VATIS UPDATE

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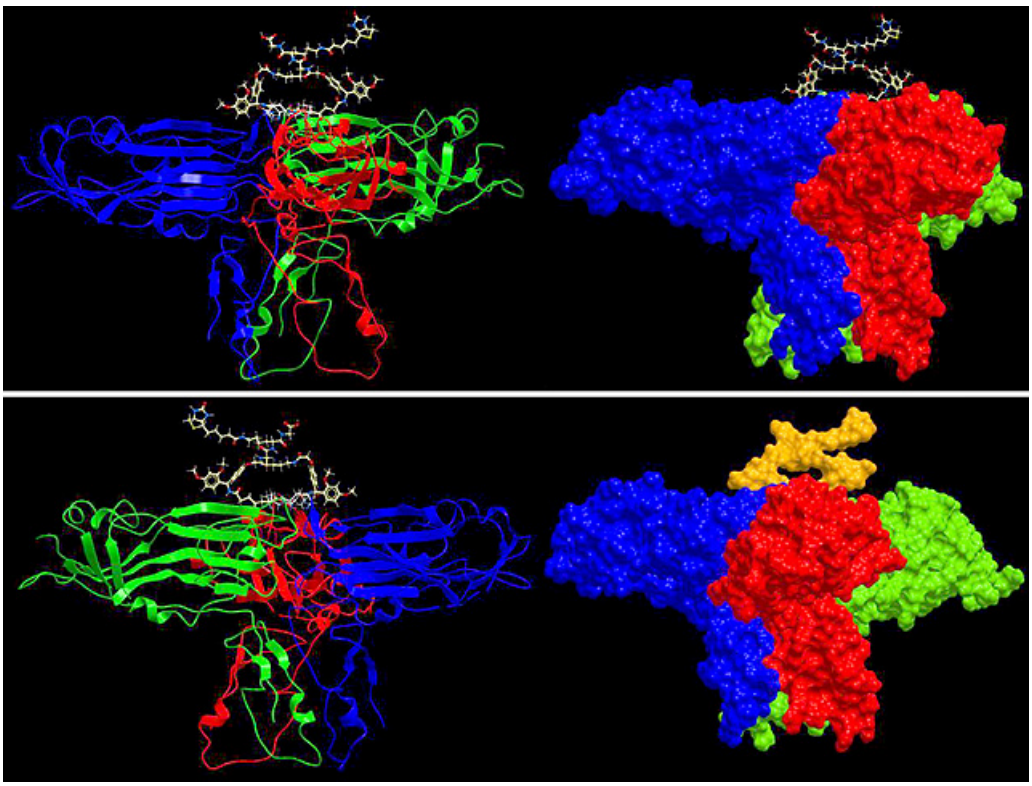
Apprise yourself with the latest technological innovations

Highlights

- Human genomes relate to zebrafish genomes
- Wound-healing genes found in flies
- Metabolic fingerprinting to identify proteins
- Glass and plastic implants to repair broken bones
- Radioactive bacteria targets pancreatic cancer
- Super salt-tolerant rice from wild parent



UNITED NATIONS ESCAP
Economic and Social Commission for Asia and the Pacific

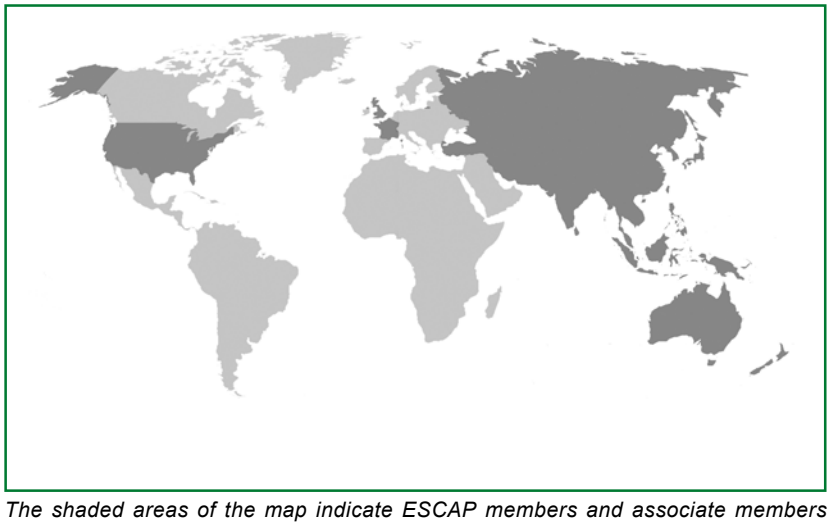
ASIAN AND PACIFIC CENTRE FOR TRANSFER OF TECHNOLOGY (APCTT)

BCIL

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

The structure of the building blocks of infectious potato leaf roll virus particles, modelled by cross-linking measurements with protein interaction reporter technology.

(Credit: Ms. Michelle Cilia & Mr. James Bruce, Agricultural Research Service, the United States)

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Funding for malaria, tuberculosis and HIV vaccine research

Aeras, a United States-based non-profit biotechnology firm that is advancing tuberculosis vaccines, the University of Oxford in the United Kingdom and Okairos, a Swiss biopharmaceutical company focused on T-cell vaccines, have received US$2.9 million grant from the Bill & Melinda Gates Foundation to support the development of vaccines against tuberculosis, malaria and human immunodeficiency virus (HIV). The grant allows the three groups to work together to develop scalable methods to enable large-scale production of multiple novel chimpanzee adenovirus vector constructs.

Novel constructs to be pursued include Okairos' proprietary technology platform that employs potent chimpanzee adenovirus vectors to stimulate robust T-cell and antibody responses against selected antigens. Dr. Adrian Hill, Director, Jenner Institute, Oxford University, said that "Chimpanzee adenovirus-based vaccines have recently been shown to safely induce exceptionally potent cellular immunity in adults, children and infants, and are in clinical trials involving over 1,000 vaccinees in seven countries." He described the investment as "very timely".

Source: www.biospectrumasia.com

Indian biotech sector to have independent regulator

In India, a statutory independent regulator for the country's rapidly growing biotechnology sector is on the cards. A Bill that provides for setting up the Biotechnology Regulatory Authority of India (BRAI) for regulating research on, and the transport, import, manufacture and use of organisms and products of modern biotechnology was introduced in the lower house of the Parliament (Lok Sabha) recently. The Biotechnology Regulatory Authority of India Bill, 2013, provides for the setting up of an inter-ministerial governing board to oversee the performance of the proposed BRAI. It also provides for setting up the Biotech Advisory Council to render strategic advice to the Authority on matters relating to developments in modern biotechnology and their implications in India.

The proposed BRAI would be the nodal agency of the government to ensure comprehensive safety assessment of organisms and biotech products. It will regulate the trials preceding clinical trials in the health sector and the present mechanism for regulating clinical trials will continue. It will also help India keep pace in regulatory measures with the rapid technology advancement in biotechnology and, at the same time, ensure safety to human and animal health and environment. Currently, activities involving genetically engineered organisms and products are broadly regulated under the "Rules for Manufacture, Use/Import/Export and Storage of Hazardous Micro-organisms/Genetically Engineered Organisms or Cells, 1989" notified under the Environment (Protection) Act, 1986, and the guidelines published by the Department of Biotechnology, under the Ministry of Science and Technology.

Source: www.thehindubusinessline.com

China backs its biopharma industry

China is in the middle of one of its 5-year economic plans, and it has got big plans for biopharmaceuticals. According to reports, the sales revenue from the industry came close to US$29 billion last year, up a whopping 18 per cent. The government is feeding about half a billion dollars in annual government support to keep the growth going at the same torrid pace.

China's government, which turned to biopharma as one of seven key pillars in its plan for fast economic growth, has focused on supporting vaccine development, diagnostics and protein-related drug discovery projects. There are more than 400 biomedicine producers in the country at present. China's growing economy, boasting a swelling group of middle class consumers, has drawn the close attention of the world's pharma industry. A number of major companies – like Sanofi, Merck and Novo Nordisk – have established big R&D operations in the country, anxious to tap the emerging market. There has been a steadily growing interest in developing new compounds, as many of China's best educated scientists return home to launch their own companies, often with government support.

