestrial biosphere during the late deglacial period (14 to 10 thousand years ago). The finding is scientifically important for understanding the causes of atmospheric CO_2 concentration changes and climate change in the past, providing a most direct analog scenario for the global carbon budget. The findings were published as a highlight paper recommended in the recent issue of *Science* magazine.

RESEARCH AND DEVELOPMENT

Transporter's Protein Structure Analyzed

Researchers, from Tsinghua University School of Life Sciences and School of Medicine, and Princeton University Lewis Thomas Laboratory, reported in the recent issue of the journal *Nature* their findings on the protein structure possessed by a major transporter in six transmembrane segments. The finding is valuable for understanding the transport of riboflavin and associated biological structures.

Researchers discovered an important energy-coupling factor (ECF) transporter protein in their recent study. The energy-coupling factor (ECF) transporters, responsible for vitamin uptake in prokaryotes, are a unique family of membrane transporters. Each ECF transporter contains a membrane-embedded and substrate-binding protein (known as the S component), an energy-coupling module that comprises two ATP-binding proteins and a transmembrane protein. The structure and transport mechanism of the ECF family remain unknown.

Leonurine Effective for Treating Stroke

A team, led by Prof. ZHU Yizhun, Dean of Fudan University College of Pharmacy, found through a 5-year study that Leonurine, extracts from the Chinese Motherwort, is able to produce a significant therapeutic effect on treating strokes. Leonurine can significantly reduce the cerebral ischemia caused by infarction in the cerebral cortex area, improving the functions of damaged neurons. The finding, published in the recent issue of *Stroke*, has made itself a class-I new national drug candidate to be further worked on.

ZHU and coworkers found that in the state like ischemia or hypoxia, the mitochondria, one of the basic elements that build an intact cell, would swell, causing cell ruptures, brain tissue and myocardial necrosis, and eventually death. The study also found that adenosine triphosphate not only provides the energy needed for keeping the normal life activities of cells in vivo, but is also a direct energy source for keeping the tissues and cells working. In hypoxia, cells would see a reduced activity of adenosine triphosphate, resulting in apoptosis. Leonurine (SCM-198) works to inhibit cell death induced by mitochondrial oxidative stress through reducing the oxygen consumption of brain cells, and prevent further cell necrosis/apoptosis by enhancing the activity of ATP, achieving the effect of easing brain tissue necrosis.

Turning Ammonia Wastewater into Resources

Highly concentrated ammonia wastewater treatment technology and associated demonstration, a project jointly undertaken by the Chinese Academy of Sciences Institute of Process Engineering and Tianjin University under the National 863 Program, has recently passed the result checking. The project makes a breakthrough in handling highly concentrated ammonia wastewater, along with proprietary clean techniques for such treatment. The innovative techniques have resulted in an ammonia pollutant reduction rate and a resource utilization rate that are both higher than 99%, desirable for the resource oriented ammonia wastewater treatment.

With the support of National 863 Program, the Institute of Process Engineering and Tianjin University have jointly developed the techniques and industrial appliances able to turn ammonia wastewater into resources. The new technique is built on the differences of relative volatility between ammonia and water molecules. Researchers realized the resource oriented ammonia wastewater treatment, through developing new internal components featured with high-flux, low resistance, high separation efficiency, and scaling resistance, and the fully automated control system. Having found solutions to a range of

old problems, such as high energy consumption and jamming, the new technique is able to lower down the concentration of ammonia to 10 mg/liter or under when treating the wastewater of an ammonia concentration at 3-30 g/liter, satisfying the Class-I emission standard. After the treatment, all the ammonia can be recovered in the form of high-purity ammonia, making it a resource, with an ammonia pollutant reduction rate and a resource utilization rate that are both higher than 99%. The entire treatment process produces no waste water, gas, or dregs.

Using the technology, researchers have so far built demonstration treatment facilities with a capacity ranging from 100 tons to 400 tons a day in 7 places, including Tianjin, Fujian, Liaoning, Jilin, Guangdong, and Hunan, all working smoothly. Some businesses using the technology have produced a profit worth RMB 2-6 per ton of wastewater treated, in addition to the treatment cost. The new technology has become a proven technology listed on a catalog for advanced pollution treatment technologies published by the Ministry of Environmental Protection for 2010, thanks to its fine environmental and economic benefits.

