Hospital Infections Bring Costly Loss in Lost Bed Days

Infections caught in hospital are costing the Australian healthcare system more than 850,000 lost bed days, according to a new study by Queensland University of Technology (QUT). The research was funded by The Centre for Healthcare Related Infection Surveillance and Prevention.

Associate Professor Nick Graves, from QUT’s Institute of Health and Biomedical Innovation, said there were 175,153 cases where patients had acquired an infection during their hospital stay. “If rates were reduced by just 1%, then 150,158 bed days would be released for alternative uses, allowing an estimated 38,500 additional admissions annually,” he said.

The results, which have been published in the *Australian Journal Healthcare Infection*, calculate the economic consequences of healthcare-acquired-infections arising among admissions to Australian acute care hospitals. Assoc Prof Graves said the research revealed there was an opportunity to improve the efficiency of the Australian healthcare system. “Acute hospitals in Australia cannot meet current demand,” he said. “Waiting lists for elective surgery and specialist outpatient appointments are lengthening in every state and territory.”

Assoc Prof Graves said many infections were preventable and Australian infection control practitioners could reduce rates if they had additional resources. “Healthcare-acquired infection rates are about 5% of all admissions at the moment and with bed days valued at A$1005 (US$931) each, the total economic burden is close to A$1 billion (US$0.9 billion) per annum,” he said. Assoc Prof Graves said the bulk of the costs were faced by the most populous states of New South Wales, Queensland and Victoria.

“Spending more money on infection control could reduce rates, release bed days and increase hospital throughput. This is likely to improve the efficiency of the hospital sector,” he said. Assoc Prof Graves said the next step was to investigate cost-effective ways of spending extra dollars on new and expanded research programs.

He said a national program was being undertaken to encourage healthcare workers to wash their hands before and after touching every patient, which had the potential of being effective at reducing infection and cost-effective.

Novel Mechanism in Chinese Herbs Discovered for Cancer Treatment

Researchers from the Shanghai Institute of Materia Medica (SIMM), Chinese Academy of Sciences reported in the recent issue of *Cancer Research* the discovery of a novel
mechanism of a traditional Chinese medicine in treating cancer.

The traditional Chinese herb medicine *Euphorbia fischeriana Steud* has been widely used in China for treating various cancers. Several compounds in the medicinal herb have been reported to have anti-tumor effects. However, the mechanisms of these compounds in inhibiting tumor growth have not been fully understood.

Dr Ying Wang identified 17-hydroxy-jolkinolide B (HJB) from the herb as a novel inhibitor of the JAK family kinases. The mechanism of this compound is rather unique. It covalently cross-links the JAKs into dimers and inactivates their kinase activities. This effect on the JAKs is very specific. It does not affect many other kinases. As a consequence, it induces apoptosis of tumor cells, particularly those with constitutively activated JAK/STAT3. The JAK family kinases are important targets for anti-cancer and anti-inflammation drugs.

This discovery provides a new direction for JAK inhibitor drug research and development. It also helps to understand the mechanisms of the traditional Chinese medicines in treating cancer.

**“Dung of the Devil” Plant Roots Point to New Swine Flu Drugs**

Scientists in China have discovered that roots of a plant used a century ago during the great Spanish influenza pandemic contains substances with powerful effects in laboratory experiments in killing the H1N1 swine flu virus that now threatens the world. The plant has a pleasant onion-like taste when cooked, but when raw it has sap so foul-smelling that some call it the “Dung of the Devil” plant.

In the study, Fang-Rong Chang, Yang-Chang Wu and their colleagues note that the plant, *Ferula assa-foetida*, grows mainly in Iran, Afghanistan and mainland China. People used it as a possible remedy during the 1918 Spanish flu pandemic that killed between 20 million to 100 million people. Until now, however, nobody had determined whether the plant does produce natural antiviral compounds.

Chang and Wu identified a group of chemical compounds in extracts of the plant that showed greater potency against influenza A (H1N1) than a prescription antiviral drug available for the flu. "Overall, the present study has determined that sesquiterpene coumarins from *F. assa-foetida* may serve as promising lead components for new drug development against influenza A (H1N1) viral infection,” the authors write.

**New Center at Chinese Academy of Sciences Pushes Life Science Innovation**

Chinese Academy of Sciences (CAS) established the Life Science Instruments and Technological Innovation Centre at the Institute of Biophysics (IBP), CAS (IBP) in Beijing in September 2009.

