

VATIS UPDATE

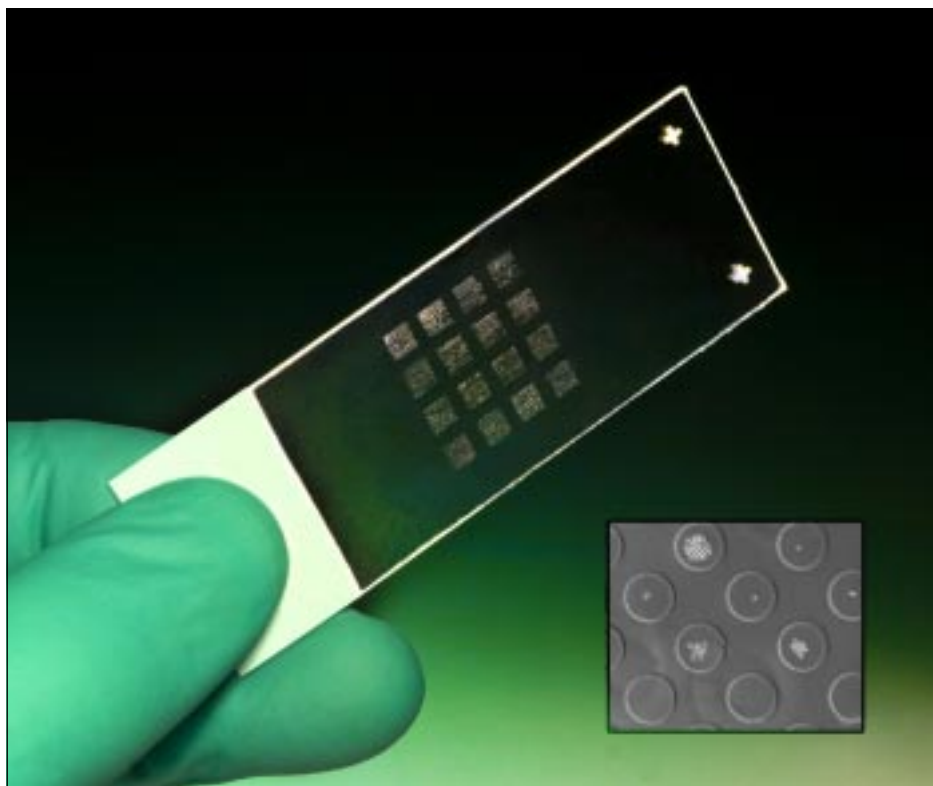
# Biotechnology

Vol. 1 No. 98 • Jul - Aug 2009

ISSN 0971-5622

## Highlights

- Cholesterol-regulating genes ●
- One-step test for abnormalities in embryos ●
- Key regulator of fat cell development discovered ●
- Honey more effective than antibiotics ●
- Plants can produce specific microbicide ●
- Scientists create drought-resistant tomato ●



**APCTT**  
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The **Asian and Pacific Centre for Transfer of Technology (APCTT)**, a subsidiary body of ESCAP, was established on 16 July 1977 with the objectives: to assist the members and associate members of ESCAP through strengthening their capabilities to develop and manage national innovation systems; develop, transfer, adapt and apply technology; improve the terms of transfer of technology; and identify and promote the development and transfer of technologies relevant to the region.

The Centre will achieve the above objectives by undertaking such functions as:

- Research and analysis of trends, conditions and opportunities;
- Advisory services;
- Dissemination of information and good practices;
- Networking and partnership with international organizations and key stakeholders; and
- Training of national personnel, particularly national scientists and policy analysts.



*The shaded areas of the map indicate ESCAP members and associate members*

#### **Cover Photo**

Microenvironment microarrays (MEArrays) that enable researchers to mimic in cell culture studies the complex microenvironments that affect the fate of a stem or progenitor cell

*(Credit: Roy Kaltschmidt, Berkeley Lab Public Affairs, United States of America)*

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Jul - Aug 2009

## VATIS\* Update Biotechnology

is published 6 times a year to keep the readers up-to-date of most of the relevant and latest technological developments and events in the field of Biotechnology. The update is tailored to policy makers, industries and technology transfer intermediaries.

Website: <http://www.techmonitor.net>

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## IN THE NEWS

### Indian biotech sector impacted in the meltdown

The global meltdown and the foreign exchange rate have impacted Indian biotechnology sector. The industry growth rate slipped to 18 per cent in 2008-09, compared with 30-34 per cent in the previous years. The sector's overall turnover in 2008-09 was Rs 121.37 billion (US\$2.5 billion), said Ms. Kiran Mazumdar-Shaw, CMD of Biocon, citing the annual Biospectrum survey of industry.

With 60 per cent of the income coming from exports, the turnover in dollar terms was static year-on-year at US\$2.5 billion, as the exchange rate last year was Rs 47/dollar compared with Rs 40/dollar in 2007-08. The Bangalore cluster, with 187 or nearly half of the 370 biotech industries, topped among clusters, with a turnover of Rs 25 billion. The Mumbai-Pune cluster, Ms. Mazumdar-Shaw said, is catching up with the highest growth rate among all clusters. Bio-pharma contributed Rs 78.8 billion, bio-agri nearly Rs 15 billion, bio-industrial segment Rs 4.8 billion and bio-informatics touched Rs 2.2 billion. (Source: [www.thehindubusinessline.com](http://www.thehindubusinessline.com))

### Israel sets up biotech fund

Israel is setting up a capital fund of up to 1 billion shekels (US\$255 million) to finance biotechnology start-up companies, its industry and trade and finance ministries said recently. The state would contribute about a quarter of the fund, which it hopes to raise to the target amount using loans from private investors. The aim of the initiative is to encourage and advance growth in Israel's biotech sector. The government will split profits from activities in the fund between itself and the private investors, the ministries stated. (Source: [www.cnbc.com](http://www.cnbc.com))

### Tsinghua University gets a cryo-electron microscope

Tsinghua University in Beijing, China, has procured a cryo-transmission electron microscope (cryo-TEM) from the United States-based FEI

Company, a leading provider of three-dimensional (3-D) molecular, cellular and atomic-scale imaging systems. The acquisition of this advanced, multi-million dollar microscope, marks the first Titan Krios™ to be installed in Asia. "Titan Krios' unique capabilities in automation, cryogenic sample handling and low dose imaging are essential for the advanced structural biological research we pursue here," said Prof. Yigong Shi, Senior Vice Dean of the Medical School at Tsinghua University.