Novel Passive Breathing Fuel Batteries

CAS Changchun Institute of Applied Chemistry has recently rolled out a passive breathing fuel battery using pure methanol feeds. The novel fuel battery is made up of a pure methanol storage chamber, a methanol buffer, and a battery unit. The flow of methanol between the storage chamber and the buffer is controlled by an infiltration membrane that makes the feeding of pure methanol and long work life of the methanol battery possible. Meanwhile, the battery does not require an external peristaltic pump or a methanol sensor for fuel feeding control. In addition, the methanol in the buffer is adsorbed on the electrode surface in the form of vapor or liquid membrane for reaction, enabling the battery placed in multiple directions in a short period of time, thanks to the limited feed of methanol allowed. On the contrary, a traditional passive breathing battery can only be placed in one direction, or it will lead to the direct leakage of liquid fuel.

The battery is simple for assembly, with a reliable performance and a greatly prolonged work life. Comparing with the traditional passive breathing battery, the new battery is able to work for 45 hours, under the same discharge capacity (100mA), a greatly prolonged work life. Under the same battery size and operating conditions, the battery can provide a longer work life, or a higher energy density.

NEWS BRIEFS

Acupuncture: an Intangible Cultural Heritage

Not long ago, China's traditional acupuncture was adopted at the fifth meeting of the UNESCO Intergovernmental Committee on intangible cultural heritage as part of the Intangible Cultural Heritage.

Acupuncture is a process of inserting and manipulating needles or burning medicinal leaves in acupoints on human body for therapeutic purpose. The technique, enjoying a history as long as several thousand years, is not only a clinical practice for making people healthier or treating diseases, but is also a culture combining people's knowledge of the nature and cosmos. It has become a symbol and messenger of Chinese culture of international influence, accepted by more than 100 countries or regions.

WU Gang, Chinese Deputy Administrator of TCM told reporters that acupuncture is facing many problems and challenges. On the one hand, acupuncture has been enriched with a lot of new techniques that enhance the therapeutic effects of acupuncture, including electrical acupuncture, laser acupuncture, acupoints injection, and drug covering, thanks to the advancement of modern science and technology. The acupuncture theory and associated cultural connotations, on the other hand, have been gradually ignored or played down. As a result, some practical and special skills that has to be mastered through long term practice face the risk of getting lost. However, some special folk acupuncture techniques could get lost or simply disappear for lacking of the successors who are able to carry the technique forward.

New Supercomputing Center in Changsha

A new national supercomputing center, built to be the home of Tianhe-I supercomputer, had its ground breaking ceremony on November 28 at Hunan University in Changsha. The new supercomputing center is a major information technology project approved by the Ministry of Science and Technology. Sitting on the campus of Hunan University, the Center will be equipped with a high-performance supercomputer (Tianhe-I) built by the National University of Defense Technology, with a computation capability at the petaflop level. With an investment worth RMB 720 million, the phase-I project will build 30,000 square meters of floor space, and be completed at the end of 2011. Once completed, the new center will enjoy a computing capability of 300 trillion floating-point operations per second.

Expedition Team Reached Antarctic Station

China's 27th Antarctic scientific expedition team reached the Zhongshan Station in the South Pole on December 5, 2010. According to a briefing, the "Snow Dragon", an expedition boat, has met with six large cyclones when crossing the Southern Ocean westerlies, since its departure from Anchorage Fremantle in Australia on Nov. 24 2010. The expedition team made a reasonable route arrangement based on satellite cloud images and weather forecasts, effectively bypassed 10-m high big waves, and allowing the boat to work within a 30-degree swing amplitude.

LIU Shunlin, head of the expedition team said, the full-fledged scientific expedition will be kicked off once the "Snow Dragon" has reached the Zhongshan Station. Team members are currently working to unload the cargos from the boat, ensuring the gathering of supplies and equipment, before heading for the Kunlun station.

World's Largest Diseases Repository

It is reported from a summit held to address diseases prevention and control related innovations that Beijing has embarked on to build a clinical data and sample repository for major diseases, the first of its kind in the country. It is expected that in 2012, the repository will become the world's largest clinical data and sample library teemed with 50,000 clinical case data and 400,000 disease samples. Unlike a regular biological sample repository, the new resources repository is designed to collect clinical data and information on ten major diseases, including four major infectious diseases, such as hepatitis and AIDS, and six major chronic diseases, including cardiovascular diseases and diabetes. It collects patients' clinical data, images, and blood samples, and stores them in an internationally accepted form. At present, researchers and specialists are working to build the clinical data and sample part of the repository.

Comments or inquiries on editorial matters or Newsletter

content should be directed to:

Department of International Cooperation, MOST 15B, Fu Xing Road, Beijing
100862, PR China Tel: (8610)58881360 Fax: (8610) 58881364

<http://www.most.gov.cn>