Source: www.fiercebiotech.com

Neglected diseases research gets £5 million funding

In the United Kingdom, The Wellcome Trust has awarded £5 million to GlaxoSmithKline plc (GSK) for seeding drug discovery to support GSK's open approach to discovering and developing urgently needed new treatments for various diseases in low-income countries. The funding will help to move early-stage research to find new medicines for diseases such as malaria, tuberculosis, leishmaniasis and sleeping sickness to the next level.

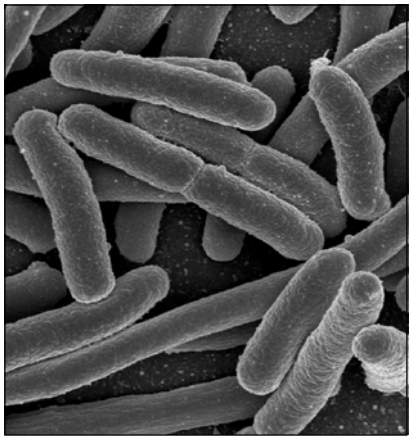
Scientists from around the world will work in collaboration with GSK drug discovery experts at the GSK facility in Madrid, Spain, with the ultimate goal of developing two high-quality experimental drugs over the next five years.

Diseases of low-income countries affect millions of people and yet research to find new treatments is struggling, owing to the complexity of the science and low return on investment. To address this, GSK set up its Madrid facility to be an engine room of scientific innovation, stimulating more R&D into diseases that affect the world's poorest people. In 2010, GSK opened the doors of the facility to external researchers to create the Open Lab. The result is academic scientists working alongside GSK scientists at a dedicated facility, enabling them to benefit from the facilities, resources and knowledge of a major pharmaceutical company to help them advance their own research projects.

Source: www.biospectrumindia.com

Diesel on demand, courtesy *E. coli*

In the United Kingdom, a team from the University of Exeter, with support from Shell, has developed a method to make bacteria produce diesel on demand. While the technology still faces many significant commercialization challenges, the diesel, produced by special strains of *Escherichia* coli bacteria, is almost identical to conventional diesel fuel and so does not need to be blended with petroleum products, as is often required by biodiesel derived from plant oils. This also means that the diesel is a 'drop-in' fuel in that it can be used with current supplies in existing infrastructure because engines, tankers



Escherichia coli bacteria

and pipelines do not need to be modified.

Prof. John Love from Biosciences at the University of Exeter said: "Producing a commercial biofuel that can be used without needing to modify vehicles has been the goal of this project from the outset. Replacing conventional diesel with a carbon-neutral biofuel in commercial volumes would be a tremendous step towards meeting our target of an 80 per cent reduction in greenhouse gas emissions by 2050. Global energy demand is rising and a fuel that is independent of both global oil price fluctuations and political instability is an increasingly attractive prospect." *E. coli* bacteria naturally convert sugars into fat to build their cell membranes. Synthetic fuel oil molecules can be created by harnessing this natural process.

Source: phys.org

Israel government to subsidize biotech funds

The Government of Israel will support the establishment and operation of four biotechnology funds in an effort to build a thriving local biotechnology industry and attract investments in Israel, the country's Finance Ministry has announced. The pre-qualification process for participation in the government-backed biotechnology fund tender has been completed, it said in a statement. The public-private programme is a joint initiative by the Finance Ministry, the Industry, Trade and Labour Ministry and the Chief Scientist's Office.

The funds taking part in the government-supported initiative are expected to create new partnerships between local industry and the United States industry, the Finance Ministry said. While the Israeli expertise in biotechnology is considered to be among the best in the world, the country's biotech companies have not matured to the point of becoming an industry. The relatively long life cycle of biotechnology investments and the "high-risk/high-reward" characteristic of these investments have largely restricted the local venture-capital funds, institutional investors and other local investors from making investments in this area. This problem has now grown more severe because of the global financial crisis.

To close this funding gap, which has stymied the growth of the local biotechnology industry, the government has decided to subsidize funding efforts and thereby encourage Israeli biomedical companies to remain in the country, rather than being sold at an early stage to foreign companies. Under the terms of the tender, the government will provide the four funds in the pre-qualification process with US$24 million each, on the condition that they each raise US$76 million in financing. In addition, the government will award the fund that raises the most financing with an additional bonus of around US$ 8 million.

Source: www.jpost.com

Selventa, Seegene to hasten personalized medicine

In the Republic of Korea, Seegene and Selventa have entered into a strategic collaboration to develop novel molecular diagnostics including autoimmune, cancer and infectious diseases. The synergistic combination of Selventa's Systems Diagnostics (SysDx) multi-omic analytics platform and Seegene's TOCE™ and DPO™ multiplex polymerase chain reaction (PCR) technology will result in powerful new Molecular Diagnostics (MoDx) that accelerate the adoption of personalized medicine in major classes of disease.

Selventa's SysDx works by analysing a holistic range of a patient's molecular information to identify a panel of multi-omic biomarkers that can accurately diagnose a patient's disease as well as response or non-response to a therapy. Seegene's qTOCE technology provides real-time simultaneous detection and quantification of multiple targets in a single channel, and enables multiplex assay development across a wide range of applications, including high-multiplex quantitative real-time PCR and highly selective mutational analysis. The collaboration is expected to facilitate better patient diagnostics, improved patient care, and reduced healthcare costs.

Source: www.biospectrumasia.com

Anti-diarrhoea vaccine goes on-stream

India's first vaccine against rotavirus, Rotavac from Bharat Biotech, has cleared all clinical trials and will be available for sale in the market by 2014, subject to clearance from the Drug Controller General of India (DCGI). The vaccine development was supported by the Department of Biotechnology (DBT), the Bill and Melinda Gates Foundation, Programme for Appropriate Technologies in Health (PATH), and several United States public and private organizations that include Centres for Disease Control (CDC), the National Institutes of Health (NIH) and Stanford University. Bharat Biotech invested technical, manufacturing, and financial resources towards vaccine development, said Krishna M. Ella, Chairman and Managing Director of the company.

The cost of Rotavac is likely to be around Rs 54 (US$0.90) per dose, which is 1/40th that of imported vaccines available in Indian market at present, said Dr. M.K. Bhan, former DBT Secretary, who isolated the rotavirus strain in 1985. "Our trials have shown an efficacy of 56 per cent in severe diarrhoea and 61 per cent in very severe diarrhoea cases. There is no side-effect or safety issue," Dr. Bhan added. The Phase III clinical trial of the vaccine was carried out on 6,799 infants in the country at three sites.

Source: timesofindia.indiatimes.com

Allecra's 15 million euro kick-off

The Swiss banking group Edmond de Rothschild, the Dutch venture capital company Forbion Capital Partners and the German venture capital firm EMBL Venture Funds have jointly made a 15 million euros Series-A investment in a new anti-infectives company, Allecra Therapeutics GmbH. The new German-French company aims to bring two novel antibiotics to clinical stage targeting multi-drug resistant gram-negative microbes such as *Pseudomonas aeruginosa* or *Klebsiella pneumoniae*. The required intellectual property has been already in-licensed from Orchid Chemicals & Therapeutics Ltd., India. Allecra's drug development will be based on a strategic partnership between Allecra's founders and Orchid.

Source: www.eurobiotechnews.eu

Merck, Pfizer partner on investigational diabetes drug

In the United States, Merck & Co. Inc. and Pfizer Inc. have agreed to collaborate on the development of a combination drug for type 2 diabetes. The companies will work on combining Pfizer's ertugliflozin and metformin with Merck's Januvia sitagliptin. Ertugliflozin pill is currently in the Phase III testing stage, with trials expected to begin later this year. Merck will continue to retain the rights to its existing portfolio of sitagliptin-containing products. Under the agreement, Pfizer has received an upfront payment of US$60 million and will be eligible for additional payments based on the achievement of future clinical, regulatory and commercial milestones. Merck and Pfizer will share revenues and certain costs on a 60:40 per cent basis.

