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In The News

CSIR Celebrates 69th Independence Day



Swami Vivekanand and many others. He then quoted the work of a girl and a rickshaw puller, both devoted to teaching in the slum areas as an inspiration for all to work with more rigor and dedication for the betterment of the common man.

Dr. Harsh Vardhan said that real happiness

THE true spirit of independence should imply working hard to contribute to the development of the nation so as to realize complete literacy, meet the technological needs and attain self-reliance, said Dr. Harsh Vardhan, Hon'ble Minister of Science & Technology and Earth Sciences and Vice President, CSIR, in his Independence Day message at the CSIR Headquarters on 15 August 2015.

Celebrating the 69th Independence Day at Anusandhan Bhawan, Dr. Harsh Vardhan talked about 'unity in diversity' and the uniqueness of the country and the opportunities lying ahead. He took the opportunity to remember the contributions of legendary leaders of our great nation, such as Mahatma Gandhi, Bhagat Singh,

lies in encouraging people to be educated properly. He also referred to the speech of the Hon'ble PM delivered from the ramparts of the Red Fort and requested the audience to work hard with sincerity to realize the goals set. He believed that one could only be known by his/her good deeds towards other fellow beings.

Before the start of the celebrations, Dr. Harsh Vardhan was warmly welcomed by Dr. M.O. Garg, DG, CSIR, Dr. Anupama, Joint Secretary (Admin), CSIR, Dr. Sudeep Kumar, Head, PPD and other senior officers of CSIR. He was given a ceremonial salute by the CSIR security. The Hon'ble Minister unfurled the National Flag at the CSIR premises to the melodious tunes of the National Anthem.

Thereafter, the celebrations were held

in the Shanti Swarup Bhatnagar Auditorium which began with the reciting of the National Song ‘Vande Mataram’ by the women staff of CSIR. To celebrate the spirit of Independence Day, a song ‘Ae Mere Pyare Vatan’ was sung by another enthusiastic group.



Dr. M.O. Garg addressing the gathering

Addressing the gathering, Dr. M.O. Garg, DG, CSIR recalled the discussion held during CSIR’s Directors Conference – “The Chintan Shivir” – held at CSIR-IIP, Dehradun during 12-13 June 2015 and expressed the commitment of CSIR to live up to the “Dehradun Declaration” and the expectations of the Government of India. He touched upon the speech of

the Hon’ble PM delivered from the ramparts of the Red Fort on the occasion of the 69th Independence Day and emphasised upon the role and commitment of CSIR to provide the desired S&T interventions. He said that science and technology alone can help India to grow further and become a global leader in the identified technology domains.-

On the occasion, Dr. Harsh Vardhan, Vice President, CSIR gave a slogan:

**देश हमें देता सब कुछ,
हम भी तो कुछ देना सीखें ।**

The compere of the function, Dr. Hari Om Yadav, Sr. Scientist, summarized the address of the Hon’ble Minister aptly as, “Keep working with sincerity, keep contributing to the growth of the organization and keep giving to the nation.”

The function concluded with the singing of the National Anthem.



Dr. Harsh Vardhan unfurling the National Flag



Independence Day Celebrations in the Shanti Swarup Bhatnagar Auditorium

CSIR Successfully Foils Two MNC Patents



The Council of Scientific and Industrial Research has recently successfully foiled attempts by two multinationals to patent medicinal compositions that have been used since long in the Indian systems of medicines like Ayurveda and Unani and which have been documented in the Traditional Knowledge Digital Library (TKDL), a unit of CSIR.

CSIR's Innovation Protection Unit located the patent application for a medicinal composition containing turmeric, pine bark and green tea for treating hair loss. The patent was filed by Pangaea Laboratories at the European Patent Office in February 2011, and in January 2014 a pre-grant opposition along with evidence material of use of the products in traditional Indian medicine was registered. Finally, on 29th June this year, the UK-based company withdrew the application.

CSIR also recently thwarted Colgate-Palmolive Co.'s bid to patent a mouthwash formula containing herb extract used in Indian traditional systems of medicine to cure oral diseases, at the European Patent office. The Traditional Knowledge Digital Library gave references from ancient books stating the herb and its extracts of *Myristica fragrans* were historically used for oral diseases in Indian systems of medicine. It informed the EPO about references of the extracts in 'Charaka Samhita' – the ancient text of the traditional medicinal practices. It also cited how the extracts are used in different traditional medicines like 'Raughan', 'Dantaprabha Churna Manjan' and 'Sahakaravati'.