Titan Krios provides a high resolution 3-D imaging solution, which is specifically designed to image biological structures down to the molecular level in structural biology applications. Its integrated cryogenic sample handling robotics offer improved automation over existing cryo-TEMs, and the solution permits a full range of high resolution and 3-D techniques including: cryo electron microscopy; single particle analysis; and dual-axis tomography of frozen hydrated samples, such as cells. Cryogenic imaging techniques preserve sample integrity by maintaining it in its native hydrated condition, and proteins in their naturally occurring conformation. Low electron dose methods enable data acquisition with minimal sample damage. *Contact: Mr. Fletcher Chamberlin, FEI Company, North America NanoPort, 5350 NE Dawson Creek Drive, Hillsboro, Oregon, 97124, United States of America. Tel: +1 (503) 726-7710; Fax: +1 (503) 726 2570; E-mail: [fletcher.chamberlin@fei.com](mailto:fletcher.chamberlin@fei.com).* (Source: FEI Press Release)

### New national genome centre launched in the United Kingdom

A new national genome centre was opened recently in the United Kingdom by Nobel Laureate and genome pioneer Prof. Sir John Sulston. The new Genome Analysis Centre (TGAC) will further the United Kingdom's capacity in genomics for use in developments that include the production of new antibiotics to fight 'superbugs', breeding of new crops with increased tolerance of drought, and the breeding of livestock better able to resist emerging exotic disease. TGAC will underpin these advances, as well as make a significant contribution to economic development.

TGAC has been established in Norwich by the Biotechnology and Biological Sciences Research Council (BBSRC) in partnership with regional

economic development partners. The centre represents an investment by all the partners in the capital infrastructure of £13.5 million. TGAC will concentrate on understanding the genomes of economically and socially important plants, animals and microbes. The exact projects that TGAC will initially work on will be decided by an independent advisory board but candidates include: helping to replace petrol with eco-friendly bioenergy, protecting livestock from exotic diseases, and producing more nutritious fruit and vegetables.

A key aim for TGAC is to combine world-class genome science with an innovation programme that aims to benefit the regional and national economy. TGAC will utilize its own discoveries to maximize economic and social impact and is also committed to making cutting edge facilities available to the industry in the United Kingdom. The centre is estimated to generate £5 million of revenue annually and create up to 750 highly-skilled local jobs through commercial development in the next three to seven years. (Source: [www.bbsrc.ac.uk](http://www.bbsrc.ac.uk))

## Pakistan in talks to buy Bt cotton seed

Pakistan is in the process of signing a US\$1 billion agreement for the purchase of Bt cotton seed from Monsanto of the United States. It has finalized issues in its negotiations with Monsanto about growing Bt cotton, which is expected to increase the yield by 40 per cent. However, the quantity that the country would purchase has not yet been agreed upon.

“Last year, around 28 per cent land was cultivated with Bt cotton, but this year our target is 60 per cent,” said Textiles Adviser Dr. Mirza Ikhtiar Baig. “There are also arrangements to produce Bt seeds locally, and the Economic Coordination Committee has approved growing Bt cotton to increase production,” he said. Currently, farmers are using Bt cotton seed on around 2.7 million acres of land against total cultivation of over eight million acres in the country. But the Bt cotton seed being sold in the country was smuggled in and therefore illegal, said the textile adviser.

The package negotiated includes latest Bt cotton seed with weed control feature called ‘Bollguard II

with round-up ready flex’, which would save up to US\$250 million spent on pest control. According to preliminary talks with Monsanto, the company would charge US\$21 for sowing BT seeds over one acre. Of that amount, the company would return US\$4.2 to the farmer for research purpose. (Source: [www.seedquest.com](http://www.seedquest.com))

## Chinese scientists create pig stem cells

Scientists have managed to induce cells from pigs to transform into pluripotent stem cells that, like embryonic stem cells, are capable of developing into any type of cell in the body. It is the first time that this has been achieved using somatic cells (cells that are not sperm or egg cells) from any animal with hooves (ungulates). The research could open the way to creating models for human genetic diseases, genetically engineering animals for organ transplants for humans, and for developing pigs that are resistant to diseases such as swine flu.

Dr. Lei Xiao, who heads the stem cell lab at the Shanghai Institute of Biochemistry and Cell Biology, China, and colleagues succeeded in generating induced pluripotent stem (iPS) cells by using transcription factors to reprogramme cells taken from a pig’s ear and bone marrow. After the cocktail of reprogramming factors had been introduced into the cells via a virus, the cells changed and developed in the laboratory into colonies of embryonic-like stem cells. Further tests confirmed that they were pluripotent stem cells. The development could make it much easier for researchers to develop embryonic stem cells (ES cells) that originate from pig or other ungulate embryos.

However, Dr Xiao warned that it could take several years before some of the potential medical applications of his research could be used in the clinic. The next stage of his research is to use the pig iPS cells to generate gene-modified pigs that could provide organs for patients, improve the pig species or be used for disease resistance. The modified animals would be either “knock in” pigs where the iPS or ES cells have been used to transfer an additional bit of genetic material into the pig’s genome, or “knock out” pigs where the technology is used to prevent a particular gene functioning. (Source: [www.genengnews.com](http://www.genengnews.com))

## MARKET NEWS

### NeoStem inks pact with Enhance BioMedical for stem cell collection

NeoStem Inc., the United States, has signed an exclusive ten-year agreement with Enhance BioMedical Holdings Ltd., China, to develop a stem cell collection and treatment network using NeoStem's proprietary adult stem cell technologies in Chinese provinces as well as Taiwan. Enhance BioMedical Holdings is a subsidiary of Enhance Holding Corporation, a multinational conglomerate with successful businesses in various market sectors including healthcare.

The agreement expands NeoStem's China-related activities, which are focused on regenerative medical therapies and medical tourism for clientele seeking high-quality treatments not available in their own countries. Under the agreement, Enhance BioMedical is given the exclusive rights to utilize NeoStem's proprietary adult stem cell technologies identified by NeoStem from time to time to provide adult stem cell services and therapies in the Asian territory. NeoStem will train Enhance BioMedical staff in the proprietary knowledge, technology and operating procedures.

In return, NeoStem is entitled to a six-figure technical assistance fee. NeoStem also will be entitled to a stated royalty on gross revenues generated by Enhance from providing the NeoStem stem cell services for the duration of the renewable agreement and may receive other fees also in connection with assisting in the launching of the network. (Source: [aap.newscentre.com.au](http://aap.newscentre.com.au))

### Kemwell to set up new biopharma facility

Kemwell Pvt. Ltd., a leading contract manufacturing and development services company based in India, would invest around Rs 2.0-2.5 billion to set up an advanced biopharmaceutical manufacturing plant in the outskirts of Bangalore, India. The facility would be opened in two years, and the financing would come from the company's own funds and through a private equity partner.

Kemwell has also entered into a strategic collaboration with Boehringer Ingelheim (BI), Germany, wherein Kemwell will complement BI's early clinical supply services ranging from full-service process development, manufacture, formulation, and fill-and-finish at the current good manufacturing practices (cGMP) facility. It will have access to BI's cell line development with the HEX technology platform, followed by a preferred access to the large-scale commercial production of its facilities in Europe.