Source: www.bizjournals.com

Maruishi to develop, commercialize CR845 in Japan

Cara Therapeutics Inc., the United States, has licensed Maruishi Pharmaceutical Company, Japan, the exclusive rights to develop, manufacture and commercialize in Japan CR845, Cara's lead analgesic drug candidate for acute pain and uremic pruritus. Under the terms of the agreement, Cara received an

up-front payment, including an equity investment, and is eligible to receive further milestone payments related to pre-defined clinical and regulatory events in Japan and the United States, as well as royalties on Japanese sales of any marketed products containing CR845.

Source: www.news-medical.net

Carbios and INRA form collaboration

In France, the green plastics company Carbios has secured exclusive patent rights under a collaboration agreement with the National Institute for Agricultural Research (INRA). The five-year, 7 million euro collaboration of Carbios and INRA at the Toulouse White Biotechnology (TWB) research centre is part of THANAPLAST™ – the 22 million euro private-public consortium on plastics involving INRA, the National Centre for Scientific Research (CNRS), University of Poitiers, the Barbier Group, the Limagrain Group and Deinove.

The Carbios-INRA project will focus on the development of bioprocesses for recovering plastic waste and producing economically competitive bio-based polymers. The collaboration will be interdisciplinary and will include R&D staff from TWB, the 3BCar Carnot Institute and two INRA groups. The INRA groups will focus on enzymatic catalysis, enzyme screening and cell engineering. Carbios is developing solutions for transforming the global supply of over 100 million tonnes of plastic waste into a novel, high-quality, renewable raw material for the plastics industry. The company offers a viable economic alternative to the depletion of agricultural resources and the rarefaction of fossil fuels.

Source: www.eurobiotechnews.eu

Monsanto and Bayer CropScience to share technology

Multinational crop biotech rivals Monsanto Co., the United States, and Bayer CropScience, Germany, have signed a series of cross-licensing deals to share certain crop biotechnology for weed and pest control. Monsanto said it will provide Bayer CropScience with a royalty-bearing licence to herbicide-tolerant soybean technology, known as Genuity Roundup Ready 2 Yield and Genuity Roundup Ready 2 Xtend technology, in the United States and Canada. Bayer CropScience also will receive a royalty-bearing licence to utilize Monsanto's Intacta RR2 PRO, an insect-protected soybean, in Brazil with an option to a royalty-bearing licence in other countries of Latin America in the future. Bayer CropScience will be able to stack the genetic traits with other traits in the crops it develops under certain conditions.

In return, Bayer CropScience will grant Monsanto licences to evaluate some of its own technologies for controlling corn rootworm pests and for making crops that are herbicide-tolerant. Financial terms of the deals have not been disclosed. Monsanto and some other agricultural biotech companies have been working to come up with new combinations of chemicals to try to fight back weed resistance to Roundup herbicide. Insect resistance is also a growing concern in some areas.

Source: www.reuters.com

Thermo Fisher to buy Life Tech for US$13.6 billion

In the United States, Thermo Fisher Scientific Inc. (TFS) is buying Life Technologies Corp. for US$13.6 billion in a deal that would make TFS one of the top two companies in the hot field of genetic testing. The deal will also catapult TFS, the world's largest scientific and laboratory equipment company, to the forefront of the fledgling field of personalized medicine, where research is uncovering the hereditary underpinnings of diseases.

Analysts estimate the combined company's 2013 revenue at about US$17 billion. The acquisition will also enhance TFS's offerings in the fast growing field of food safety, and its ability to grow in China and other emerging markets. TFS will assume Life Tech's net debt of about US$2.2 billion.

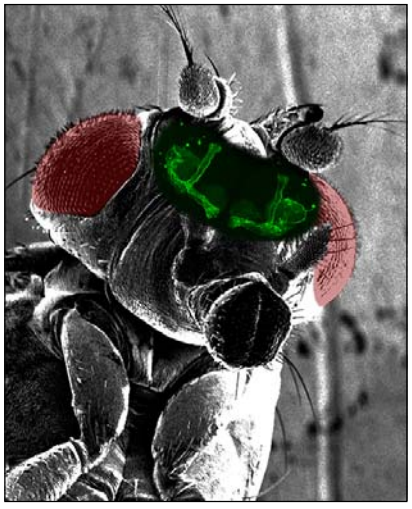
Source: www.reuters.com

US$800 million fund for biotechnology, healthcare deals

Capital Royalty L.P., the United States, has put together a US$ 805 million fund to back a new package of loans and royalty deals with biotechnology, pharmaceutical and other healthcare companies looking for "alternative" sources of financing. Capital Royalty Partners II will work directly with leading healthcare companies, research institutions and inventors to offer highly customized growth financing solutions to support product commercialization, pipeline development and other growth opportunities. The Fund has an emphasis on credit-oriented investments in approved as well as commercialized healthcare products and technologies. It will invest globally and will primarily target investments between US$20 million and US$ 200 million, though it will maintain the flexibility on the upper limit.

Source: www.fiercebiotech.com

'Jumping genes' may contribute to aging-related brain defects



A superimposed image shows where transposons become active (green colour) in a fruit fly's brain

In a recent study, Associate Professor Mr. Joshua Dubnau and his colleagues at the Cold Spring Harbor Laboratory (CSHL), the United States, have shown that transposons, called the "jumping genes", increase in abundance and activity in the brains of fruit flies as they age. Transposons are typically repeat DNA sequences that transpose or reinsert themselves, when activated, into another part of an animal or plant genome. In doing so, they are thought to either provide variations in genetic function or induce potentially fatal disruptive defects.

Mr. Dubnau's interest was piqued by an experiment in which his team showed that when the activity of a protein called Argonaute 2 (Ago2) was perturbed, so was long-term memory. "This is a neurodegenerative defect that gets profoundly more apparent with age of the flies," notes Mr. Dubnau. Since Ago2 is known to be involved in protecting against transposon activity in fruit flies, the researchers were compelled to look for transposons. They found that there is a marked increase in transposon levels in the brain cells by 21 days of age in normal fruit flies. The levels were observed to increase steadily with age. These transposons, in particular the one called gypsy, were highly active, jumping from place to place in the genome.

When Ago2 was blocked from being expressed in fruit flies, transposons accumulated at a much younger age. Accompanying this transposon accumulation were defects in long-term memory that mirrored those usually seen in much older flies, as well as a much reduced lifespan. A previous paper from the Dubnau lab had established a connection between transposons and neurodegenerative diseases such as amyotrophic lateral sclerosis (ALS) and frontotemporal lobar degeneration (FTLD). The link was the protein TDP-43, which they showed controls transposon activity. Taken together with the results in the new paper, Mr. Dubnau proposes that a "transposon storm" may be responsible for age-related neurodegeneration as well as the pathology seen in some neurodegenerative disorders.

Source: www.cshl.edu

Human genomes relate to zebrafish genomes

Researchers in the United States have demonstrated that 70 per cent of protein-coding human genes are related to genes found in zebrafish and that 84 per cent of genes associated with human diseases have a zebrafish counterpart. The research team developed a high-quality annotated zebrafish genome sequence to compare with the human reference genome. Only two other large genomes have been sequenced to this high standard: the human genome and the mouse genome. The completed zebrafish genome would be an essential resource that drives the study of gene function and disease in people.

While zebrafish may seem at first glance to be a strange comparator to humans, they too are vertebrates and share a common ancestor with humans. They are remarkably biologically similar to and share the majority of the same genes as humans, making them an important model for understanding how genes work in health and disease. "This genome will allow researchers to understand how our genes work and how genetic variants can cause disease in ways that cannot be easily studied in humans or other organisms," said a senior author of the study Dr. Derek Stemple from the Wellcome Trust Sanger Institute.

Zebrafish research has already led to biological advances in cancer and heart disease research, and is advancing our understanding of muscle and organ development. By modelling the human disease genes in zebrafish, the scientists hope that resources worldwide will produce important biological information regarding the function of these genes and possibly find new targets for drug development, says Professor Jane Rogers, a senior author of the study and formerly from the Genome Analysis Centre. Zebrafish have the highest repeat content in their genome sequences so far reported in any vertebrate species – almost twice as much as seen in their closest relative, the common carp. Also unique to the zebrafish, the scientists identified chromosomal regions that influence sex determination.