Being CAS’ first life science instruments and technological innovation institution, the center will be responsible to design and develop research equipments, such as precision machinery, precision optical devices and general electronics circuit, and realize basic control software formulation and debugging.

According to Professor Xu Tao, director of IBP, life science has entered into the era of systematic biology from molecular biology and therefore breakthroughs in experimental methodology and the support of key research technology and equipment innovation are needed and would be critical for major scientific achievements.

Laboratories in China are, however, mainly equipped by imports. The home-made equipments account for only an insignificant percentage. Some leaders of Chinese science community believe that this dependency on the expensive advanced equipments is becoming a barrier to Chinese innovation.

According to Prof Xu, IBP has developed more than one hundred scientific research equipments since its establishment, covering areas of space, biomimetics, radiation, separation and purification, spectrum, graphical analysis and medical diagnosis.

**A New Function of Insulin Receptor Discovered**

Researchers from Institute of Biochemistry and Cell Biology at Shanghai Institutes for Biological Sciences, Chinese Academy of Sciences (CAS) recently found a novel biological function of IRS-1 (insulin receptor substrate-1). The results were published recently in *Cancer Research*.

E M T (Epithelial-to-Mesenchymal Transition) is a process that is implicated in embryonic development, wound repair, fibrotic diseases, tumor invasion and metastasis. Studies in this field are important for understanding the underlying mechanisms of some patho-physiological events, and can contribute to the establishment of effective new strategy and method for treating relevant diseases.

Dr Song Jianguo and his re-
Bio

board

search team observed that TGF-β1 (transforming growth factor-b1)-induced EMT is accompanied with a decrease in the levels of tyrosine phosphorylation and the protein molecules of IRS-1.

The results showed that high IRS-1 protein levels played an important part in the suppression of TGF-b1-induced EMT and in maintaining the epithelial phenotype of cells. Their work also showed that IRS-1 suppresses TGF-β1-induced EMT through a mechanism involving the modulation of the expression of snail and slug. The studies are helpful for better understanding of the TGF-β1 signaling and the biological functions of IRS-1.

JAPAN

Researchers Identify Fat-Causing Protein

A group of Japanese researchers has identified a protein said to cause obesity, a finding that could lead to the development of a new medicine, according to a report by Cell Metabolism, a U.S. science magazine.

The group confirmed the protein causes chronic inflammation in adipose tissue, which eventually triggers diabetes. Prof Yuichi Oike of Kumamoto University and other researchers found that blood from people who were overweight, with diabetes and arterial hardening, showed high concentrations of a protein called Angptl2. They learned that this protein causes inflammation within white blood cells when acting on human vascular cells.

It is known that this kind of chronic inflammation can promote disease, including high blood sugar levels, by producing biological materials that lower the function of insulin. In the study, mice, which had been genetically engineered so the Angptl2 protein malfunctioned, registered blood sugar levels lower than those of ordinary mice, and did not develop diabetes after eating fat-enriched food.

SINGAPORE

Operation Conducted Entirely Through the Navel

The KK Women’s and Children’s Hospital (KKH) team from Singapore performed world’s first emergency operation for a rare ectopic pregnancy entirely via the navel in early September 2009.

The team – made up of Dr Bernard Chern, who heads the minimally invasive surgery (MIS) unit, Professor Tan Kok Hian, deputy chairman of the hospital’s medical board, Dr Jasmine Mohd and Dr Steven Teo, both from the department of obstetrics and gynaecology – carried out the operation after the hospital started its single-port keyhole surgery program.

Single-port surgery is literally performed through a single port – or incision – in a patient’s navel (belly button). In conventional keyhole surgery, the surgeon makes several small cuts allowing access for medical instruments.

The first such cornual ectopic pregnancy operation was carried out on a seven-week pregnant woman from Myanmar. This rare condition, representing only about 2% to 4.7% of all ectopic pregnancies, occurs when the fertilized egg is implanted in the fallopian tube deep in the wall of the uterus.

Traditionally, the abdomen has to be surgically opened to remove the cornual ectopic tissue in procedure which is considered a medical emergency because of the significant loss of the uterus and excessive bleeding.

The advantage of single-port operation is that it leaves little to no scarring and may reduce complications that commonly occur after open and even traditional laparoscopic abdominal surgery. The entire operation is performed using specialized 5mm instruments and ports via the navel, and the removed tissue retrieved through a 10mm port from the same location.

The procedure is, however, not suitable for everyone. It is recommended for patients with normal-size uterus, cysts measuring between 3cm and 5cm or those suffering from ectopic pregnancies.