The Traditional Knowledge Digital Library integrates diverse disciplines like

ayurveda, unani, siddha and yoga. It is based on 359 books of Indian systems of medicine. It acts as a bridge between these books and international patent examiners.

Till date, the CSIR has achieved success in about 200 such cases where the patent applications have either been withdrawn/cancelled/declared dead/terminated or have the claims amended by applicants or rejected by the examiners on the basis of the TKDL submissions.



Patent Granted to CSIR-CSMCRI's Iodising Agent

The Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar recently won a long-drawn patent battle that saw its novel iodising agent finding use in iodised salt finally being granted a patent.

The patent application related to a novel process for the preparation of stable iodising agent, which can be effectively used in the formulation of iodised salt, wherein it offers stability to iodine. The CSIR had filed the patent application in June 2004. However, the patent was opposed by the Hindustan Lever Limited on the grounds that the process put forward by CSIR was not new so the patent should be cancelled. In 2013, the Indian Patents Office rejected CSIR's

patent application.

However, CSMCRI's inventors decided to pursue the matter further and approached the Intellectual Property Appellate Board (IPAB) in Chennai which has now upheld that the technology was "novel, inventive and non-obvious" so the patent can be granted.

Iodine deficiency is a recognised disorder that can be corrected by salt iodisation. It has been part of health programmes of various international organisations focusing on health. CSMCRI's novel invention reduces the cost of purification of salt besides maintaining the iodising agent in the stable form.

CSIR-IIP Develops Micro-Channel Reactors for Hydro-processing of Vegetable Oils

The CSIR-Indian Institute of Petroleum (CSIR-IIP), Dehradun, has developed micro-channel reactors to convert non-edible oil and biomass-derived oil (pyrolysis-oil), biomass-derived gases (syn-gas) and coal derived gases (Coal gasification to syn-gas) into second and third generation biofuel. These reactors greatly increase the product yield and conversion in hydro-processing of vegetable oils.

The micro-channel reactors find immediate applications as a tool to intensify the process at places where there is inadequate supply of raw material (biomass); where transportation of (feedstock) fossil fuels is a problem. All this is possible mainly due to excellent mixing, controlled reaction

environment, and energy efficiency enabled by these micro-channel reactors.

The micro-channel reactors are better than the conventional (fixed bed tubular reactors) reactors in terms of: hydrodynamics and heat and mass transfer. Due to better hydrodynamics, the wall effect channeling etc. in micro-channel reactors is zero. Moreover, the high surface-to-volume ratio provides better heat control, which in turn ensures proper product distribution. The catalyst used in a micro-channel reactor is either coated on the wall or packed inside the channel. The amount of material required for micro-channel reactor, the catalyst cost and the operating cost are far less than that in case of conventional reactors.

Electronic Nose for Environmental Monitoring jointly developed by CSIR-NEERI & C-DAC



An Electronic Nose (E-Nose) to sniff out dangerous gases in the pulp and paper industry has been jointly developed by the Nagpur-based CSIR-National Environmental Engineering Research Institute (NEERI) of CSIR and Centre for Development of Advanced Computing (C-DAC). The development was announced by CSIR-NEERI and C-DAC on 8 July 2015.

The Electronic Nose, the first of its kind of technology to be developed in India that makes use of intelligent software to identify odorous molecules, is a portable device that measures odour concentration as well as odour intensity using an array of sensors that function on the principle similar to that of human olfaction (sense of smell). The sensor array generates a pattern based on the type of aroma. The software can be trained by feeding information based on observation of experts.

The E-Nose will find particular application in the pulp and paper industry that emits a variety of gases like hydrogen sulphide, methyl mercaptan, dimethyl sulphide, and dimethyl disulphide all of which beyond a certain concentrations may adversely affect the environment and human health. By continuously monitoring the concentration of these gases, it is a boon for workers. Besides, it also overcomes all limitations of the available analytical instruments that are expensive and time-consuming.