The Greenfield project which spans over an area of 15,000 sq m will be designed for process development, fermentation, purification and formulation of biologics for early-phase preclinical and clinical studies. The facility will consist of a cGMP drug substance manufacturing facility and a sterile fill-and-finish facility for drug product with a floor for process development laboratories to support production of protein therapeutics from mammalian-cell culture or microbial fermentation. (Source: [www.pharmabiz.com](http://www.pharmabiz.com))

### AstraZeneca, Merck collaborate on cancer treatment

AstraZeneca PLC, based in the United Kingdom, and Merck & Co., based in the United States, will jointly develop a pair of drugs meant to hit cancer with a one-two punch, part of a growing trend of combination cancer treatments. The companies, two of the world's largest multinational drug-makers, said they would combine efforts with Merck's MK-2206 and AstraZeneca's AZD6244, both of which are still in very early development. Such a partnership among major pharmaceutical companies on a combination treatment at nascent stage is unusual.

In a statement, the companies said that by working together, they could bring the treatment to patients more quickly. Pre-clinical studies have indicated the combination has potential as an anticancer drug, the statement said. AstraZeneca's AZD6244 is currently in mid-stage, or Phase II development, as a potential treatment for several tumour types, while Merck's MK-2206 is in early-stage studies focusing in general on treating solid tumours. Each drug targets a different protein that is abnormally activated in cancer, one called MEK and the other AKT. (Source: [www.physorg.com](http://www.physorg.com))

## Biocon, Mylan tie up for generic biologic drugs

Biocon Ltd., a premier biotechnology firm in India, has signed a definitive agreement with the world's third largest biopharma company, Mylan Inc., the United States, to develop, manufacture and supply generic biologic drugs globally. As part of this collaboration, the companies will share capital, development, and certain other costs to bring products to market. Mylan will have exclusive commercialization rights in the United States, Canada, Japan, Australia, New Zealand, as well as in the European Union and European Free Trade Association nations under a profit sharing arrangement with Biocon. Mylan will also have co-exclusive commercialization rights with Biocon in all other markets around the world. (Source: www.domain-b.com)

## Luminex launches two new cystic fibrosis tests

Luminex Corporation, the United States-based worldwide leader in multiplexed solutions, has announced the launch two new cystic fibrosis (CF) tests in Europe – the xTAG® Cystic Fibrosis 39 Kit v2 and xTAG® Cystic Fibrosis 71 Kit v2 – as CE IVD Marked products under the European Directive on *In Vitro* Diagnostic Medical Devices.

As the most comprehensive CF tests available, the new xTAG tests will be used to provide assistance in CF screening for newborns and confirmatory diagnostic testing in infants and children. The tests can be used also for carrier testing in adults of reproductive age, for mutation in the CF transmembrane conductance regulator (CFTR) gene, which leads to the disease.

The xTAG Cystic Fibrosis 39 Kit v2 can quickly and accurately detect up to 39 of the most common CFTR mutations from a child or parent's blood sample or bloodspot in a matter of hours. The xTAG Cystic Fibrosis 71 Kit v2 can screen for all of the genetic mutations in the xTAG Cystic Fibrosis 39 Kit v2 plus an additional 32 mutations including those that are typically found in specific ethnic populations. The xTAG tests are uniquely designed to be fast and easy for use, requiring only about one hour of hands-on time to process 48 purified samples. They also offer physicians

the ability to select the CFTR gene mutations for which they want to test. (Source: www.cnbc.com)

## Juvaris BioTherapeutics joins hands with Antigen Discovery

In the United States, Juvaris BioTherapeutics Inc. has signed a definitive agreement with Antigen Discovery Inc. (ADi) to access ADi's proprietary high-throughput protein microarray screening system to discover novel disease-specific antigens to fuel Juvaris' vaccine pipeline. Juvaris will sponsor research for multiple disease targets and pay ADi upfront payments, development milestones and royalties on licensed products in exchange for full product development rights to all fields except diagnostics, which will belong to ADi.

ADi's antigen discovery platform involves assaying the entire proteome of a disease target to identify every possible protein antigen. The selected antigens are derived from reactive antibodies generated by infected individuals. They mimic the presence, accessibility and antigenicity of relevant proteins from the particular pathogens in humans. This process identifies antigens that best stimulate the immune system and are thus ideal targets for vaccine and diagnostic development. Through the collaboration, Juvaris will select the optimal antigens from the discovery efforts of ADi to combine with its proprietary adjuvant technology to create highly immunogenic prophylactic and therapeutic vaccines against major unmet medical needs. (Source: www.businesswire.com)

## Glaxosmithkline opens largest vaccine plant in Asia

Glaxo SmithKline (GSK), the global pharmaceutical company, has officially opened its largest vaccine plant in Asia and the first of its kind in Singapore. The new plant was inaugurated by the Prime Minister of Singapore, Mr. Lee Hsien Loong. GSK has so far invested more than US\$1 billion and expanded its activities in Singapore into drug discovery, clinical research and manufacturing, making the city-state one of the company's two global strategic manufacturing hubs as well as its regional headquarters for Asia-Pacific. (Source: www.bernama.com)

# GENOMICS

## Japanese scientists create transgenic monkeys

Japanese scientists announced recently that they had created the world's first transgenic primates, breeding monkeys with a gene that made the animals' skin glow a fluorescent green. The exploit opens up exciting prospects for medical research, and could eventually lead to lab monkeys that could provide a new model for investigating the cause of and cure for human disorders.

In a study published in the journal *Nature*, a team led by Dr. Erika Sasaki of the Central Institute for Experimental Animals at Keio University reported on experiments on common marmosets (*Callithrix jacchus*), a small monkey native to Brazil. The team introduced a foreign gene, tucked inside a virus, into marmoset embryos that were then nurtured in a bath of sucrose. The gene codes for green fluorescent protein (GFP), a substance that was originally isolated from a jellyfish and is now commonly used as a biotech marker.

The transgenic embryos were then implanted in the uterus of seven surrogate mother marmosets. Three of the recipients miscarried. The other four gave birth to five offspring, all of which carried the GFP gene. In two of these five, the GFP gene had been incorporated into the reproductive cells. A second generation of marmosets was then derived from one of the two.

The work is important, because medical researchers have hankered for an animal model that is closer to the human anatomy than rodents. Mice and rats, genetically engineered to have the symptoms of certain human diseases, are the mainstay of pre-clinical lab work, in which scientists test their theories before trying out any outcome on human volunteers. But many disorders, especially neurological diseases such as Alzheimer's and Parkinson's, are so complex that they cannot be reproduced meaningfully in rodents because their biology is different. Hopes for a non-human primate model have until now been dashed by the failure to insert a gene into monkey sperm and eggs, to ensure the passing of the inserted DNA on to future generations. (Source: [www.physorg.com](http://www.physorg.com))

## A gene that regulates tumours in neuroblastoma

In the United States, Virginia Commonwealth University (VCU) researchers have identified a gene that may play a key role in regulating tumour progression in neuroblastoma, a form of cancer usually found in young children. According to co-lead investigators of the study – Dr. Paul B. Fisher from VCU Massey Cancer Centre, and Dr. Seok-Geun Lee from the VCU Department of Human and Molecular Genetics – their work has demonstrated that astrocyte elevated gene-1, AEG-1, a cancer promoting gene, is frequently activated in neuroblastoma.