Saliva From Blood-Feeding Bug Could Help Prevent Heart Attacks

A team of international researchers, including scientists from the biological sciences department of National University of Singapore (NUS), has been working on one tick – Amblyomma variegatum, found in sub-Saharan Africa.

The tick’s saliva, which prevents the host’s blood from clotting while the tick is feasting, can be used to
destroy arterial blood clots, the causes of heart attacks or strokes. Its saliva protein, called variegin, has potential application in diseases such as narrowed arteries and deep-vein thrombosis, and to control bleeding during surgery.

The local team targets to produce a compound that will surpass the current anti-clot drug on the market, hirulog, which is derived from leech saliva. The researchers have managed to change the structure of variegin to make it bind more tightly to the clotting enzyme, thus stopping its action. One form of the altered tick saliva protein is 70 times more potent than hirulog and can remain active for a longer period. This could mean that patients who need anti-clot drugs regularly to keep their arteries unclotted can make do with fewer injections or pills with the modified variegin.

The team had conducted tests on zebrafish, and the modified variegin prevented blood-clotting indefinitely, compared to other anti-clot agents which keep the blood flowing for only minutes at most. The team plans to test the protein on more complex animals such as pigs or rats before proceeding to human trials. It may take almost a decade before the tick saliva drug is available.

Ticks also came under the spotlight when Brazilian scientists recently reported that tick saliva could potentially cure cancer by destroying cancer cells while leaving normal cells alone.

17 Projects Awarded Grants by A*STAR

The A*STAR’s (Agency for Science, Technology and Research) Science and Engineering Research Council (SERC) awarded S$12.2 million (US$8.76 million) to fund 17 research projects in the areas of media and entertainment, medical technologies, education, water, infocomm, chemicals, energy and electronics. The grants were awarded to Singapore’s public sector institutions such as the National University of Singapore (NUS) and the Nanyang Technological University (NTU) to enable them to pursue long-term scientific goals and technological innovation.

Professor Chong Tow Chong, executive director of SERC said this year saw a record high number of 115 grant applicants. The 17 teams that ultimately secured the research grants are indeed the crème de la crème and they have the potential to break new grounds and deliver impactful outcomes in the near future.

One of the projects on medical technologies involves the development of a vision-aided, intelligent tremor-compensating microsurgical instrument that is supposed to reduce the inherent physiological tremors in the human hand, and hence minimize any margin of error. This will potentially enable surgeons to perform complex clinical tasks of microsurgical manipulation and suturing of vessels in reconstructive microsurgery more accurately. The project led by Assistant Prof Ang Wei Tech of NTU’s School of Mechanical and Aerospace Engineering will give the “sense of sight” to the instrument to provide visual guidance to surgeons during surgery. This will give an additional advantage to the instrument that can feel its own motion and distinguish between the tremulous movement and the intended motion of the hand in real-time.

One other project aims to provide communities in rural areas with a cheaper and better means of obtaining water that is free from contaminants and toxic substances. Led by grant recipient Associate Prof J. Paul Chen from NUS’s Division of Environmental Science and Engineering, the project team will develop metal oxide-based affinity membranes to remove harmful substances such as arsenic from water. This novel membrane makes use of adsorption and filtration technology, which is a more practical and energy-efficient approach than current methods of reverse osmosis, adsorption, and ion exchange, to effectively remove arsenic and other contaminants such as bacteria from water.

Said Assoc Prof Chen, “The presence of arsenic is common in ground water and is especially harmful in the South-east Asian regions where a large number of people drink from and consume food crops irrigated by tube well water. Ingestion of arsenic results in a wide range of health problems, some of which include painful skin lesions, liver failure, kidney and lung diseases, cardiovascular diseases and in extreme cases, multiple cancers. The affinity membrane that we will develop will offer an affordable and robust means to hunt down, capture and rid harmful substances in water to prevent this.”

Third Medical School for Singapore
Tan Tock Seng Hospital (TTSH) – with its recognized strength in infectious disease research – has been identified to partner the Nanyang Technological University (NTU) to set up a third medical school under a proposal to the Education Ministry. The initiative would help ease the chronic shortage of doctors and boost healthcare in Singapore which recruits as many as 1,000 overseas-trained doctors in the past three years to plug the demand at public hospitals.

Though discussions were preliminary, the new medical school could be located next to the hospital, according to NTU provost Bertil Andersson. He said, “The plan is that the primary clinical partner will be TTSH, although it will not be the only one.” If given the green light, the school could open as early as 2012.