Source: www.sanger.ac.uk

Genetic variations predict side-effects of chemotherapy

Seemingly benign genetic differences of patients could influence who develops side-effects to chemotherapy, according to a study by Mayo Clinic, the United States. The study identified gene variations that can predispose patients to chemotherapy-induced peripheral neuropathy, a condition that is hard to predict, but often debilitating enough to cause cancer patients to stop their treatment early. The study – which implicates the genes EPHA5, ARHGEF10 and PRX – is the first to mine large swaths of the human genome for predictors of chemotherapy side-effects.

"Our study creates a path for how to approach the whole genome in order to tailor cancer treatments," explains Dr. Andreas Beutler, an oncologist at Mayo Clinic Cancer Centre and senior author of the study. Chemotherapy-induced peripheral neuropathy affects an estimated 20-30 per cent of cancer patients. There are approximately 50 genes linked to a hereditary form of peripheral neuropathy. However, many of the people who have a mutation in one of these genes experience no symptoms until they are exposed to chemotherapy.

Dr. Beutler's approach relied on exome sequencing, a type of DNA sequencing that focuses on the protein-coding exonic regions of the genome that code for functional proteins. These regions are believed to harbour about 85 per cent of all disease-causing mutations. Dr. Beutler's team carried out exome sequencing on 20,794 genes from 119 cancer patients, over half of whom had developed chemotherapy-induced peripheral neuropathy during the course of a chemotherapy clinical trial. Among the 50 hereditary neuropathy genes, they found one – EPHA5 – that tend to predispose the patients to chemotherapy-induced peripheral neuropathy. Next, among the remaining genes, the researchers discovered two new genes – ARHGEF10 and PRX – that are also associated with chemotherapy-induced peripheral neuropathy. They validated those findings in another group of 75 cancer patients.

Source: www.mayoclinic.org

A surprising new function for small RNAs in evolution

Insect bodies are usually covered with a large number of microscopic hairs, as is the case with the legs of many closely related species of the fruit fly (*Drosophila).* However, the insects have a bald patch on the second pair of legs, intriguingly known as the naked valley. Previous work had shown that the size of this patch is regulated by the gene ultrabirax (Ubx) and that it differs between species. An international research team – which includes Mr. Christian Schlötterer and Mr. Alistair McGregor from the Institute of Population Genetics of University of Veterinary Medicine (Vetmeduni) Vienna, Austria – has now discovered a completely new mechanism by which evolution can change the appearance of an organism. The researchers found that the number of hairs on the legs of fruit fly (*Drosophila melanogaster*) varies according to the level of activity of a microRNA.

Their search for the genetic basis of the variation led the researchers to a segment of fruit fly DNA that contained four genes. Three of the genes were known to encode proteins with no role in the development of the hairs. The fourth gene, known as miR-92a, encodes for a microRNA. Previous experiments had shown that an increased activity of the miR-92a gene was associated with a loss of hairs from the fly's wings. By overexpressing the gene in the legs of the fruit flies, the scientists were able to cause hair loss on the insect's legs.

Source: www.vetmeduni.ac.at

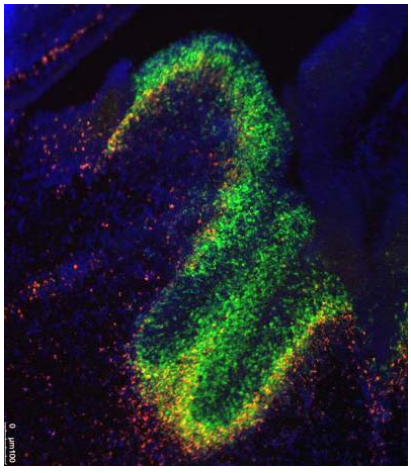
New light on DNA copying process

In the United Kingdom, research led by a scientist at the University of York has thrown new light on the way breakdowns in the DNA copying process inside cells can contribute to cancer and other diseases. Professor Peter McGlynn in the University's Department of Biology led a team of researchers who have discovered that the protein machines that copy DNA in a model organism pause frequently during this copying process, creating the potential for dangerous mutations to develop. The research involved the University of Aberdeen School of Medical Sciences, the Centre for Genetics and Genomics of the Queen's Medical Centre, University of Nottingham, and the Memorial Sloan-Kettering Cancer Centre in the United States.

The project focused on *Escherichia coli* bacterium – a powerful model for studying the DNA copying process – the study of which has revealed many aspects of DNA metabolism in more complex organisms such as man. "Our work demonstrates that when organisms try to copy their genetic material, the copying machines stall very frequently, which is the first step in formation of mutations that, in man, can cause cancers and genetic disease," Prof. McGlynn says.

Source: www.york.ac.uk

Brain development is led by 'junk' DNA



Fluorescent dyes track the genes they affect in the developing mouse brain

Specific DNA once dismissed as "junk" plays an important role in brain development and might be involved in several devastating neurological diseases, scientists at University of California-San Francisco (UCSF), the United States, have found. The UCSF scientists studied molecules called long non-coding RNA (lncRNA), which are made from DNA templates in the same way as RNA from genes. "The function of these mysterious RNA molecules in the brain is only beginning to be discovered," said Dr. Daniel Lim, an assistant professor of neurological surgery, a member of the UCSF Eli & Edythe Broad Centre of Regeneration Medicine and Stem Cell Research, and the senior author of the study.

Mr. Alexander Ramos, an MD/PhD student at UCSF and first author of the study, conducted extensive computational analysis to establish a link between lncRNAs within cells and the activation of genes. Mr. Ramos found an association between a set of 88 long non-coding RNAs and Huntington's disease, a fatal neurodegenerative disorder. He also found weaker associations between specific groups of long non-coding RNAs and Alzheimer's disease, convulsive seizures, major depressive disorder and various cancers.

As lncRNA molecules don't carry blueprints for any protein, they were thought to not influence a cell's fate or actions. However, lncRNAs also are transcribed from DNA, just like messenger RNA, and consist of unique sequences of nucleic acid building blocks. Evidence indicates that lncRNAs can tether structural proteins to the chromosomes that contain DNA, and in so doing affect gene activation and cellular physiology indirectly without altering genetic code. In other words, within the cell, lncRNA molecules act "epigenetically" – beyond genes – not through changes in DNA.

The neurons in the sub-ventricular zone that the scientists focused on the most give rise to various cell types of the central nervous system. This is the part of the brain where neurons are destroyed in Huntington's disease, a condition triggered by a single genetic defect. Mr. Ramos combined several advanced techniques for sequencing and analysing DNA and RNA to identify where certain chemical changes happen to the chromosomes, and to identify lncRNAs on specific cell types found within the central nervous system. The research revealed roughly 2,000 such molecules that had not been described previously, out of about 9,000 thought to exist in mammals ranging from mice to humans.

Source: www.ucsf.edu

Wound-healing genes found in flies

Biologists at University of California-San Diego, the United States, have identified eight genes never before suspected to play a role in wound healing that are called into action in the vicinity of wounds. Their discovery was made in the fruit fly *Drosophila.* "Many of the key molecules and proteins involved in *Drosophila* wound healing are involved in mammalian wound healing," says Ms. Rachel Patterson, the first author of the study. That makes them attractive candidates for many kinds of wound-healing drugs or other compounds that could be used to treat skin ailments.

By puncturing the cuticle and epidermis of fruit fly embryos in their experiments, the scientists examined 84 genes that are turned on and 78 that are turned off as the fly embryo responds to healing. From these 162 genes, they identified eight genes that are expressed at either very low levels or not at all in most cells during development, but are activated near the puncture wounds. The researchers were surprised to discover that an immune response begins as soon as the flies' cuticles and epidermis were punctured, releasing antimicrobial peptides and other compounds that prepare the embryo should bacteria or fungi enter the site of injury. The key to the technique was the use of the enzyme trypsin, which activates genes involved in wound healing. The next step is to see if the results that the team obtained can be translated to existing human therapies by incorporating specific, regulated enzymes and antimicrobial peptides at the sites of wounds, said Ms. Patterson. She said the results might also have application to treating chronic skin diseases such as psoriasis and eczema in which levels of these enzymes are known to be abnormal.