In the study, the VCU team found that the elevated expression of AEG-1 makes cancer cells highly aggressive and resistant to factors that may influence cell suicide, and that loss of AEG-1 reduces the tumour-causing properties of highly aggressive neuroblastoma cells. Additionally, the expression of AEG-1 was significantly elevated in six of 10 neuroblastoma patient-derived samples compared with normal peripheral nerve tissues. The team also established the potential correlation between AEG-1 and MYCN in neuroblastoma. MYCN is a known genetic determinant of neuroblastoma and elevated levels have been observed in one-third of neuroblastoma patients.

The team has already begun analysing the expression of AEG-1 and its relationship with MYCN status in neuroblastoma patient samples. They will also test if inactivation of AEG-1 using small interfering RNA could be a therapeutic intervention for neuroblastoma through second collaborative effort. (Source: [www.genengnews.com](http://www.genengnews.com))

## New genetic immune disorder in children

At the National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS), the United States, researchers have discovered a new auto-inflammatory syndrome, a rare genetic condition that affects children around the time of birth. The new auto-inflammatory syndrome has been named "deficiency of the interleukin-1 receptor antagonist" (DIRA). The research was supported by several other institutes under the National Institutes of

Health, as well as institutes and universities from Canada, the Netherlands and Sweden.

Children with the disorder display several serious and potentially fatal symptoms such as: swelling of bone tissue; bone pain and deformity; inflammation of the periosteum; and a rash that can span from small individual pustules to extensive pustulosis. Most of the children begin to have symptoms from birth to two weeks of age. All these children have inherited mutations in IL1RN, a gene that encodes a protein known as interleukin-1 receptor antagonist (IL-1Ra). IL-1Ra binds to the same cell receptors as the inflammatory protein interleukin-1 (IL-1) and acts as a brake on it. Without IL-1Ra, the children's bodies cannot control systemic inflammation caused by IL-1.

The scientists identified nine patients from six families with DIRA in Canada, the Netherlands, Lebanon and Puerto Rico. The six patients who were alive at the time of diagnosis were treated with anakinra, a drug that is normally used for rheumatoid arthritis and is a synthetic form of human IL-1Ra. Most patients responded successfully and immediately to anakinra, although they were resistant to other medications such as steroids. (Source: [www.niams.nih.gov](http://www.niams.nih.gov))

## Discovery of facial malformation gene

The first specific genetic mutation, which can cause a potentially serious facial disfigurement, has been identified jointly by researchers in the United Kingdom and the Netherlands. The finding offers the promise of improved genetic counselling for parents at risk. The researchers – led by Prof. Andrew Wilkie from the Weatherall Institute for Molecular Medicine at the University of Oxford and Dr. Irene Mathijssen from the Erasmus Medical Centre in the Netherlands – identified individuals from seven families who had 'frontorhiny', a distinctive facial appearance that include a wide, malformed nose and an abnormally large distance between the eyes.

Genetic analysis showed that each of the individuals carried two copies of a mutation in the gene ALX3. Mouse models have previously highlighted the involvement of the equivalent gene in the production of a protein that regulates other genes

involved in facial development. However, while the absence of the protein produced by this gene does not disrupt facial development in mice, Prof. Wilkie and colleagues found that it leads to frontorhiny in humans.

The researchers believe that by identifying and naming the condition, they will be able to diagnose more cases and provide improved genetic counselling. Because this is a recessive genetic disorder, a parent with the condition is very unlikely to have a similarly affected child. However, where unaffected parents have a child with the condition, they have a one in four chance of each future child being affected. (Source: [www.sciencedaily.com](http://www.sciencedaily.com))

## Cholesterol-regulating genes

In Germany, scientists at the European Molecular Biology Laboratory (EMBL) and the University of Heidelberg (UH) have come one step closer to understanding how cholesterol levels are regulated. In a study published in *Cell Metabolism*, the researchers identified 20 genes that are involved in this process. Besides giving scientists a better idea of where to look to uncover the mechanisms that ensure cholesterol balance is maintained, the discovery could lead to new treatments for cholesterol-related diseases. "This finding may open new avenues for designing targeted therapies, for example by looking for small molecules that could impact these genes," says Dr. Heiko Runz, whose group at the UoH Clinic carried out the research together with Dr. Rainer Pepperkok's laboratory at EMBL.

The researchers deprived isolated human cells of cholesterol and then looked at the whole genome to find the genes that react to changes in cholesterol levels by altering their expression. This large-scale approach pointed to hundreds of genes that might be involved in cholesterol regulation. To identify the genes were involved, the scientists used RNA interference to systematically turn each of the candidate genes off. With a microscope they then observed what effect the switching off of different genes had, both on cholesterol uptake and on the amount of cholesterol inside cells.

Of the 20 genes the scientists identified as involved in regulating cholesterol levels and uptake, 12 were previously unknown. The remainder were known to have some link to lipid metabolism –

how the body breaks down fat – including two genes that when mutated may cause heart disease, but which were only now shown to also play a part in bringing cholesterol into cells in the first place. The scientists are now trying to discover how the novel genes regulate cholesterol levels inside cells, whether these genes (or alterations in them) constitute risk factors, and how they could be useful drug targets. (Source: [www.sciencedaily.com](http://www.sciencedaily.com))

## One-step test for abnormalities in embryos

One-step screening for both genetic and chromosomal abnormalities has come a stage closer, as scientists announced that an embryo test they have been developing has successfully screened cells taken from spare embryos that were known to have cystic fibrosis. The researchers based in the United States and the United Kingdom have been able to prove that the technique, known as genome-wide karyomapping, was capable of detecting not only diseases caused by a specific gene mutation but also aneuploidy (an abnormal number of any of the 23 pairs of chromosome).

Dr. Gary Harton, a scientific director of the Genetics & IVF Institute in Virginia, the United States, said: “Karyomapping is a universal method for analysing the inheritance of genetic defects in the pre-implantation embryo without any prior patient or disease specific test development, which often delays patient treatment.” For the first time, the inheritance of both single gene defects and chromosomal abnormalities can be detected simultaneously at the single cell level. As karyomapping involves analysing chromosomes, it also detects the existence of aneuploidy at the same time. The DNA sequence is analysed at over 300,000 locations genome-wide in parents and appropriate family members, and their sequence is compared with that inherited by the embryo.

Karyomapping was developed by Prof. Alan Handyside of the London Bridge Fertility Gynaecology and Genetics Centre in London, the United Kingdom. “The hope is that clinicians will be able to test embryos for specific genetic diseases and know that, with one test, they are transferring chromosomally normal embryos. This will be a step forward from current technology that is

mostly limited to choosing one test or the other,” explained Prof. Handyside. Karyomapping would also be quicker and hence, cheaper. Currently, developing a pre-implantation genetic diagnosis test for a single gene defect can take weeks or months. By contrast, karyomapping can be carried out without such extended pre-test development; at present, it takes about three days, but the researchers believe this could be reduced to 18-24 hours. (Source: [www.eurekalert.org](http://www.eurekalert.org))

## Gene mutation responsible for catastrophic epilepsy

Catastrophic epilepsy – characterized by severe muscle spasms, persistent seizures, mental retardation and sometimes autism – results from a mutation in a single gene, write researchers from Baylor College of Medicine (BCM) in the United States. The BCM team replicated the defect in mice, developing a mouse model of the disease that could help researchers figure out effective treatments for and new approaches to curing the disease, said Dr. Jeffrey Noebels, professor of neurology, neuroscience and molecular & human genetics, and director of the Blue Bird Circle Developmental Neurogenetics Laboratory.