The National University of Singapore’s Yong Loo Lin School of Medicine has a yearly intake of 260 students, and a maximum capacity of 300. The Duke-NUS Graduate Medical School takes about 50 postgraduate students. The third medical school could supply up to 150 doctors a year, but this could be increased to 200 within five years, Prof Andersson said. To differentiate it from other medical schools, its five-year curriculum could take in NTU’s existing strengths in engineering and business.

For example, students could learn about bioengineering, an interface between medicine and engineering, as well as health management.

Earlier this year, NTU revealed it was hoping to tie up with the Imperial College London to tap its expertise in the multidisciplinary fields of engineering and medicine. Talks are ongoing. Infectious diseases were another area it hoped to develop, said Professor Jan Carlstedt-Duke, director of the medical school project at NTU. He added that TTSH, as an established teaching hospital, would be an ideal partner.

Singapore’s Medical Technology Sector Reports Strong Growth

Singapore’s medical technology sector is expected to see strong growth over the next few years.

Manufacturing output for the sector, including hearing aids and heart valves, hit S$3 billion (US$2.2 billion) last year. It is expected to grow to S$5 billion (US$3.6 billion) by 2015 as more international players seek out Singapore as a gateway to the growing population in the region.

Singapore’s medical technology sector hired a total of 8,200 people in 2008, and it is expected to hire an additional 400 people in 2009. More international medical technology firms are expected to set up operations here, looking to tap into the region’s growing demands.

Abhijit Ghosh, pharmaceutical/healthcare leader, PWC Singapore, attributed the growth to an increasing demand for personalized medicine globally as well as locally in an Asian context.

To administer any personalized medicine for a system, diagnostic tools would be needed to support and check the development of the drugs, and that culminates in a trend already seen in the West whereby pharmaceutical companies are looking at close collaborations and some kind of alliance with the med-tech companies. Therefore, more collaboration in that space – that is, medical devices companies setting up in Asia, Singapore, in particular – take place, and also because of the intellectual property protection and enforcement regime that Singapore provides.

Key names in the medical technology sector already in Singapore include Siemens and Baxter. More international players setting up in Singapore are expected in the fourth quarter of 2009.

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Scientists Unlock Secret to Youthful Skin

Scientists from Singapore and Germany have made a novel discovery that might lead to ways of reversing the effects of aging and wrinkled skin.

The international team of scientists led by Dr Bruno Reversade from A*STAR’s Institute of Medical Biology (IMB) discovered that mutations in the PYCR1 gene cause a rare genetic condition which results in premature skin aging, known as “wrinkly skin syndrome”. Their findings, which are published in the issue of the prestigious journal Nature Genetics, provide insight into how some unexpected genes help maintain youthful skin. This research project involved collaborations with over 15 hospitals and research centers in 13 countries. The study is a great example of scientific synergy, when clinicians and scientists from around the world come together to share their specialist skills and knowledge, they can discover new insights into complex medical conditions.

Using bioinformatics tools, Dr Reversade and his team analyzed rare DNA samples collected from affected patients across the world who, at a young age, displayed signs of premature aging. They identified the PYCR1 gene on chromosome 17 of these patients to be defective and found specific mutations in the gene that led to conditions often seen in elderly people, such as loose skin, loss of bone density, hip dislocation and cataract. Furthermore, they determined that skin and bone were the two tissues most severely affected in patients. As skin and bone contain high levels of the PYCR1 protein under normal circumstances, developing therapies that could increase the activity of the PYCR1 protein could possibly reverse the process of aging in affected individuals or slow it down in normal people.

The scientists also found that inside cells, the PYCR1 protein is located in the mitochondria – the “power houses” of the cell that provide energy for the cells’ consumption. In their experiments, they observed changes in mitochondrial morphology and cell death in the connective tissues of individuals with PYCR1 mutations. They also conducted further investigations into the effects of reduced levels of PYCR1 protein by examining the growth of frog and fish models in which the PYCR1 gene had been experimentally shut off. They noted that mitochondrial function in the skin of the animal models was altered and there was also an increased occurrence of cell death.

Dr Reversade remarked that their findings confirm the significance of mitochondrial function in the aging process, thereby highlighting the importance of metabolism as PYCR1 is important in the synthesis of proline, a common amino acid involved in metabolism. Age-defying and anti-wrinkling treatments for common disorders related to aging may also benefit from sustaining proline metabolism.