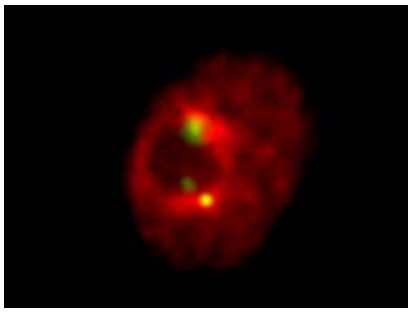
Source: phys.org

Protein maintains order in the nucleus

Researchers led by biologist Mr. Patrick Heun at the Max Planck Institute of Immunobiology and Epigenetics in Freiburg, Germany, have identified a protein that ensures the correct arrangement of the chromosome centromeres, clustered in a few specific locations in the cell nucleus. Scientists from the BIOSS Centre for Biological Signalling Studies of the University of Freiburg cooperated in the study. Using fruit flies as a model, the researchers showed that a single protein plays a major role in this process. If this protein is missing, DNA damage in the cell increases and cell division is impaired.

In a series of experiments using the fruit fly *Drosophila melanogaster*, Mr. Heun and colleagues showed that the nucleplasmin-like protein (NLP) plays a major role for centromere positioning. It binds specifically to the centromere region of the chromosomes and causes their clustering near the nucleolus, an important area of the nucleus. The site where the protein binds to the chromosome depends on the packaging of the DNA. However, the DNA sequence at this site does not appear to matter, the scientists discovered. NLP also exists in a slightly modified form in humans and is known as nucleophosmin.

When the researchers eliminate the NLP protein using the gene knockdown method, the centromeres fall apart and distribute themselves throughout the nucleus. Owing to this change in the spatial architecture of the nucleus, silenced areas of DNA are activated and damage accumulates in the DNA double-strand. Such changes can impair the genome stability and ultimately contribute to the emergence of cancer. In addition to



Clusters of centromeres (greenish) of the Drosophila chromosomes

NLP, the scientists also succeeded in decoding the interactions with two other already known proteins. The nucleolus protein module anchors the complex consisting of the centromere and NLP to the nucleolus, and the insulator protein CTCF supports NLP in the clustering of the centromeres.

Source: www.mpg.de

Newly discovered blood protein solves an old riddle

Researchers at Lund University in Sweden have discovered a new protein that controls the presence of the Vel blood group antigen on human red blood cells. The discovery makes it possible to use simple DNA testing to find blood donors for patients who lack the Vel antigen and require a blood transfusion. Because there has not been any simple way previously to find these rare donors, there is a global shortage of Vel-negative blood. The largest known accumulation of this type of blood donor is found in the Swedish county of Västerbotten, which exports Vel-negative blood to all over the world.

Lund University researchers have discovered that the presence of the Vel antigen in red blood cells is controlled by a previously unknown protein (SMIM1) that is not carried by those who lack the Vel antigen. The findings have major clinical significance, according to Professor Martin L. Olsson, a consultant in transfusion medicine, as it helps identify Vel-negative blood donors using simple DNA tests. Another interesting aspect is that the new protein is unlike any previously known protein and appears to be present on the red blood cells of other species as well. SMIM1 is similar to other molecules used by malaria parasites to infect humans, and therefore could be a long-sought malaria receptor on the red blood cells, the scientists say. *Contact: Professor Martin L. Olsson, Faculty of Medicine, Lund University, Box 117, 221 00 Lund, Sweden. Tel: +46 (705) 773207; E-mail: martin_l.olsson@med.lu.se.*

Source: www.lunduniversity.lu.se

Plant protein shape puzzle solved

Researchers from North Carolina State University, the United States, believe they have solved a puzzle that has vexed science to date. The researchers have provided the first three-dimensional (3-D) model of cellulose synthase – an enzyme that links glucose into long-chain cellulose, the basic building block within plant cell walls that gives plants structure. The new understanding of the structure of cellulose synthase may allow scientists to genetically engineer plants and trees for better fibres or stronger wood, for example.

“This structural model gives us insight into how cellulose synthesis works,” said Dr. Yaroslava Yingling, a materials science and engineering professor and an author of the study. “In the long term, it could result in new genetically modified plants that can be tweaked to induce specific engineered properties of cellulose.” The study examined

the structure of one cellulose synthase found in cotton fibres. The researchers compared their model with the structure of a similar enzyme in bacteria and found that the proteins were similarly folded in key regions required for cellulose synthesis. They identified in *Arabidopsis thaliana* potential causes for defective cellulose synthesis in mutant plants by making analogies to the modelled cotton cellulose synthase.

Source: news.ncsu.edu

Metabolic fingerprinting to identify proteins

A new study by graduate student Ms. Natalie Prior from the Department of Biology, University of Victoria, Canada, and her colleagues has demonstrated the suitability of proteomics in determining the composition of gymnosperm pollination drops. "The proteins we are finding are really starting points for other research," claims Ms. Prior. "We can identify these proteins, but there is a lot more research that can be done once we know what proteins are there."

Mediating signalling between the pollen and the ovule, one role of the pollination drop is to provide a germination medium, which can be species specific. Additionally, in some species, anti-microbial proteins have been identified, suggesting that pollination drops provide protection in addition to acting as a landing spot for pollen grains. Identification of the proteins found in pollination drops provides a metabolic fingerprint and thereby helps understand seed plant evolution. Comparing the proteomes of different species allows for protein identification, elucidating ovule-pollen interactions in gymnosperm. "We are using proteomics to examine the biological relevance of the proteins that the pollen grain is exposed to in the drop," Ms. Prior comments.

Source: www.eurekalert.org

Protein interference with appetite-reducing hormone

Since 1994, it was known that the appetite-regulation hormone leptin was made by fat cells, reduced appetite and interacted with insulin. However, the molecular details of its function remained elusive. Researchers in the United States have identified a protein that can interfere with the brain's response to leptin, thus revealing a significant part of one of those mechanisms. They also created a compound that blocks the protein's action – which could lead to an anti-obesity drug.

Using mice fed on a high-fat diet, scientists from University of Texas Medical Branch (UTMB) and University of California-San Diego (UCSD) explored the role of Epac1 protein in blocking leptin's activity in the brain. They found that mice genetically engineered (GE) to be unable to produce Epac1 had lower body weights, body fat and blood-plasma leptin levels, besides better glucose tolerance, than normal mice. When they used an Epac inhibitor to treat brain-slice cultures from normal laboratory mice, they found elevated levels of proteins linked with higher leptin sensitivity. Similar results were seen in GE mice that lacked the Epac1 gene, said Dr. Xiaodong Cheng, a UTMB professor lead author of a paper in the study.

In addition, normal mice treated with the inhibitor had significantly lower levels of leptin in their blood plasma – an indication that Epac1 also affected their leptin levels. Dr. Cheng's team suspected a link between Epac1 and leptin because Epac1 is activated by cyclic AMP (cAMP), a signalling molecule that is linked to metabolism and leptin production and secretion, which is tied to a multitude of other cell signalling processes. Dr. Cheng believes that understanding how cAMP acts through Epac1 (and another form of the protein called Epac2) could create a new drug therapy that will help fight obesity and diabetes.

Source: www.utmb.edu

Proteins filter out antibiotics from water

Researchers at University of Cincinnati, the United States, have developed and tested a solar-powered nano-filter that is able to remove harmful antibiotics and carcinogens from water bodies at a significantly higher rate than the currently used activated carbon-based filters. Mr. Vikram Kapoor, an environmental engineering doctoral student, and Mr. David Wendell, an assistant professor of environmental engineering, developed and tested the new filter made of two bacterial proteins that was able to absorb 64 per cent of antibiotics in surface waters vs. about 40 per cent absorbed by activated carbon filter.