Why some children have a more complicated set of disorders was a mystery. A gene known as Aristaless-related homeobox (ARX) has a specific mutation called a triplet repeat, which means that a particular nucleotide triplet (in this case, Guanidine-Cytosine-Guanidine) is repeated in the gene. When this particular mutation was duplicated in specially bred mice, the animals had motor spasm similar to those seen in human infants.

Brain waves of the animals showed that they had several kinds of seizures, including absence epilepsy and general convulsion. They also had learning disabilities and were four times more likely to avoid contact with other mice than their normal counterparts – a behaviour similar to that seen in children with autism or other such disorders. Mutation of the ARX gene was previously known to affect interneurons, a class of cells that inhibit electrical activity in the brain. When the scientists evaluated the brains of the adult mice with the mutated gene, they found that a special class of interneurons had never developed in specific brain regions. (Source: [www.sciencedaily.com](http://www.sciencedaily.com))

# PROTEOMICS

## Stem cell protein as a new cancer target

A protein abundant in embryonic stem cells is now shown to be important in cancer, and offers a possible new target for drug development, say researchers from the Stem Cell Programme at Children's Hospital Boston, the United States. Dr. George Daley, graduate student Mr. Srinivas Viswanathan and colleagues have shown that the protein LIN28 can transform cells to a cancerous state, and that it is abundant in a variety of advanced human cancers.

Last year, Dr. Daley and Mr. Viswanathan, in collaboration with Dr. Richard Gregory, had shown that LIN28 regulates an important group of tumour-suppressing microRNAs known as let-7. Rising LIN28 production in a cell prevents let-7 from maturing, making the cell more immature and stem-like. Since these qualities also make a cell more cancerous, and because low levels of mature let-7 have been associated with breast and lung cancer, the discovery had suggested that LIN28 might be oncogenic.

The scientists believe that overall, LIN28 and a related protein, LIN28B, may be involved in some 15 per cent of human cancers, particularly liver cancer, ovarian cancer, chronic myeloid leukaemia, germ cell tumours and Wilm's tumour (a childhood kidney cancer). By blocking or suppressing LIN28, it might be possible to revive the let-7 family's natural tumour-suppressing action. "It gives us a new target to attack, especially in the most resistant and hard-to-treat cases," said Dr. Daley. (Source: [www.medicalnewstoday.com](http://www.medicalnewstoday.com))

## Key regulator of fat cell development discovered

Scientists at the Cornell University, the United States, have discovered how two related proteins and their roles in a key molecular pathway are critical to creating obesity-causing fat cells. Targeting the proteins, IRE1alpha and XBP1, could hopefully lead to drug therapies to fight obesity, which affects one in three adults and contributes

to heart disease, diabetes, some cancers and high blood pressure. The study is the first to show that endoplasmic reticulum and the IRE1alpha-XBP1 pathway are involved in the genesis of fat cells.

The creation of fat cells involves a two-step process: stem cells first develop into precursors of fat cells called pre-adipocytes, and then these develop into adipocytes, the mature fat cells. The new study focuses on this second phase in which the pre-adipocytes experience a low level of stress in the endoplasmic reticulum, the organelle where new proteins are made, folded and then transported out for use by the cell. The stress caused by an accumulation of mis- or un-folded proteins is critical for the transition from pre-adipocytes to mature fat cells, the researchers found.

To counter the stress, cells activate IRE1alpha, a protein that resides in the endoplasmic reticulum and that senses unfolded proteins as a part of a cellular defence mechanism, called the unfolded protein response. Dr. Ling Qi, Assistant Professor of nutritional sciences and senior author of the paper, and his colleagues created cells lacking IRE1alpha and demonstrated that these cells were unable to develop from pre-adipocytes into adipocytes. This evidence indicates that IRE1-alpha is a key component of the pathway that leads to fat cell development. Activated IRE1alpha then converts the protein XBP1 into a new form. In its new configuration, XBP1 moves into the cell's nucleus, where it turns on genes that work to resume normal protein folding and balance to the endoplasmic reticulum. The researchers also found that loss of XBP1 interferes with the conversion of pre-adipocytes into mature fat cells. (Source: [www.bionity.com](http://www.bionity.com))

## Fish protein link to controlling high blood pressure

Medical scientists at the University of Leicester, the United Kingdom, are investigating how a fish species from the Pacific Ocean could help provide answers to tackling chronic conditions such as hereditary high blood pressure and kidney disease. They are examining whether the Goby fish can help researchers locate genes linked to high blood pressure. This is because a protein called Urotensin II, first identified in the fish, is important

for regulating blood pressure in all vertebrates, from fish to humans, said researcher Dr. Radoslaw Debiec from the University's Department of Cardiovascular Sciences.

"The protein found in the fish has remained almost unaltered during evolution. This indicates that the protein might be of critical importance in the regulation of blood pressure and understanding the genetic background of high blood pressure," Dr. Debiec said. Drugs affecting the protein might be a novel alternative to the available therapies, particularly in those patients who suffer from chronic kidney disease along with high blood pressure. (Source: [www.sciencecentric.com](http://www.sciencecentric.com))

## Protein in the envelope enclosing the cell nucleus

A research team led by Prof. Einar Hallberg at the Department of Life Sciences at Södertörn University in Sweden has discovered a new protein in the inner membrane of the cell nucleus. This protein, which may play an important role in cell division, now provides a new piece of the puzzle to study in cancer research. The protein normally exists in the membrane envelope that surrounds the cell nucleus. During cell division, it becomes part of the process that distributes the chromosomes evenly between the daughter cells – the so-called 'mitotic spindle'. Hence, the protein is named spindle-associated membrane protein 1 (Samp1).

The distribution of chromosomes during cell division is extremely rigidly regulated; the slightest error can lead to the development of tumours. Hence, Samp1 will now be a key piece of the puzzle to study in cancer research.

The research team discovered in their study that Samp1 protein has connections to the cell skeleton outside the cell nucleus. This takes place between cell divisions, when the protein is in the inner membrane of the cell nucleus. It is possible that Samp1 plays a major role when mechanical signals from the outside of the cell are transmitted to the genes in the cell nucleus. The researchers are now focusing on investigating the role Samp1 might have in the transmission of mechanical signals from the outside of the cell to the genes. (Source: [www.sciencecentric.com](http://www.sciencecentric.com))

## Enzyme fights mutated protein in Parkinson's disease

An enzyme that naturally occurs in the brain helps destroy the mutated protein, which is the most common cause of inherited Parkinson's disease, report researchers from Southwestern Medical Centre, University of Texas, the United States. Their study, using human cells, provides a focus for further research into halting the action of the mutated protein. The particular mutation that the researchers studied affects a protein, which is named LRRK2, whose function is not well understood. In its normal form, LRRK2 appears to have multiple sites where other molecules can attach themselves. Several mutations can affect the protein, and some cause Parkinson's disease.