Singapore Gears Up for Influenza A (H1N1) Vaccines

Singapore’s Ministry of Health has bought one million doses of the Influenza A (H1N1) vaccine from GlaxoSmithKline (GSK), expected for delivery by the end of 2009. This is said to be a part of the government’s phased and diversified approach in securing a sufficient quantity of the vaccine for its population.

The purchase would cover 1 million people of Singapore’s 4.8 million population as the government’s studies show one dose per one person was sufficient.

According to the Ministry, large-scale vaccination, on a voluntary basis, would start once the government was satisfied with the safety and efficacy reviews of this vaccine, currently being undertaken internationally. The Ministry is also keeping a close watch on the experience of other countries, which have launched or announced their plans to conduct mass vaccinations for their people. It also said the GSK contract should meet immediate needs and could secure further supplies from...
Commonwealth Serum Laboratories Australia Pte Ltd. 

China and Australia are among the countries that have already carried out H1N1 vaccinations. The World Health Organization is trying to reassure a global audience the vaccine, made by 25 firms with different formulas, is safe as it is made with the same technology as the seasonal flu vaccine given to hundreds of millions of people every year.

There is also growing evidence that just one shot is needed to protect most people against the virus, experts say. But while the success of single dosing has effectively halved the potential global H1N1 vaccine market, the fact is there was never going to be anywhere near enough vaccine to go around at this stage in the pandemic.

**NUS Gets World’s Most High-Tech Microscope**

NanoCore at the Faculty of Engineering, National University of Singapore (NUS) has recently entered into a cooperative agreement with Zeiss SMT, resulting in the installation of the first Helium Ion Microscope (HIM) in Asia.

The world’s most advanced microscope, which can project clear images of objects a million times smaller than a single strand of human hair, is worth S$1.35 million (US$1 million) and is one of only 12 available around the world.

The microscope scans the surface of objects with a fine helium beam formed by a single atom at the tip of a 2m-tall emitter.

While current technology does not allow for sufficient resolution to observe materials at the atomic scale, the HIM is able to produce images below 0.25 nanometer in scale. This is critical in precision manufacturing, explained Mr. Manfred Hanke, managing director of Carl Zeiss Semiconductor Technology’s business unit in South-east Asia and China.

Researchers here are particularly excited by the microscope’s potential for application in the life sciences, to better understand viruses and improve targeted drug therapy, said NanoCore’s director, Prof. Thirumalai Venky Venkatesan. Dr. Nick Economou, North American president of optics manufacturer Carl Zeiss which markets the HIM, added that the device would also help to show how medicine is being absorbed by the body.

The HIM is part of the NUS Plasmonics and Advanced Imaging Technology Laboratory, helmed by Assistant Professor Daniel Pickard. “Under the agreement, Zeiss is allowed to bring their customers to our laboratory to demo this tool on a periodic basis which actually brings some high-tech customers from the electronics industry in to close contact with the NanoCore researchers, resulting in collateral benefits for all concerned,” said Dr. Pickard.

NanoCore researchers have already embarked on critical collaborations with various other groups in NUS. Besides working with the Research Centre of Excellence on Mechanobiology to study cell structure and movement as well as bacteria formation, they are also collaborating with the Yong Loo Lin School of Medicine to study the effect of toxic nano-particles on kidney cells.

Another study involves teaming up with the graphene research team at NUS to generate the narrowest ribbons of graphene ever made, thus advancing the boundaries of research into the thinnest and strongest known material that has the potential to replace the use of silicon.

**Waseda University Opens First Overseas Biosciences Research Institute in Singapore**

Waseda University opened the Waseda Bioscience Research Institute in Singapore (WABIOS) in Biopolis.

WABIOS will focus its research in the areas of bioimaging, bioengineering, biophysics and nanobiotechnology. It will also further develop the neuroscience-focused research findings derived from the Waseda-Olympus Bioscience Research Institute, a joint initiative between Waseda University and Olympus Corporation in Biopolis from 2004 to 2009.

WABIOS has committed S$2 million (US$1.44 million) for its research activities here and will start with a few researchers from both Japan and Singapore. The establishment of WABIOS is particularly significant in that it marks the first time that Waseda University is setting up research operations overseas independently.

Professor Katsuhiko Shirai, president of Waseda University, and Mr. Lim Chuan Poh, Chairman of the Agency for Science, Technology and Research (A*STAR), inked a Memorandum of Intent (MOI) in Singapore at the opening of WABIOS. The agreement aims to facilitate research collaborations between scientists from the two organizations through joint symposia and workshops as well as enable graduate students from Waseda University to spend up to two years at A*STAR research institutes during the course of their PhD studies under A*STAR’s Research Attachment
The establishment of WABIOS in Singapore is a strategic move for Waseda University because it has been promoting internationalization focused on the Asia-Pacific region. Singapore is well-known as a crossroads of knowledge exchange between Japan, China and India and the West. WABIOS will function as a platform for academic exchange between researchers from Waseda University and A*STAR, and in the near future, the institute hopes to establish itself as an academic research center for all the Japanese research organizations based in Singapore.