The E-Nose is currently functioning successfully at the Mysore Paper Mills Limited at Bhadravati in Karnataka and Tamil Nadu Paper Mill.

As a next step, the researchers are working on enabling the Electronic Nose to monitor gas emissions from any source, be it an industry or leakage of petroleum pipes.



Sensor array

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Dr. A.P.J. Abdul Kalam (1931-2015) Great Well-wisher of CSIR

Late Dr. A.P.J. Abdul Kalam was a great well-wisher of CSIR and always had a word of advice for all the laboratories that he visited. Here is a pictorial account of some of his visits to CSIR Laboratories.



President Dr. A.P.J. Abdul Kalam visited RRL-Jammu (now CSIR-Indian Institute of Integrative Medicine) on 26 June 2003. He showed keen interest in the R&D work of the Laboratory and remarked, "Delighted to visit RRL-Jammu. I can see excellence in many areas of herbal plants (end to end solution)."



In 2003, Dr. A. P. J. Abdul Kalam, President of India, visiting the X-ray characterization laboratory at CSIR-NPL.



The silver jubilee function of CSIR-CIMAP, Lucknow, in 2003 was graced by the presence of President of India Dr. A.P.J. Abdul Kalam. In his address on the occasion, President Kalam lauded the efforts of CIMAP in development and transfer of mint and geranium technologies for social transformation in the country. He added that the herbal garden set up at Rashtrapati Bhavan with participation of CIMAP had been visited by many children who are now inclined towards life sciences and allied areas of biotechnology



President of India Dr A.P.J. Abdul Kalam during his visit to CSIR-IMTECH on the occasion of the "Science Congress for School Children" in 2004; Interacting with school children (on right)



Prof. Indranil Manna taking Dr. A. P. J. Abdul Kalam, around the stalls during the exhibition at CSIR-CGCRI



Dr. A. P. J. Abdul Kalam praised the work of CSIR-NISCAIR at its Diamond Jubilee celebrations on 17 October 2014



Dr A.P.J. Abdul Kalam during his visit to CSIR-NML recorded, "I am indeed delighted to interact with Scientists and Engineers of National Metallurgical Laboratory. It is a competitive world where in we have to work hard and provide inputs to our production institutions to gain technological advantages in product design and production"



Dr. A.P.J. Abdul Kalam at CSIR-NAL in 2013



Dr. A.P.J. Abdul Kalam, former President, inspecting stalls set up by scientists at CECRI in Karaikudi



Former President of India Dr A. P. J. Abdul Kalam dedicated the Laboratory for the Conservation of Endangered Species (LaCONES) to the nation for the Cause of Conservation on 1 February 2007

R&D Highlights

Bio-derived ZnO nanoflower: Highly efficient catalyst for the synthesis of chalcone derivatives

Over the past several years, plants and other natural sources have come up as low cost, energy efficient, eco-friendly and non-toxic resources for the synthesis of nanomaterials. *Musa balbisiana* is a medicinal and economic plant from North East India. The peel of the fruit is a food additive and helps with normalizing digestive disorders of the stomach. It is widely used to produce soaps and detergents for washing clothes and shampooing hair.

Scientists at the CSIR-North East Institute of Science & Technology (NEIST), Jorhat have succeeded in synthesizing ZnO nanoparticles with a green eco-friendly method using the peel of *Musa balbisiana*. ZnO nanoparticles

were then characterized by XRD, XPS, FTIR, SEM, BET and TEM techniques. The SEM images indicate the formation of flower like morphology of ZnO. The flower-like morphology consists of petal-like small nanosheets. The formation of flower-like structure of nanoparticles may be due to synergic effect of ions like K^+ , CO_3^{2-} , Na^+ , Cl^- etc which are available in the biomaterial during synthesis of nanoparticles. So, it is a very simple eco-friendly method for synthesis of ZnO nanoflower using natural resources. This biomaterial can be used further for synthesis of other metal oxides without using any hazardous chemicals. So, it is one of best source of natural alkali.