The current theory is that the mutation leads to increased function of LRRK2 and to the formation of abnormal clumps of proteins inside brain nerve cells. The cells eventually die from these effects. In the current study, the researchers used cultured human kidney cells and found that LRRK2 and a protein called CHIP are "robustly" associated with each other. Further testing showed that CHIP and LRRK2 could bind to each other either directly, or indirectly via a third molecule that acts as a bridge.

When CHIP was bound to either the normal or mutant form of LRRK2, levels of LRRK2 in the cell decreased, the researchers found. This occurred because the cells increased the rate at which they destroyed LRRK2. "CHIP may be a useful therapeutic target for treatments to break down LRRK2 in people with Parkinson's," said Dr. Matthew Goldberg, assistant professor of neurology and psychiatry and senior author of the paper. (Source: [www.health.am](http://www.health.am))

## Protein regulates movement of mitochondria in brain cells

United States scientists have identified a protein in the brain that plays a key role in the function of mitochondria – the part of the cell that supplies energy, supports cellular activity and wards off threats from disease. "We know that in some disease states that mitochondria function is modified, so understanding how their activity is modulated

is important to understanding how the brain responds to a pathological state,” said University of Rochester Medical Centre neurologist Dr. David Rempe, the lead author of the study.

Mitochondria are cellular power plants that generate most of the cell’s supply of adenosine triphosphate (ATP), which is used as a source of chemical energy. While mitochondria are present in all of the body’s cells, some cells – because of their size and purpose – need to transport them to distant sites within the cell to maintain proper function. “Neurons are at a disadvantage in terms of their anatomy,” said Dr. Rempe. “They put out enormous arms of axons and dendrites and they have to keep supplying nutrients and everything down these arms. The supply line is very long.”

The supply line includes mitochondria that the cell must also push down the axons and dendrites to provide energy to these parts of the cell, help with the transmission of signals, as well as generally maintain cellular health. Dr. Rempe and his colleagues have discovered a protein that plays a critical role in regulating the movement or transport of mitochondria in neuron cells. The protein, which they dubbed hypoxia upregulated mitochondrial movement regulator (HUMMR), is produced in a state of low oxygen called hypoxia. HUMMR is induced by another protein called hypoxic inducible factor 1 alpha (HIF-1), which is responsible for triggering several processes in the cell which help it function in a low oxygen environment.

The scientists observed that when HUMMR was expressed at lower than normal levels, a greater number of the mitochondria began to abandon their posts along the cell’s dendrites and axon and return to the cell body proper. One of the keys to identifying the function of HUMMR has been the appreciation in that the body operates at a relatively low oxygen level. While the air we breath consists of approximately 20 per cent of oxygen, the cells in the brain sit at somewhere between 2-5 per cent of oxygen. This creates a “normal” state of hypoxia in the brain. However, the concentration of oxygen in the brain can drop even further in instances such as a stroke, when blood flow to a portion of the brain is cut off. This decrease in oxygen promotes the expression of HUMMR which, in turn, mobilizes mitochondria. (Source: [www.crinordic.com](http://www.crinordic.com))

## MEDICAL BIOTECH

### Honey more effective than antibiotics

In the first study of its kind, researchers at the University of Sydney, Australia, have found proof that some honeys can be more effective than antibiotics in treating surface wounds and infections. Unlike antibiotics, which only work on some bacteria, the honeys worked on all the infectious bugs tested, including one that was resistant to 13 different antibiotics. Critically, the bacteria did not adapt and develop resistance to the honey as they do with antibiotics. The honeys tested by the researchers were variations of Manuka honey and jelly bush honey, from New Zealand and Australia, respectively, both of which are currently available in medicinal versions, but are not widely used in hospitals.

“Our research is the first to clearly show that these honey-based products could in many cases replace antibiotic creams on wounds and equipment such as catheters. Using honey as an intermediate treatment could also prolong the life of antibiotics,” said Associate Professor Dr. Dee Carter from the University of Sydney’s School of Molecular and Microbial Biosciences. The common denominator in the honeys tested is that they are all produced by bees that feed on *Leptospermum* plants, commonly known as tea trees, found in Australia and New Zealand.

The honeys worked on pathogens known to have a high level of acquired and/or intrinsic resistance, including superbugs such as methicillin-resistant *Staphylococcus aureus*, said Dr. Carter. “We don’t quite know how these honeys prevent and kill infections, but a compound in them called methylglyoxal seems to interact with a number of other unknown compounds in honey to prevent infectious bacteria developing new strains that are resistant to it.” (Source: [www.news-medical.net](http://www.news-medical.net))

### Cerebrospinal fluid for early detection of Alzheimer’s disease

It is possible to identify patients who run a high risk of developing Alzheimer’s disease and the

dementia associated with it, even in patients with minimal memory impairment, according to recent research at the Sahlgrenska Academy, University of Gothenburg, Sweden. The typical pattern of biomarkers known as the “CSF AD profile” can be seen in the cerebrospinal fluid (CSF) of patients even with very mild memory deficiencies, long before these can be detected by other tests.

“The patients who had the typical changes in biomarker profile of the CSF had a risk of deterioration that was 27 times higher than the control group,” says Prof. Kaj Blennow of the Academy. The researchers also found that all patients with mild cognitive impairment who deteriorated and developed Alzheimer’s disease had these alterations in the biomarker profile of their CSF. They also showed a relationship between the profile of biomarkers and other typical signs of the disease, such as the presence of the gene APOE e4 and atrophy of the hippocampus, which is the part of the brain cortex that controls memory. (Source: [www.eurekalert.org](http://www.eurekalert.org))

## Ovarian transplantation proves a success

A new technique for transplanting the ovaries of women is reported to have produced excellent results in women whose ovaries have been frozen because of cancer treatment. Dr. Pascal Piver, Manager of the IVF Centre at Limoges University Hospital, France, said that his team’s technique worked to restore ovarian function quickly and already one patient from his clinic had had a baby and another had become pregnant.

Dr. Piver and colleagues set out to tackle one of the biggest problems of ovarian transplantation: the low response to stimulation caused by insufficient vascularization of the transplanted tissue. For a woman to become pregnant, the ovaries need to be responsive to the action of hormones that cause them to release eggs each month. “If the blood supply to the ovaries is insufficient, this will not happen, even though the transplant may look as though it has been successful,” Dr. Piver said. To overcome this problem they carried out a two-stage procedure, first grafting small pieces of the frozen ovarian tissue in the ovarian and peritoneal areas three days before the real transplant. The first graft encourages the growth of blood vessels

and paves the way for the ovary to become fully functioning in a shorter time scale than would be possible if all the tissue were to be transplanted at the same time.