One of the more exciting aspects of their filter is the ability to reuse the antibiotics that are captured. The new filtering technology, called a proteovesicle system, employs one of the very elements that enable drug-resistant bacteria to be so harmful, a protein pump called AcrB. One other major innovation is the power source, a light-driven bacterial protein called Delta rhodopsin, which supplies AcrB with the power to move the antibiotics.

Source: www.uc.edu

Glass and plastic implants to repair broken bones

Scientists in Spain are developing novel implants made up of a glass and plastic mix that can hold bones together and dissolve later when the implants are not needed anymore. The implants could make obsolete the steel pins that are often employed to hold the bones together after fracture, and reduce the number of surgeries patients with big breaks have to go through. Mr. Jose Ramon Sarasua and Mr. Aitor Larranaga, researchers from the materials engineering department of the UPV/EHU-University of Basque Country, have measured the effect that "bioglass" has on the thermal degradation of polymers currently used in medicine. The researchers are at present synthesising and shaping bioimplants.

The main component, on the whole, tends to be a biodegradable polymer, which will gradually disappear as the bone occupies its own place. As the polymer is too soft, bioglass was added to the polymer in this piece that helps the bone to regenerate to give the polymer tough mechanical properties. The biodegradable polymer/bioglass composite system can be manufactured using thermoplastic processes, and were found to have a lower thermal stability compared with the systems without bioglass.

The researchers are proposing that a chemical transformation of the bioglass surface be made using plasma. Thus, by creating protective layers for the bioglass particles, reaction to the polymer is prevented and thus the final product remains undamaged. "These composites that have a biodegradable polymer base are candidates with a bright future in mending broken bones or in regenerating bone defects," said Mr. Sarasua. After the material has temporarily substituted the bone and encouraged it to regenerate, it gradually disappears as the bone returns to its proper place.

Source: www.thehindubusinessline.com

A new approach to spinal muscular atrophy

Spinal muscular atrophy (SMA) is a debilitating neuromuscular disease that in its most severe form is the leading genetic cause of infant death. By experimenting with an amyotrophic lateral sclerosis (ALS) drug in two very different animal models, researchers at Brown University and Boston Children's Hospital, the United States, have identified a potential mechanism for developing an SMA treatment. The research reports that the drug Riluzole advanced neural cell development in a mammalian model of SMA and restored neuromuscular function and mobility in a worm model (*Caenorhabditis elegans*) of the disease.

Despite Riluzole's failure in severely affected SMA patients, what makes the new research encouraging, said Dr. Anne Hart, professor of neuroscience at Brown and senior author on the paper, is that it traces the beneficial action of Riluzole to specific "SK2" potassium channels in worm neurons. Humans have these channels too, and their precise targeting by a new drug, she said, could make a more meaningful difference, at least for some patients. As SMA has a lot in common with ALS, Dr. Hart thought Riluzole might still be worth studying in the context of SMA.

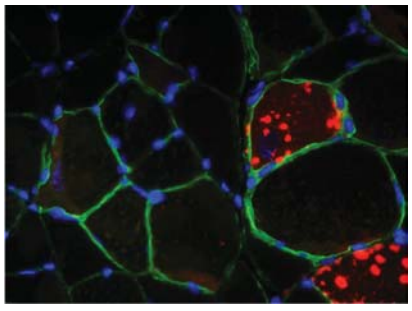
The Children's Hospital team worked in mouse neuronal cells while Dr. Hart's team at Brown worked in the worms. For each system, the researchers created SMA models in different ways by disabling the gene that produces the survival motor neuron (SMN) protein. In the mouse neuronal cells, the researchers found that Riluzole promoted the growth of axons that was lacking in the SMN-depleted cells. However, Riluzole did this not by increasing SMN levels, but by maturing the neurons more quickly in normal cells. Most earlier attempts to treat SMA had relied on trying to maintain or restore higher levels of SMN.

The Brown researchers found that Riluzole restored two important neuromuscular behaviours of SMA worms: the pumping action that permits the worms to move food through their digestive tracts and the body bending that they perform when swimming. To learn how the drug had this effect, they performed further experiments testing various potassium channels, including SK2, that Riluzole is known to act upon. Losing these channels did not cause more problems in animals with less SMN protein, but losing the SK2 potassium channels in particular made neuromuscular function worse. Without the SK2 channels, the drug Riluzole did not improve function.

Source: news.brown.edu

Uncleaned cells mean weak muscles

The protein complex mTORC1 promotes muscle growth. However, should this complex remain constantly active, it impairs the ability of the cells to self-clean, causing myopathy. Scientists at University of Basel, Switzerland, have described the mechanism involved in this. Similar to parts in a machine, individual components of a cell too



Muscle fibres in mice with hyperactive mTORC1 (accumulated waste in red)

wear out with time. The capacity for autophagy, a cellular self-cleaning process, decreases with age and results in a range of age-related diseases such as cancer, heart disease and muscle weakness. In this process, the growth regulator, mTORC1, plays a key role. The exact relationship has now been discovered by Professor Markus Rüegg and his team at Biozentrum, working with scientists from the Department of Biomedicine.

Until recently, it was assumed that the protein complex mTORC1 in the skeletal muscle plays a key role in growth regulation but not in autophagy. Prof. Rüegg and his team have refuted this widely accepted assumption. They explored the cellular processes in skeletal muscle of mice, in which mTORC1 was permanently activated. The scientists observed a progressive myopathy, particularly in aging mice, which could be ascribed to impaired autophagy. Interestingly, the researchers could reverse the symptoms by administering rapamycin, which inhibits mTORC1, thereby promoting autophagy.

By maintaining the balance between muscle growth and breakdown, mTORC1 plays a major role in tightly coordinating the mechanism of autophagy. An overactive mTORC1 complex may also contribute to the development of the age-related muscle weakness in humans. Therefore, a closer study of the mTORC1 regulation system in the context of aging may provide new therapeutic approaches for the counteracting of the muscle weakness. *Contact: Dr. Markus Rüegg, Biozentrum, University of Basel, Klingelbergstrasse 50/70, 4056 Basel, Switzerland. Tel: +41 (61) 267 2223; E-mail: markus-a.ruegg@unibas.ch.*

Source: www.unibas.ch

'Designer' tracer to quantify elusive brain protein

One of the biggest challenges with Alzheimer's disease (AD) is that by the time physicians can detect behavioural changes, the disease has already begun its irreversibly destructive course. Scientists know about the involvement of toxic brain lesions created by amyloid beta and tau proteins. Yet, emerging therapies targeting these lesions have failed in recent clinical trials, suggesting that successful treatments will require diagnosis of disease at its earliest stages.

Using computer-aided drug discovery, a molecular biochemist and a molecular imaging chemist at Ohio State University (OSU), the United States, are collaborating to create an imaging chemical that attaches predominantly to tau-bearing lesions in living brain. Their hope is that the "designer" tracer will open the door for earlier diagnosis – and better treatments for AD, frontal temporal dementia and traumatic brain injuries like those suffered by professional athletes – all conditions in which tangled tau filaments accumulate in brain tissue.

"We are creating agents that are specifically engineered to bind the surface of aggregated tau proteins so that we can see where and how much tau is collecting in the brain," said Dr. Jeff Kuret, a professor of molecular and cellular biochemistry at OSU College of Medicine. "We think the 'tau signature' can be used to improve diagnosis and staging of disease." Co-researcher, Dr. Michael Tweedle, a professor of radiology, notes that there may be more advantages to being able to image tau, in that a much more accurate view of disease staging could be generated, and the right therapeutics could be provided to the right populations at the right time. Both investigators stressed that being able to image tau in a living brain could prove critical for identifying individuals that could benefit from tau-tackling drugs as they move into clinical trials.