The prepared ZnO-nanocatalyst was then utilized for the synthesis of chalcone derivatives. The single step condensation of substituted aryl carbonyls is an attractive feature to obtain substituted chalcones by Claisen–Schmidt condensation reaction in 88–98% yields in less than 2 min under microwave irradiation in solvent free conditions (Figure 1). The significant yields and very short period of time are the novelty of our study on ZnO-nanocatalyst. We have tested the reusability of the ZnO catalyst in the condensation reaction. Very significant yield was obtained after use 5th cycle of the catalyst.

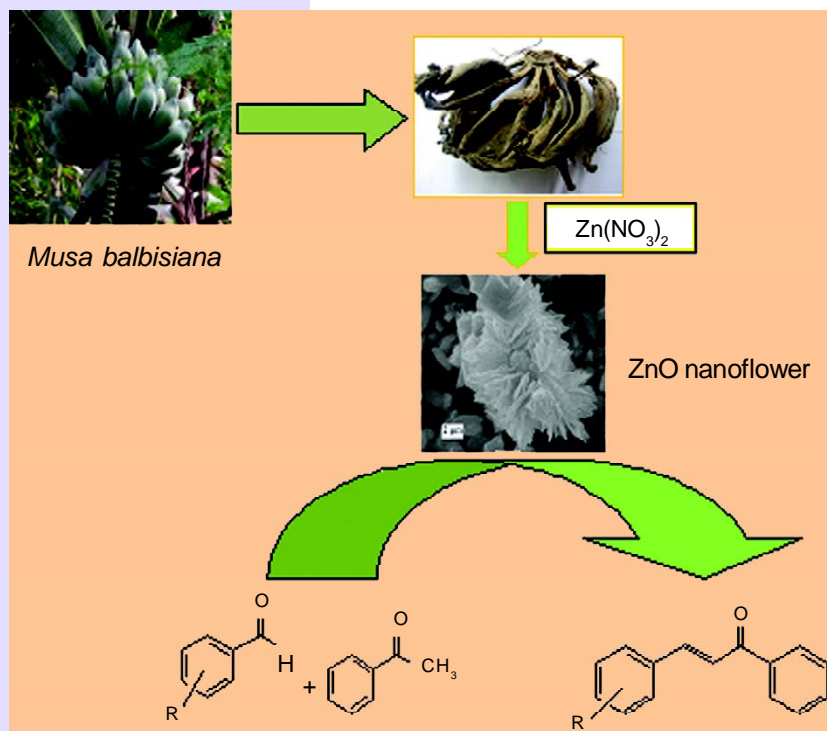


Fig. 1: Green, eco-friendly synthesis of ZnO nanoparticles using peel of *Musa balbisiana* and its utility as nanocatalyst in the synthesis of chalcone derivatives

Reference

Bio-derived ZnO nanoflower: a highly efficient catalyst for the synthesis of chalcone derivatives. Chandan Tamuly, Indranirekha Saikia, Moushumi Hazarika, Manobjyoti Bordoloi, Najrul Hussain, Manash R Das, Kaustavmoni Deba. *RSC Advances*, 2015, 5, 8604-8608.

CSIR-IMTECH Scientists Isolate Immuno-suppressive Agent from Species of Actinomycetes



In a programme directed at exploitation of microbial wealth of India, scientists at the CSIR-Institute of Microbial Technology (IMTECH), Chandigarh have isolated caerulomycin A (CaeA) from novel species of actinomycetes, *Actinomycetes spintinesis* and described its use as immunosuppressive agent (Singla et al. US 8114895; EP 1942889).

Immunosuppressive drugs (ISDs) are crucial for long-term graft survival following organ transplantation. In addition, ISDs are prescribed for the treatment of autoimmune diseases, inflammatory disorders, hypersensitivity to allergens, etc. Although currently used drugs in clinic have provided significant relief to patients, these suffer from one or the other drawback, such as poor oral bioavailability, side effects like nephrotoxicity and malignancy, non-specific mode of action, incomplete suppression of belligerent immune cells, unaffordable cost, etc. Thus the need remains for discovering efficacious, selective and safer new immunosuppressive drugs for improved sustenance of organ transplants.