The researchers have so far utilized this technique with two patients who had been treated for cancer and had their ovaries frozen. The first patient was treated for sickle cell anaemia, and the second patient for *periarteritis nodosa*, an inflammation of medium-sized arteries, which become swollen and damaged from attack by rogue immune cells. “This is the first time that a pregnancy has been obtained after a ten-year gap between ovarian cryopreservation and grafting,” Dr. Piver claimed. (Source: [www.sciencecentric.com](http://www.sciencecentric.com))

## Light therapy offers new hope for breast cancer patients

Scientists led by world-renowned breast cancer expert, Mr. Mo Keshtgar, have used photodynamic therapy (PDT) as non-invasive breast cancer treatment. PDT uses light to destroy cancer cells, and possibly offers an alternative to radiotherapy in some cases. PDT works by giving the patient a drug that makes the target area sensitive to light. The drug is activated when light – a low-power red laser – is beamed at the area. The process starves the cancerous cells of oxygen, causing them to die.

Trials will be conducted at the Royal Free Hospital in London, the United Kingdom, where Mr. Keshtgar has been working with a technical and scientific team. The treatment is already available for some other cancers such as skin cancer (non-melanoma) and oral cancer. But the Royal Free team is the first to apply it to breast cancer. Trials are also underway with PDT for prostate and bile duct and pancreatic cancer. (Source: [www.medicalnewstoday.com](http://www.medicalnewstoday.com))

## New discovery to aid treatment of kidney disease

Researchers from Boston University School of Medicine and University of Louisville in the United States, in collaboration with their colleagues from the University of Nice Sophia-Antipolis in France, have identified a target antigen, PLA2R, in patients with idiopathic membranous nephropathy (IMN).

The discovery has implications for the diagnosis and treatment of IMN, which involves the thickening and dysfunction of glomeruli, the filtering parts of the kidneys. It is caused when antibodies attack the glomeruli causing large amounts of protein to leak into the urine. Until now, the diagnosis of IMN required a kidney biopsy, as there are no blood or urine tests to distinguish it from other causes of kidney disease. This is because up until now the protein that is the target of the circulating auto-antibodies has never been identified.

To identify the target antigen in patients with this condition, the researchers used circulating antibodies from adults with this disease to detect normal glomerular proteins. Subsequent analysis using mass spectrometry and confirmation using protein-specific reagents allowed for the identification and characterization of the predominant protein detected by these circulating antibodies. (Source: [www.physorg.com](http://www.physorg.com))

## Direct link between smoking and brain damage

New research has suggested a direct link between smoking and brain damage. Researchers, led by Dr. Debapriya Ghosh and Dr. Anirban Basu from National Brain Research Centre (NBRC), India, have found that a tobacco compound, known as NNK, provokes white blood cells in the central nervous system to attack healthy cells, leading to severe neurological damage. NNK is a pro-carcinogen, a chemical substance that becomes carcinogenic when it is altered by the metabolic process of the body. While NNK does not appear to harm brain cells directly, the research team believes it may cause neuro-inflammation, a condition that leads to disorders like multiple sclerosis.

The team employed blot analysis techniques that showed that the introduction of NNK increased pro-inflammatory signalling proteins, pro-inflammatory effector proteins and other stress-related proteins. Levels of pro-inflammatory cytokines, which act as molecular messengers between cells, were also increased. This confirmed that NNK provokes an exaggerated response from the brain's immune cells, known as microglia, which start to attack healthy brain cells rather than the unhealthy cells they are supposed to attack. (Source: [www.lifesciencesworld.com](http://www.lifesciencesworld.com))

# AGRI-BIOTECH

## Scientists produce GM crops without foreign genes

Scientists have unveiled a new way of altering the genetic sequence of a crop to produce a desired trait without needing to introduce foreign genes. The technique could be less controversial than conventional genetic modification because it does not involve transferring a gene from another species. Scientists used a set of enzymes to “subtly change” a tobacco plant’s DNA to make it herbicide resistant. The enzymes – known as zinc finger nucleases – can be engineered in the lab to target specific genes, introducing changes known to cause the desired trait. There has been no efficient way of making such changes to plant genes until now.

Dr. Daniel Voytas, Director of the University of Minnesota Centre for Genome Engineering, the United States, and the lead author of the study says: “We changed a few letters in the genetic code of a native plant gene and made the plant resistant to herbicide.” The researchers hope the technique will revolutionize how crops are genetically modified. Dr. Voytas says the technique requires only standard molecular biology laboratories and competence in introducing DNA into plants – resources that are available in many parts of the developing world. (Source: [www.scidev.net](http://www.scidev.net))

## Protein that triggers plant cell division

For diversity of life to be possible, the cells that make up the living things must be just as varied. Parent cells must be able to divide in ways that create daughter cells that are different from each other, a process called asymmetric division. Scientists know how this happens in animals, but the process in plants has been a mystery. Now biologists at the Stanford University, the United States, have found a plant protein, called BASL, that plays a key role in asymmetric division. In plant cells where the protein is absent, the cells do not divide. This is crucial information, says Dr. Dominique Bergmann, an assistant professor of biology, to understand unique ways of plants of

making the different types of cells in their bodies. Dr. Bergmann and colleagues tracked BASL in epidermal cells of *Arabidopsis*, a small plant used for genetic studies. By following where in the cell BASL resides during successful asymmetric cell divisions, they have discovered that BASL behaves like many of the proteins vital for animal asymmetric cell divisions, even though BASL's structure doesn't look like any of them.

The scientists tracked BASL by adding a fluorescent tag monitoring it under the microscope. They found that the protein behaved in some ways like proteins involved in asymmetric animal cell division. After the division, only one cell inherited BASL at the cell periphery and this helped the two daughter cells become different. When the instructions to make BASL were artificially put into any other cell in the plant, those cells (which normally wouldn't be able to make BASL) not only made BASL, but the protein was found in both the nucleus and a small region at the periphery. This proved that "all plant cells have within them the ability to put proteins in specialized areas," said Dr. Bergmann. This is something scientists assumed must be true because it was a necessary step for asymmetric cell division.

Dr. Bergmann said that it was not surprising to find that plants used a different protein for their divisions because of the way their cells are built. Furthermore, the process of plant cell division is structurally different from animal cell division. Unlike animal cells, plant cells have stiff cell walls and cannot divide the way animal cells do. "A plant cell actually has to build a new wall from the inside out in order to divide," said Dr. Bergmann. (Source: [www.lifesciencesworld.com](http://www.lifesciencesworld.com))

## A gene helps confer drought tolerance in maize

Scientists from the multinational agri-business giant Monsanto Company, the United States, and the global chemicals major BASF, Germany, have discovered that a naturally occurring gene can help maize (corn) plants combat drought conditions and confer yield stability during periods of inadequate water supplies. The companies will use the gene in their first-generation drought-tolerant corn product, which is designed to provide yield stability to farmers. The companies claim that the product

would be the first biotechnology-derived drought-tolerant crop in the world. The drought-tolerant corn contains the *cspB* gene from *Bacillus subtilis*. *CspB* codes for an RNA chaperone, which are commonly occurring protein molecules that bind to RNAs and facilitate their function.