Source: www.sciencedaily.com

Radioactive bacteria targets pancreatic cancer

Researchers at the Albert Einstein College of Medicine, Yeshiva University, the United States, have developed a therapy for pancreatic cancer that uses bacteria to selectively infect tumour cells and deliver radioisotopes into them. The experimental treatment dramatically decreased the number of metastases (cancers that have spread to other parts of the body) of highly aggressive pancreatic cancer in a mouse model without harming healthy tissue. "We are encouraged that we have been able to achieve a 90 per cent reduction in metastases in our first round of experiments," said co-senior author Dr. Claudia Gravekamp, an associate professor of microbiology and immunology. "With further improvements, our approach has the potential to start a new era in the treatment of metastatic pancreatic cancer," Dr. Gravekamp added.

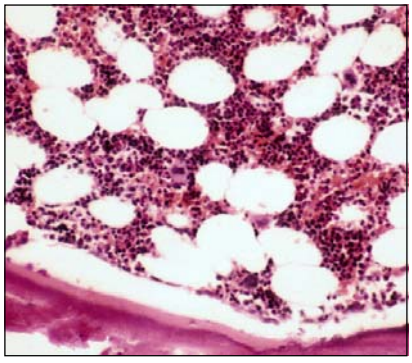
Many years ago, scientists observed that an attenuated (weakened) form of *Listeria monocytogenes* bacterium can infect cancer cells, but not normal cells. Dr. Gravekamp later discovered the reason: the tumour microenvironment suppresses the body's immune response, allowing *Listeria* to survive inside the tumours. In contrast, the attenuated bacteria are eliminated rapidly in normal tissue. Scientists then showed that *Listeria* could be harnessed to carry an anti-cancer drug to tumour cells in laboratory cultures, though this concept was never tested in an animal model.

Working with Dr. Gravekamp, Dr. Ekaterina Dadachova, Professor of radiology and of microbiology and immunology, coupled radioactive isotope rhenium to the weakened *Listeria* bacteria. "We chose rhenium because it emits beta particles, which are very effective in treating cancer," Dr. Dadachova said. "Also, rhenium has a half-life of 17 hours, so it is cleared from the body relatively quickly, minimizing damage to healthy tissue." Mice with metastatic pancreatic cancer were administered intra-abdominal injections of the radioactive *Listeria*. After 21 days, the treatment had reduced the metastases by 90 per cent compared with untreated controls. In addition, the radioactive *Listeria* had concentrated in metastases and to a lesser extent in primary tumours but not in healthy tissues, and the treated mice did not appear to suffer any ill effects.

Source: www.einstein.yu.edu

Banking on bone marrow

A research team led by the United States-based Weill Cornell Medical College researchers may have solved a key issue of expanding adult



Magnified image of normal bone marrow

haematopoietic stem cells (HSCs) outside the human body for clinical use in bone marrow transplantation, a critical step towards producing a large supply of blood stem cells needed to restore a healthy blood system. Working with collaborators from Memorial-Sloan Kettering Cancer Centre, the United States, Weill Cornell researchers describe how they engineered a protein to amplify adult HSCs once they were extracted from the bone marrow of a donor. The engineered protein maintains the expanded HSCs in a stem-like state – they will not differentiate into specialized blood cell types before their transplant.

An expansion of healthy HSCs in the lab would mean reduced need for stem cells from donors. It also suggests that adult HSCs could be frozen and banked for future expansion and use – which is not possible at present. This makes it possible, for the first time, to produce adult blood stem cells on an industrial scale, says Dr. Pengbo Zhou, the study's senior investigator and professor of pathology and laboratory medicine at Weill Cornell. If the technology passes future testing hurdles, Dr. Zhou believes bone marrow banks could take place alongside blood banks. "The hope is that when a patient needs a bone marrow transplant to treat cancer or another disease, we can find the cells that match, expand them and use them."

Source: www.biospectrumasia.com

New light on autism's biological workings

By studying genetically identical twins who differ in autism traits, scientists at King's College London, in the United Kingdom, have identified patterns of epigenetic changes involved in autism spectrum disorder (ASD). The research is the largest of its kind and may shed light on the biological mechanism by which environmental influences regulate the activity of certain genes and in turn contribute to the development of ASD and related behaviour traits. Previous studies had suggested that genes that direct brain development may be involved in the disorder. In approximately 70 per cent of cases, when one identical twin has ASD, so does the other. However, in 30 per cent of cases, identical twins differ for ASD. Because identical twins have the same genetic code, this suggests involvement of non-genetic, or epigenetic, factors.

Epigenetic changes affect the expression or activity of genes without changing the underlying DNA sequence – they are taken as one mechanism by which the environment can interact with the genome. Importantly, epigenetic changes are reversible and may therefore provide targets for developing new therapies. The researchers studied an epigenetic mechanism called DNA methylation that acts to block the genetic sequences that drive gene expression, silencing gene activity. They studied DNA methylation at over 27,000 sites across the genome using samples taken from 50 identical twin pairs.

Source: www.kcl.ac.uk

Plant cell walls engineered to boost biofuel yield

The most abundant organic material on Earth is lignocellulosic biomass, which could supply the sugars required to produce biofuels that can supplement or replace fossil fuels. However, one of the challenges is finding more cost-effectively ways to extract the sugars. Researchers at the United States Department of Energy's Joint BioEnergy Institute (JBEI) have engineered healthy plants with lignocellulosic biomass that can be more easily converted into simple sugars for biofuel production. "Working with the model plant *Arabidopsis* as a demonstration tool, we have genetically manipulated secondary cell walls to reduce the production of lignin while increasing the yield of fuel sugars," said Mr. Dominique Loque, who directs the cell wall engineering programme for JBEI's Feedstocks Division.

Mr. Loque and his research group have focused on reducing the natural recalcitrance of plant cell walls to give up their sugars. Extracting these polysaccharide sugars from their organic polymer lignin cage has required the use of expensive and environmentally harsh chemicals at high temperatures, a process that helps drive production costs of advance biofuels prohibitively high. Most efforts to reduce lignin content during plant development have resulted in severe biomass yield reduction and a loss of integrity in vessels, a key tissue responsible for water and nutrient distribution from roots to the aboveground organs, Mr. Loque explains.

To overcome the lignin problem, Mr. Loque and his colleagues rewired the regulation of lignin biosynthesis and created an artificial positive feedback loop (APFL) to enhance secondary cell wall biosynthesis in specific tissue. The idea was to reduce cell wall recalcitrance and boost polysaccharide content without impacting plant's development. They applied APFL to *Arabidopsis* plants engineered to disconnect lignin biosynthesis from the fibre secondary cell wall regulatory network. They were able to maintain the integrity of the vessels and to produce healthy plants with reduced lignin and enhanced polysaccharide deposition in the cell walls. These engineered plants, after some pre-treatments, showed improved sugar releases from enzymatic hydrolysis as compared with wild type plants: that is, the scientists accumulated polysaccharides, without spoiling it with lignin.

Source: newscenter.lbl.gov

Tulip tree reveals its ancestral ties

The extraordinary level of conservation of the tulip tree (*Liriodendron tulipifera*) mitochondrial genome has redefined the interpretation of evolution of the angiosperms (flowering plants), say researchers from Indiana University and University of Arkansas, the United States. This 'molecular fossil' has a remarkably slow mutation rate meaning that its mitochondrial genome has remained largely unchanged since the dinosaurs were roaming the Earth. Evolutionary studies make use of mitochondrial genomes to identify maternal lineages. Among plants, the lack of genomic data from lineages that split away from the main evolutionary branch early on has prevented researchers from reconstructing patterns of genome evolution.

the researchers, by sequencing the mitochondrial genome of the tulip tree, discovered that its mitochondrial genome has one of the slowest silent mutation rates (ones that do not affect gene function) of any known genome – 2,000 times slower than humans. Ancestral gene clusters and tRNA genes have been preserved and *L. tulipifera* still contains many genes lost in the 200 million years of evolution of flowering plants. In fact, one tRNA gene is no longer present in any other sequenced angiosperm.

Prof. Jeffrey Palmer who led this study explained, "By using the tulip tree as a guide we are able to estimate that the ancestral angiosperm mitochondrial genome contained 41 protein genes, 14 tRNA genes, seven tRNA genes sequestered from chloroplasts, and more than 700 sites of protein editing. Based on this, it appears that the genome has been more or less frozen in time for millions and millions of years."