CaeA exhibited better immunosuppression than clinically used drug cyclosporine A. CaeA suppresses the proliferation of naïve CD4⁺ T cells, effector T cells, Th1 cells, Th2 cells and B cells. Thus, CaeA can be used to suppress cell-mediated immunity as well as humoral immunity. In contrast Cyclosporin A works only on T cells and thus suppresses only the cell mediated immunity. CaeA induces generation of Tregs, significantly suppresses T cell response and prolongs the survival of allogeneic skin graft in mice (Singla et al. *Transplantation* **97**, e57-59, 2014; *J.*

Biol Chem **289**, 17515-17528).

At the molecular level, CaeA (molecular weight 229.23) possesses a much simpler chemical structure compared to Cyclosporin A (molecular weight 1202.61). *In vitro* studies have shown that CaeA requires 10-fold lesser amount by weight compared to cyclosporin A for achieving similar level of inhibition of lymphocytes. Thus, if successfully developed, CaeA is expected to lead to a significant decrease in cost of immunosuppressive therapy.

Having described the activity of CaeA as immunosuppressive agent, the next step was to find its intracellular target and decipher its mechanism of action. The results described in this paper established that CaeA exerts its effect at cellular level by targeting iron. CaeA causes intracellular iron depletion by reduced uptake and increased release by cells. CaeA causes cell cycle arrest by (i) inhibiting ribonucleotide reductase enzyme, which catalyses the rate-limiting step in the synthesis of DNA, (ii) stimulating MAPKs signalling transduction pathways that play important role in cell growth, proliferation and differentiation and (iii) by targeting cell cycle control molecules such as cyclin D1, cdk4 and p21^{CIP1/WAF1}.

Whereas *in vitro* 0.3µM CaeA caused complete inhibition of T-cell proliferation, 0.6µM CaeA showed insignificant effect on the viability of cells. Moreover, effect on proliferation of cells is reversible once CaeA is withdrawn from the system. These unique properties of CaeA not only make it an attractive candidate for development as drug, but also indicate that iron chelation can be used as a

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rational approach to selectively suppress the immune system; because compared to normal cells, rapidly proliferating cells require higher utilization of iron, which is a central regulator for proliferation and function of immune cells.

Reference

Kaur, S.; Srivastava, G.; Sharma, R.N. and Jolly, R.S. Immunosuppressive agent Caerulomycin A exerts its effect by depleting cellular iron content. *Br. J. Pharmacol.* 172(9), 2286-2299, 2015.

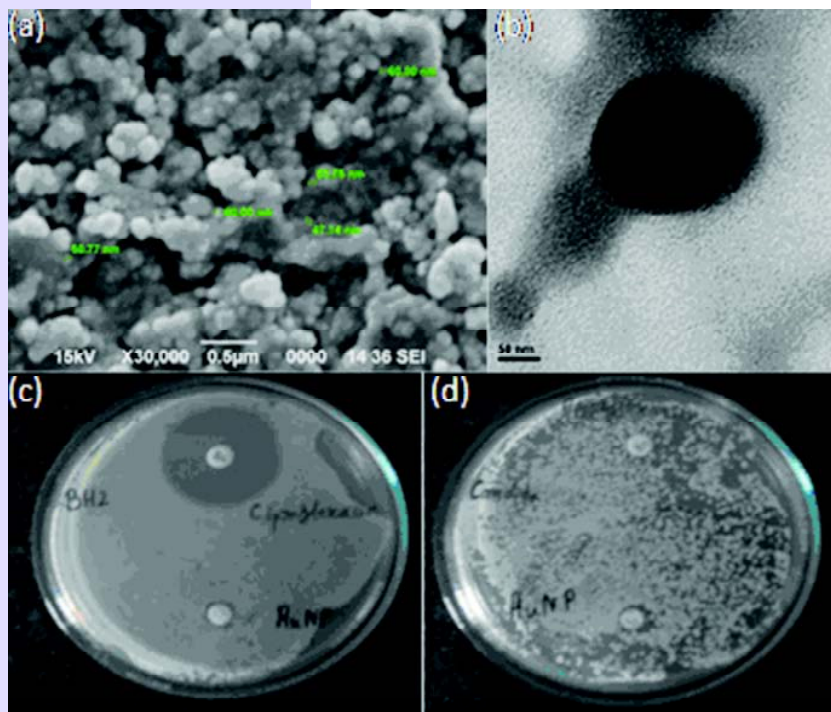
CSIR-NEIST scientists develop new method for biosynthesis of Au nanoparticles from *Nepenthes khasiana* plants

Bhau et al. (2015) from CSIR-NEIST, Jorhat, have reported a suitable method for biosynthesis of Au nanoparticles from *Nepenthes khasiana* plants. The use of plant material not only makes the process eco-friendly but also the abundance makes it more economical.