WABIOS will function as an overseas institute under the Waseda Institute for Advanced Study (WIAS). It will receive funding through a research grant from Japan’s Ministry of Education, Culture, Sports, Science and Technology (MEXT) disbursed through the Japan Science and Technology Agency (JST). In addition, the institute has plans in the midterm to employ distinguished researchers outside of Japan.

**Taiwan**

Taiwan Makes Headway in New Drug Development

Taiwan has made encouraging progress in biopharmaceutical development, as two new drugs developed by local companies with government assistance have received international recognition recently, an official said.

PharmaEssentia, a Taipei-based pharmaceutical company founded by a group of Taiwanese-American scientists in 2003, has received Investigational New Drug (IND) approval from U.S. and Canadian authorities for its third-generation interferon drug candidate P1101 (PEG-P-IFN-alpha-2b), the Ministry of Economic Affairs (MOEA) official said.

The drug, which treats hepatitis B and C and is particularly long-acting compared to the two other pegylated-interferon drugs currently on the market, will begin phase 1 clinical trials in both Canada and Taiwan later this year. It had already received IND approval from Taiwan’s Department of Health.

Meanwhile, the MOEA official said GlycoNex Inc. has successfully developed a potential therapeutic drug for colorectal cancer, known as fully human monoclonal antibody GNX-8. GlycoNex Inc. has recently signed an agreement with the Japanese pharmaceutical company Otsuka Pharmaceutical for technology transfer, and GlycoNex will receive a substantial sum of royalty annually.

According to GlycoNex chairman, Mr Tong H. Chang, the new drug is expected to fully attack cancerous cells without hurting healthy cells. Attracted by the drug’s promising global market potential, Otsuka has decided to complete follow-up clinical trials.

As development of biotechnology and new pharmaceuticals entails high risks and requires a heavy capital infusion over a long period of time, the MOEA has supported many development projects through the government-funded Development Center for Biotechnology (DCB).

In addition, the DCB has set up world-class facilities, including a GPCR (G-Protein Coupled Receptors) Drug Discovery Facility and the Center of Toxicology and Preclinical Sciences, to help local pharmaceutical companies research and develop new drugs.

**Nutrition Sensor in Plants Pivotal in Understanding Molecular Equilibrium in Human Body**

A local research group led by Academia Sinica research fellow Tsay Yi-fang has made a breakthrough that may in the future reduce the need for nitrogen fertilizer to grow plants in poor soil and even help understand how key molecules in the human body are detected and stay balanced.

The research team discovered an ion sensor that helps plants detect changes of nitrate concentration in soil. Since plants use roots to acquire all their essential nutrients from soil in inorganic forms, they cannot move freely to hunt for food if the soil condition is not optimal. As a result, plants need to have a versatile sensing system to detect and compete for limited soil nutrients, but, until now, how plants sense changes in nutrient concentrations was not understood.

The research team has discovered...
that plants use a transporter involved in acquiring nitrate from soil to sense nitrate. It is the first ion sensor identified in higher plants, as most sensors identified so far have only been able to detect the presence or absence of a substrate.

This study showed that the nitrate sensor, called CHL1, can detect a wide range of concentration changes and lead to different levels of response in plants, such as flowering and bearing fruit. The discovery was published in Cell, marking the first time a botany paper composed by Taiwanese scientists has been published in a prestigious journal.

Ho Chen-hsun, a doctoral researcher at the National Defense Medical Center’s Graduate Institutes of Life Sciences who is the first author of the paper, compared the function of the sensor to a man eating fried chicken seasoned with salt and pepper. Just as humans can sense how spicy the chickens are, the nitrate sensor helps plants control their nitrate intake.

Therefore, with the knowledge of CHL1, scientists could develop a way to “trick” the sensor into getting plants on poor land to bear fruit. In the future the sensing mechanism may not only help reduce the need for nitrogen fertilizer, but also serve as a prototype for scientists to understand how nutrient concentration changes are detected in other organisms. The theory could conceivably be adopted in the medical treatment of diseases, like diabetes, which are caused by defects of sensing substrate concentration changes and maintaining a state of balance within the body.