The gene was first identified in bacteria subjected to cold stress conditions and further research has demonstrated that *cspB* helps plants cope with drought stress. In corn, *cspB* works by helping the plant maintain growth and development during times of water scarcity. A corn plant is particularly vulnerable to drought during reproductive growth stages. By mitigating the impact of drought on the plant, *cspB* helps provide yield stability. Improved yield stability is of significant value to farmers faced with unpredictable rainfall. (Source: [sev.prnewswire.com](http://sev.prnewswire.com))

## Safety tests for GM rice that fights allergy

In a first-of-its-kind advance towards the next generation of genetically modified foods intended to improve consumers' health, researchers in Japan have reported that a new transgenic rice designed to fight a common pollen allergy appears safe in animal studies. The researchers from the Transgenic Crop Research and Development Centre of National Institute of Agrobiological Sciences, and the Forestry Science Laboratory of Nippon Paper Industries Company, describe the development of a transgenic rice plant that is genetically engineered to fight allergies to Japanese cedar pollen, a growing public health problem in Japan that affects about 20 per cent of the population.

In laboratory studies, the scientists fed a steamed version of the transgenic rice and a non-transgenic version to a group of macaque monkeys every day for 26 weeks. At the end of the study period, the test animals did not show any health problems, in a demonstration that the allergy-fighting rice may be safe for consumption, the researchers say. Analysis of blood from monkeys showed that, with few exceptions, there were no significant differences in hematological or biochemical values between the two groups. Neither pathological symptoms nor histopathological abnormalities were observed. Thus, the scientists concluded that oral administration of transgenic

rice that contains T-cell epitopes from Japanese cedar pollen allergens has no adverse effects. (Source: [www.newscientist.com](http://www.newscientist.com))

## Plants can produce specific microbicide

Scientists have developed an anti-HIV microbicide that can be mass-produced in plants – in quantities large enough to make it affordable for people in developing countries. The microbicide, which has been found to prevent HIV transmission in cells, is a combination of two promising microbicide compounds – monoclonal antibody b12 and the protein cyanovirin-N. Together the compounds are “more potent at neutralizing HIV than its single components”, said Dr. Amy Sexton, lead author of the study and a researcher at the University of Melbourne, Australia.

The researchers also showed that the microbicide can be mass-produced by transferring the gene constructed for the microbicide into tobacco plant cells. “This way the plant expresses the gene and produces the microbicide in the same way it produces its own proteins,” says Dr. Sexton. Scaling-up production simply requires growing acres of the plants from genetically modified seeds, she adds. Microbicide gels and creams are a great hope for female-initiated protection from HIV/AIDS but so far trials have had mixed results. (Source: [www.scidev.net](http://www.scidev.net))

## Scientists create drought-resistant tomato

Scientists at the University of Arkansas at Little Rock (UALR), the United States, are developing a tomato plant hearty enough to grow in space and survive droughts and diseases. “Our transgenic plants are able to survive without water for three weeks,” says Dr. Mariya Khodakovskaya, UALR Assistant Professor of Applied Science. She says her genetically modified cherry red tomatoes are darker and bigger than the regular ones. It also has more lycopene and antioxidants, and produces more sugar and more fructose.

The experiment has gone beyond earth. It was the first transgenic tomato tested in outer space. “The long-term goal was to create a new food

source for astronauts,” says Dr. Khodakovskaya. But more than providing fresh produce for astronauts on extended missions, the research has important implications for developing crops that are resistant to drought and other stresses while improving the nutritional value of food. (Source: [www.todaysthv.com](http://www.todaysthv.com))

## Salt-tolerant crops one step closer to reality

An international team of scientists has developed salt-tolerant plants using a new type of genetic modification (GM), bringing salt-tolerant cereal crops a step closer to reality. The research team, based at the University of Adelaide in Australia, has used a new GM technique to contain salt in parts of the plant where it does less damage. The work has been led by researchers from the Australian Centre for Plant Functional Genomics and the University of Adelaide’s School of Agriculture, Food and Wine, in collaboration with the Department of Plant Sciences at the University of Cambridge, United Kingdom.

“Salinity affects the growth of plants worldwide, particularly in irrigated land where one-third of the world’s food is produced. And it is a problem that is only going to get worse, as pressure to use less water increases and quality of water decreases,” says the team’s leader, Prof Mark Tester, from the School of Agriculture, Food and Wine at the University of Adelaide and the Australian Centre for Plant Functional Genomics (ACPGF).

Prof. Tester says his team used the technique to keep salt – as sodium ions (Na<sup>+</sup>) – out of the leaves of a model plant species. The scientists modified genes specifically around xylem, the plant’s water conducting pipes, so that salt is removed from the transpiration stream before it gets to the shoot. “This reduces the amount of toxic Na<sup>+</sup> build-up in the shoot and so increases the plant’s tolerance to salinity,” Prof. Tester says. In doing so, the researchers have enhanced a process used naturally by plants to minimize the movement of Na<sup>+</sup> to the shoot. They used GM technique to amplify the process, helping plants to do what they already do. The team is now in the process of transferring the technology to crops such as rice, wheat and barley. (Source: [www.genengnews.com](http://www.genengnews.com))

## RECENT PUBLICATIONS

### Trends in Stem Cell Biology and Technology

The study of stem cell research is gaining the attention from a growing, multi-disciplinary community of scientists. *Trends in Stem Cells Biology and Technology* serves this growing community, as it reveals new aspects of stem cell research by specifically covering studies focused on spermatogonial stem cells, uniparental embryonic stem cell lines, the generation of gametes from stem cells, reprogramming germ cells to stem cells, genetic reprogramming of nuclear and somatic cells, tissue engineering and mechanotransduction of stem cells, and the development of stem cell technologies for the treatment of deafness, heart disease, corneal injury and diabetes.

### Gene Therapy of Cancer: Methods and Protocols

This second edition fully updates the publication with expert coverage of established and novel protocols involving both experimental and clinical approaches to cancer gene therapy. It contains overviews of new concepts and strategies with chapters on regulatory and ethical issues, developments, problems and possible limitations of design, and production of gene therapeutics as well as translational issues. The chapters include introductions to their respective topics, lists of the necessary materials and reagents, step-by-step rendition of protocols, and notes on troubleshooting and avoiding known pitfalls.

Cutting edge and authoritative, *Gene Therapy of Cancer: Methods and Protocols* is an ideal guide for all those who wish to explore the fast-paced and critical study of non-viral, viral, experimental and clinical cancer gene therapy.

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### 02-04 Sep

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United Kingdom

### Drug Delivery Summit

Contact: Mr. Sam Marsden  
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Tel: +44 (1787) 315112;  
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### 17-18 Sep

Berlin  
Germany

### RNAi Europe

Contact: Ms. Helen Read,  
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### 27-30 Sep

Aachen  
Germany

### Signal Transduction and Disease

Contact: Mr Tino Apel,  
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### 05-08 Oct

Lyon  
France

### World Vaccine Congress

Contact: Mr. Neil Darkes,  
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E-mail: neil.darkes@terrapinn.com.

### 06-08 Oct

Hannover  
Germany

### Bio-IT World Europe

Contact: Ms. Cindy Crowninshield,  
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### 08-10 Oct

Annamalai  
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### ICBF 2009 – International Conference on Challenges in Biotechnology and Food Technology

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