The aim of this study was to investigate the ability of this plant to synthesise gold nanoparticles and study the properties of the nanoparticles thus

produced. Antimicrobial activity and medicinal values of *Nepenthes khasiana* fascinated us to utilize it for biosynthesis of gold nanoparticles. The synthesized gold nanoparticles were characterized by UV-Vis spectrophotometry, Scanning Electron Microscopy, X-ray Diffraction, Fourier Transform Infra-red Spectroscopy and Transmission Electron Microscopy.

Different time intervals for the reaction with aqueous chloroauric acid solution increased in the absorbance with time and became constant giving a maximum absorbance at 599.78 nm at three hours of incubation. The results from XRD, TEM and SEM support the biosynthesis of triangular and spherical shaped Gold nanoparticles between 50 nm to 80 nm. In this study, the antimicrobial property of the AuNPs was exploited against human pathogenic micro-organisms. The results of TEM, SEM, FT-IR, UV-VIS and XRD confirm that the leaves extract of *N. khasiana* can be used to produce Gold nanoparticles with significant amount of antimicrobial activity.



(a) SEM and (b) TEM images of gold nanoparticles after bioreduction with *Nepenthes khasiana* leaf extract
(c) & (d) antimicrobial activity shown by AuNPs against bacterial and fungal species

Reference

BS Bhau, S Puri, S Ghosh, B Borah, DK Sarmah & Raju Khan, Green synthesis of Gold nanoparticles from the leaf extract of *Nepenthes khasiana* and antimicrobial assay, *Advance Material. Letters*, 2015, 6(1), 55-58.

MoUs

MoU Signed between CSIR-NCL and Security Printing and Minting Corporation of India Ltd



The CSIR-National Chemical Laboratory (CSIR-NCL), Pune entered into a Memorandum of Understanding (MOU) with Security Printing and Minting Corporation of India Ltd. (SPMCIL) here recently.

The MoU will seek to foster collaboration on research and exchange of technical expertise in areas of material sciences and testing capabilities for bank

notes, security documents and coins. The MoU was signed by Dr. Sourav Pal, Director, CSIR-NCL and Shri Rakesh Kumar, Additional General Manager, SPMCIL in the presence of Shri. P.N. Radkar, Director (Technical), SPMCIL.

The agreement ascertained the research projects within the focus areas of SPMCIL's requirements and domain expertise available at CSIR-NCL.

Workshops

Workshop on “Indian Innovations in Materials Research: New Materials and Processes” at CSIR-CGCRI



Shri Kamal Dasgupta, Acting Director, CSIR-CGCRI welcoming the delegates.

A Workshop on “Indian Innovations in Materials Research: New Materials and Processes” (IIMR-15) was jointly organized by CSIR-Central Glass and Ceramic Research Institute (CSIR-CGCRI), Kolkata, and the Indian Association for Productivity, Quality and Reliability (IAPQR), Kolkata, during 25-27 June 2015.

The Workshop was part of a pilot project approved by the NSTMIS Division of the Department of Science and Technology (DST), GOI. The backdrop to IMMR-15 is the fact that the decade 2010-2019 has been declared as the “Decade of Innovation” by the government of India, and a new Science, Technology and Innovation (STI) Policy

was spelt out by the Prime Minister in January 2013.

The aim of the Workshop was to invite experts in chosen scientific domains to speak on identified issues related to Innovations in general and on New Materials in particular. The Workshop was planned to cater to different segments of society which included senior scientists, professionals, students and members of the lay public. The scope of IIMR-15 also included the involvement of young researchers in an interactive session on Innovation.



Panel discussion: (From left to right) Prof. Dr. A.B. Mandal, Dr. K. Muraleedharan, Prof. S.P. Mukherjee, Dr. S. Baherjee, Prof. B. S. Murty

The Welcome Address was delivered by Dr. R.N. Basu, Head, Fuel Cell and Battery Division, CSIR-CGCRI. He spoke briefly about the scope of the workshop and said that in all, about 40 posters, 24 students oral presentations, 17 contributory presentations, 29 Invited talks and 5 Plenary talks would be the highlight of the workshop.