The findings could help scientists understand how key molecules in the body are detected and kept in balance.

VIETNAM

U.S. Provides Aid to Vietnam for Pandemic Preparedness

The U.S. announced a grant of US$450,000 to Vietnam for implementing a new project to strengthen the role of civil society in combating Type A influenza H1N1 and other threats.

A U.S. Embassy press release said the grant from the U.S. Agency for International Development (USAID) will be used by the Vietnam Red Cross Society (VNRC) to develop a pandemic influenza preparedness and response plan and provide training for civil society organizations active in the country.

The civil society support activity complements government priorities and plans in pandemic influenza preparedness and response to minimize preventable deaths and illnesses, and lessen the impact of a potential pandemic, it said.

The one-year project, carried out in partnership with national authorities and non-governmental organizations (NGOs), is expected to enhance Vietnam’s ability to respond to community needs during an influenza pandemic in the areas of health, food security and livelihoods.

The project will support effective coordination between governmental and United Nations agencies, mass organizations, and NGOs.

Since 2005, the U.S. government has provided more than US$33.5 million to support Vietnam’s programs to combat avian and pandemic influenza.

EUROPE

Heart Risks Cut Life Span by 10 Years

A 50-year-old smoker who has a history of high blood pressure and high cholesterol can expect to die a decade earlier than someone of the same age with none of these heart disease risk factors.

That is the finding from the widely respected Whitehall study, which followed more than 19,000 middle-aged men in the U.K. for four decades. The study is one of the largest ever to quantify the benefits of stopping smoking and controlling blood pressure and cholesterol in terms of life expectancy. “We were able to put a number on what can be achieved by dealing with these three main risk factors for heart disease during middle age,” said epidemiologist and study researcher Robert Clarke.

“The presence of all three of these risk factors in a middle-aged person is associated with a 10- to 15-year difference in life expectancy. The good news is these things can be controlled. We can all make changes to help us live a longer, healthier life.” The death rate from heart disease has dropped steadily since the late 1960s and early 1970s, when recruitment for the study took place.
This decline is largely attributed to a big drop in smoking and the wider availability and use of effective blood pressure and cholesterol-lowering drugs. When they entered the Whitehall study, 42% of the men who took part were current smokers, 39% had high blood pressure, and half had high cholesterol.

Close to three decades later, when interviewed in 1997, two-thirds of the surviving men had quit smoking, and many also had improved their blood pressure and cholesterol levels. Middle-aged smokers with elevated blood pressure and cholesterol were three times as likely to die from cardiovascular causes as men with none of these risk factors.

The researchers also concluded that men with these three risk factors were also twice as likely to die from causes other than heart and vascular disease. The life expectancy of a 50-year-old smoker with high blood pressure and high cholesterol was estimated to be 24 years, while a 50-year-old with none of the risk factors could expect to live nine additional years, to age 83. When other contributors to heart disease like obesity and diabetes were considered, the life expectancy of men with the fewest risk factors was 15 years longer than men with the most.

The study, which will appear in the journal BMJ, was published online.

There were no women in the study, but Dr Clarke says the impact of smoking, high blood pressure, and high cholesterol on life expectancy in women is probably similar to that reported for men. “Women do survive longer than men, but that is largely explained by the fact that they have traditionally had fewer of these risk factors,” he says.

New research has shown that more than half a million U.S. children yearly have bad reactions or side effects from widely used medicines that require medical treatment and sometimes hospitalization.

The study was published in the October issue of Pediatrics.

Children below the age of five are most commonly affected. Penicillin and other prescription antibiotics are among drugs causing the most problems, including rashes, stomachaches and diarrhea.

The lead author of the research, Dr Florence Bourgeois, a pediatrician with Children’s Hospital in Boston, urged parents to pay close attention when their children are started on medicines since “first-time medication exposures may reveal an allergic reaction.

Doctors also should tell parents about possible symptoms for a new medication, she said.

The study was based on national statistics on patients’ visits to clinics and emergency rooms between 1995 and 2005. The number of children treated for bad drug reactions each year was mostly stable during that time, averaging 585,922.

Dr Bourgeois said there were no deaths resulting from bad reactions to drugs in the data she studied, but 5% of children were sick enough to require hospitalization.

The study involved reactions to prescribed drugs, including accidental overdoses. They were used for a range of ailments including ear infections, strep throat, depression and cancer. Among teens, commonly used medicines included birth control pills bringing about troublesome side effects such as menstrual problems, nausea and vomiting.