Source: www.alphagalileo.org

Weeding out ineffective biocontrol agents

'Keep it simple' is a good rule of thumb when designing biocontrol programmes to combat weeds and invasive plants, according to a meta analysis of studies by biodiversity experts at the University of British Columbia (UBC), Canada. Most biocontrol programmes combine many different natural enemies (insects and pathogens) – typically about three different species, but sometimes as many as 25 – of an invasive plant with the hope that at least one will prove effective.

More need not be necessarily better. Some combinations of enemy species can actually end up interfering with each other, instead of attacking the weed. "Our study sug-

gests that this approach can lead to ineffective biocontrol, because the interactions between the released enemies can reduce the overall effectiveness of biocontrol," says Ms. Diane Srivastava, author on the paper and a professor in UBC's Biodiversity Research Centre. Of the 75 combinations that the researchers investigated, about a quarter appeared to have a smaller combined impact than expected. The researchers suggest simple species combination rules could give more effective biocontrol.

The study recommends avoiding combinations of species that attack the same part of the plant at the same time, as well as assessing the impact of species attacking reproductive structures. Insect species feeding on the seeds of plants tend to compete and so multiple introductions can be detrimental, explains Ms. Judith Myers, Professor Emerita and an author on the paper. One of the studies that the researchers analysed focused on three agents (two species of weevils and a fly) that have been released in western North America to control two species of invasive plants, diffuse and spotted knapweed. The weevils consume the fly larvae, nullifying the effectiveness of the fly.

Source: science.ubc.ca

A key to mass extinctions could up food production

Hydrogen sulphide (H_2S) is implicated in several mass extinctions, including the one at the end of the Permian period 251 million years ago that killed more than three-quarters of all species on Earth. However, in low doses, H_2S could greatly enhance plant growth, leading to a sharp increase in global food supplies and plentiful stock for biofuel production, shows new research at University of Washington, the United States.

Mr. Frederick Dooley, a doctoral student in biology who led the research, started off to examine the toxic effects of H_2S on plants but mistakenly used only one-tenth the amount of the toxin he had meant to use. The results were so unbelievable that he repeated the experiment several times for confirmation. Mr. Dooley used a concentration of 1 part per billion (ppb) or less to water seeds of peas, beans and wheat on a weekly basis. Treating the seeds less often reduced the effect, and watering more often typically killed them.

With wheat, all the seeds germinated in one to two days instead of four or five, and with peas and beans the typical 40 per cent rate of germination rose to 60-70 per cent. Mr. Dooley has applied H_2S treatment to corn, carrots and soybeans with results that appear to be similar to earlier tests. When plants grow to larger-than-normal size, they typically do not produce more cells but rather elongate their existing cells. However, with the H_2S treatment, Mr. Dooley found that the cells actually got smaller and there were vastly more of them. That means that the plants contain significantly more biomass for fuel production, he said.

Source: www.washington.edu

Super salt-tolerant rice from wild parent

Farmers are set to reclaim salt-ravaged land thanks to a single rice plant born of two unlikely parents that is spawning a new generation of rice that has double the salinity tolerance of other rice. "This will make saline-stricken rice farms in coastal areas usable to farmers," stated lead scientist Dr. Kshirod Jena of the International Rice Research Institute (IRRI), based in the Philippines. Unlike regular rice, the new rice line can expel salt it takes from the soil into the air via the salt glands on its leaves, explained Dr. Jena. The new rice was bred by successfully crossing two different rice parents – the exotic wild rice species *Oryza coarctata* and rice variety IR56 of the cultivated rice species *O. sativa*. What is extra special about this breakthrough is that *O. coarctata* is very difficult to cross with cultivated rice varieties. In the rice genome sequence, *O. coarctata* and IR56 are at two opposite ends. Crossing two rice types that have such wide difference in genome sequence tend to result in unviable embryo, Dr. Jena said.

O. coarctata is a special type of rice that grows in brackish, salty water – making it highly resistant to saltiness in the soil. According to Dr. Jena, it can tolerate a higher salinity concentration (similar to that of seawater), whereas current salinity-tolerant rice varieties can cope with only half that concentration. However, *O. coarctata* is unsuitable for the production of edible rice. The first sign of good news came when, out of 34,000 crosses made, three embryos were successfully "rescued". Of these three, only one embryo germinated to produce one single plant. That one surviving plant was then transferred into a liquid nutrient solution to guarantee its survival. Once the plant was strong enough, it was grown in the field, where Dr. Jena's team used it to backcross with IR56. Backcrossing ensures that the resulting progeny contain all traits of IR56, and take only the salt tolerance trait of *O. coarctata*.

Source: www.irri.org

Glycosylation Engineering of Biopharmaceuticals

Glyco-engineering is being developed as a method to control the composition of carbohydrates and to enhance the pharmacological properties of monoclonal antibodies (mAbs) and other proteins. In *Glycosylation Engineering of Biopharmaceuticals: Methods and Protocols,* experts in the field provide readers with production and characterization protocols of glycoproteins and glyco-engineered biopharmaceuticals with a focus on mAbs. The volume is divided in four complementary parts dealing with glyco-engineering of therapeutic proteins, glycoanalytics, glycoprotein complexes characterization, and PK/PD assays for therapeutic antibodies. Authoritative and cutting-edge, the book is an ideal guide for scientists striving to push forward the exciting field of engineered biopharmaceuticals.

Contact: Springer GmbH, Haberstrasse 7, 69126, Heidelberg, Germany. Tel: +49 (6221) 345 4301; Fax: + 49 (6221) 345 4229; E-mail: orders-hd-individuals@springer.com.

Successful Agricultural Innovation in Emerging Economies

World population is forecast to grow from 7 to 9 billion by 2050, and food production must increase by 70-100 per cent if it is to feed this growing population. No single solution will solve this problem but recent developments in the genetic technologies of plant breeding can rapidly incorporate new traits and tailor existing crops to meet new requirements, while greatly reducing the time and costs taken for crop improvements. This book provides a collected, reliable, succinct review that deals expressly with the successful implementation of the new plant genetic sciences in emerging economies in the context of the interrelated key regulatory, social, ethical, political and trade matters. The authors have combined both the sciences involved and the policies and practices surrounding them, providing readers with a valuable real-world perspective. It is a valuable guide for policy and decision makers, funding and aid agencies, and other interested professionals.

Contact: Cambridge University Press, 10 Hoe Chiang Road, #08-01/02 Keppel Towers, Singapore 089315, Singapore. Tel: +65 6323 2701; Fax: +65 6323 2370; E-mail: singapore@cambridge.org.

25-28 Jul
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France

2nd International Congress on Personalized Medicine
Contact: Congress Secretariat,
Paragon Conventions,
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1209 Geneva, Switzerland.
Tel: +41 (22) 5330 948;
Fax: +41 (22) 5802 953;
E-mail: Secretariat@upcp.org.

11-13 Aug
Nashville
United States

ICIBM – International Conference on Intelligent Biology and Medicine
Contact: Ms. Rebecca Hiller Posey,
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Vanderbilt Ingram Cancer Centre,
2525 West End Avenue, Suite 800,
Nashville, Tennessee, TN 37203,
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Tel: +1 (615) 936 6830;
Fax: +1 (615) 322 0502;
E-mail: R.HillerPosey@vanderbilt.edu.

12-14 Aug
Kollam
India

Amrita Bioquest 2013 International Conference on Biotechnology for Innovative Applications
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Amrita Vishwa Vidyapeetham University,
Amritapuri Campus, Amritapuri,
Clappana P.O., Kollam 690525,
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E-mail: bioquest@amrita.edu.

24-25 Aug
Singapore

ICBFE 2013 – International Conference on Biotechnology and Food Engineering
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Chemical, Biological &
Environmental Engineering Society,
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Kowloon, Hong Kong, China.
Tel: +86 (28) 8652 8465;
E-mail: icbfe@cbees.org;
Website: www.icbfe.org.

25-27 Sep
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China

Sixth China Medicinal Biotech Forum
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