Shri Kamal Dasgupta, Acting Director, CSIR-CGCRI also warmly welcomed all delegates and guests. He said that IIMR-15 would help delegates understand the changes in science policy in the context of the nuances of innovation involved. He exemplified this by touching briefly upon the Dehradun Declaration. He said that any innovation

in sync with the stated objectives as outlined in the Dehradun Declaration would get support and thus help in making the nation's dreams come true.

Prof. B. Das spoke about IAPQR's activities. Established in 1973, IAPQR is engaged in the pursuit, propagation and promotion of concepts, methods and practices to enhance productivity in manufacturing and service organizations through Quality and Reliability.

In his keynote address, Chief Guest Dr. Srikumar Banerjee, DAE Homi Bhabha Chair Professor, Bhabha Atomic Research Centre, Mumbai, spoke about the Innovation Ecosystem. He succinctly pointed out that the meaning of Innovation did not lie in the words published in a dictionary but more in its application as evident in Google search for the same. He said Innovation is Competition-driven; Knowledge is Scholarship-driven and Deployment is Market-driven and the two-way dynamics among these three impact societal development. Under innovation comes incremental innovation, radical innovation, large-system innovation, and innovation for inclusive growth. Protection of IPR and the challenges of technology transfer have to be addressed in this context.

He spoke about the changing contexts of social challenges in India during 1950s to the 1990s during which period science delivered solutions to situations arising out of technology denial in the strategic sectors. Subsequently, Dr. Banerjee focussed on self-reliance in the era of techno-globalization and illustrated his talk with the story of nuclear reactor development in India. In the following years, social challenges would include problems of Energy, Environment, Climate change, Water, Education, Affordable healthcare and Increased food production to feed the burgeoning population. Flow of solutions from

science is therefore, global and wide-reaching.

The Vote of Thanks was delivered by Dr. A.K. Ray, Convenor, IIMR-15.

Spread over three days, the IIMR-15 comprised of Plenary lectures, Invited talks, Contributory presentations, Poster session and a Panel discussion. A galaxy of distinguished, delegates, guests and speakers from across India participated. Their presence alongside the exuberant young researchers and Summer Interns at CSIR-CGCRI added great value to IIMR-15.

The Plenary talks were: Nano-structured functionalised nanocomposites delivered by Prof. K.L. Chopra (IIT Delhi); Innovations in the context of STI Policy-2013 by Prof. S.P. Mukherjee (IAPQR); Impacting Research Innovation and Technology - An MHRD Initiative for Self-Reliance in Engineering and Technology by Prof. Indranil Manna (IIT Kanpur); Science, Technology and Innovations in Leather Research by Prof. Dr. A. B. Mandal (Formerly Director, CSIR-CLRI) and Sustainability and Life Cycle Assessment of Materials by Dr. S. Srikant (CSIR-NML).

Among the other dignitaries who delivered talks were: Prof. Ajay Ray (IEST, Shibpur), Dr. Ashish Lele (CSIR-NCL), Prof. Anindya J. Bhattacharya (IISc, Bangalore), Prof. Rabibrata Mukherjee (IIT-Kharagpur) Dr. G. Padmanabham (ARCI), Dr. S.K. Bhadra (CSIR-CGCRI), Prof. B. S. Murty (IIT-Madras), Dr. Goutam De (CSIR-CGCRI), Dr. R.N Basu (CSIR-CGCRI), Sitendu Mandal (CSIR-CGCRI), Prof. H.S. Ray (Former Director, CSIR-RRL, Bhubaneswar) and Dr. B. B. Jha (CSIR-IMMT) to name a few.

Dr. Srikumar Banejee was Chairman of the Panel discussion on 'The Role of Innovations in Make in India'. The other distinguished Panelists were: Dr. K. Muraleedharan, Professor K.L. Chopra,

Prof. S.P. Mukherjee, Prof. B.S. Murty, and Dr. A.B. Mandal.