Children aged 5 and younger accounted for 43% of visits to clinics and emergency rooms; followed by teens aged 15 to 18, at about 23% of the visits.

Similar numbers of hospitalized children — about 540,000 yearly — also have bad reactions to drugs, including side effects, medicine mix-ups and accidental overdoses, recent government research suggests.

The new report indicates children at home are just as vulnerable.

Dr Michael Cohen, president of the Institute for Safe Medication Practices, said a common problem involves giving young children liquid medicine. Doses can come in drops, teaspoons or milliliters, and parents may mistakenly think those amounts are interchangeable.

Dr Cohen said doctors should be clear about doses and parents should be sure before leaving the pharmacy that they understand exactly how to give liquid medicine.

**Virus Linked to Prostate Cancer Discovered**

A virus may be responsible for some prostate cancers and hold clues to the cause of the deadly disease, according to a new study.

Xenotropic murine leukemia
virus-related virus (XMRV) has been previously linked to leukemia and sarcomas in animals, but researchers say this has more recently been identified in human prostate cancer samples.

If further studies confirm that the virus causes prostate cancer, researchers say it would open new avenues for diagnostic tests, vaccines, and therapies for treating prostate cancer. Prostate cancer affects one in six American men and is the most common type of cancer among men after skin cancer.

Previous studies have shown that a small group of men with a certain genetic variation were more susceptible to infection with XMRV, and the virus was present in about 10% of prostate cancer samples. In this study, published in the Proceedings of the National Academy of Sciences, researchers examined about 200 cancerous prostate samples as well as 100 non-cancerous prostate samples. They found 27% of the prostate cancers contained either XMRV DNA or proteins compared to 6% of healthy prostate cells. The virus was also more likely to be found in more aggressive prostate cancers.

In addition, the presence of XMRV was found in malignant prostate cancer cells, a finding that indicates the virus may be directly related to the formation of prostate cancer tumors or possibly that the virus has a preference to replicate within prostate cancer cells.

Finally, researchers say infection with XMRV was seen regardless of whether the men had the genetic variation making them susceptible to it, which would expand the “at-risk” population from a small group of genetically predisposed men to all men.

Viruses have previously been shown to cause other types of cancer, including cancer of the cervix and immune system (lymphoma). XMRV is a retrovirus that is known to cause cancer in animals but has not been proven to cause cancer in humans. However, researchers say these results show the virus merits further investigation as a potential cause of prostate cancer.

Will H1N1 Mutate into “Superbug”?

The new H1N1 virus appears to outcompete seasonal flu, making it less likely to mix with other circulating flu viruses into a “superbug” as some had feared, U.S. researchers said.

The H1N1 virus also spreads more quickly and causes more severe disease in animal studies, the team said, but it shows no signs of mixing with either of the two seasonal flu viruses to form a new, so-called reassortant virus.

A study, conducted in ferrets by a team at the University of Maryland, underscores the need for getting vaccinated with the new swine flu vaccine.

When the team infected ferrets with 2009 H1N1 virus plus either seasonal H1N1 virus or seasonal H3N2 virus, both viruses made them sick, but only the H1N1 virus spread to other ferrets, suggesting it will dominate ordinary flu. “The H1N1 pandemic virus has a clear biological advantage over the two main seasonal flu strains and all the makings of a virus fully adapted to humans,” Daniel Perez of the University of Maryland said in a statement. “I’m not surprised to find that the pandemic virus is more infectious, simply because it’s new, so hosts haven’t had a chance to build immunity yet. Meanwhile, the older strains encounter resistance from hosts’ immunity to them,” Perez said.

The researchers also found that the pandemic virus established infections deeper in the ferrets’ respiratory system, including the lungs, while the seasonal flu strains remained in the nasal passages. That confirmed observations in people. “The findings of this study are preliminary, but the far greater communicability of the pandemic virus is a clearly blinking warning light,” he said.

The World Health Organization predicts a third of the world’s population will eventually be infected with swine flu. Seasonal flu infects between 5% and 20% of a given population every year, but 90% of severe cases and deaths are among the elderly. It kills between 250,000 and 500,000 people globally.

Perez and his team used samples of the H1N1 pandemic variety from the April’s initial swine flu outbreak this year. They found some of the animals infected with both a seasonal flu strain and the pandemic strain developed both respiratory and intestinal illness. The team plans to study whether this combination may explain some of the deaths attributed to the new virus. Because hardly anyone has immunity to the new H1N1 virus, experts believe it will infect far more people than usual, as much as a third of the population.