Prof. Chopra initiated the discussion in his characteristic straightforward manner. He said that, we are a scientific civilization and health and wealth depend on Knowledge, on Science and Technology, which must be translated for the benefit of the citizens. He said that the Decade of Innovation as launched by the GOI calls for support at all levels and that Innovation and Entrepreneurship go together. According to him, the University system must recognize this and teach the art of entrepreneurship to its students as part of its curriculum. Universities and educational institutions must have business incubator and/or Technology parks. The ecosystem in an educational institute must support entrepreneurship.

Dr. K. Muraleedharan said that the lack of innovation in recent times must be addressed but not through slogans alone. He said that Make in India is an opportunity and all should play a role to make it a success. Make in India will usher in an era of resources, he said. He gave the example of Warship-grade steel that India used to procure from Russia. When laboratory scale production was successful as a result of indigenous research, his team approached Steel Authority of India (SAI) which took up the challenge of production. Today, this steel is used to manufacture the first aircraft carrier at the Hazira plant. This was possible only because SAI had the skillsets for manufacturing, which calls for different tools and doctrines as compared to laboratory-scale production.

Prof. Mukherjee emphasized that Make in India included design in India, develop in India and deliver in India (and globally!). He stressed the fact that designing in India was integral to the task of Make in India; it was not enough to simply develop and deliver using the



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abundant and cheap labour-force in the country. The word design too should not be taken in the narrow sense of assembly/manufacture in India. Goods and services must be designed to meet current, future and also, unmet needs. We need to design newer and better products/processes/controls he said. We must use our innovative minds for creativity; for using our knowledge of S&T for better design and services.

Prof. Murty focused on the people who innovate and how to educate them. He said that with the mushrooming of engineering colleges there are many with degrees in Engineering but they are not all, necessarily good engineers. There is a lack of various levels of strong educational backgrounds. Good quality education must reach all. There must also be a faculty development programme. He

discussed the difficulties inherent in reaching a large group of students and researchers spread over the country but insisted that with innovative thinking and novel use of technology, this could be made possible. He gave an example of how he was planning to set up a facility for a very expensive Atom Probe machine. Because it is so expensive, funding is not easy to come by. However, he has designed the facility to be capable of being remotely operated so that every contributor, no matter where geographically, is a partner with equal access to the machine. He said this was a new model. Such innovative models can be used to reach a large part of the population.

Prof. Dr. A. B. Mandal also spoke about the encouragement and support that researchers, scientists and entrepreneurs need at all levels.

Training Programmes/Science Awareness Programmes

CSIR-CFTRI organises Awareness-cum-Workshop for MSMEs under CSIR-MSME Initiatives

CSIR-Central Food Technological Research Institute (CFTRI), Mysore in collaboration with Confederation of Indian Industry (CII), Mysore Chapter organized the MSME meet on 'Value added Agriculture & Food Processing' at CSIR-CFTRI, Mysore on 29 May 2015. The programme was coordinated under the banner of CSIR-MSME Initiative supported by Department of MSME, Govt. of India, New Delhi.

The focus of the meet was to provide a wider platform for interaction of entrepreneurs with scientists who are working in the areas of food processing such as spices, grains, fruit & vegetables,

packaging and food safety. A total of 124 participants attended this workshop.

Prof. Ram Rajasekharan, Director, CSIR-CFTRI, Mysore delivered the keynote address. Mr. M.I. Ganagi, Chief General Manager, NABARD talked about the scope of Agro & Food processing industry in Karnataka. Experts from CSIR-CFTRI made presentations on various topics related to food processing industry. The technology for production of turmeric powder from fresh turmeric rhizomes and table-top multipurpose roti-processing machines were demonstrated to the participants.

It is envisaged that this hand-holding would transform the food processing industry to be more competitive and responsive to meet the global and domestic challenges in the marketplace. During the meet, an MoU was signed

between CSIR-CFTRI, Mysore and CII, Mysore. Under this MoU, CII, Mysore and CSIR-CFTRI, Mysore will jointly engage in activities towards promotion of best agriculture practices and food processing in Mysore district.



A view of the audience in the MSME meet 2015 at CSIR-CFTRI

Program on Socio-Economic Empowerment of Tribal Women through Tasar Sericulture

A one-day program on socioeconomic empowerment of tribal women through Tassar sericulture was held at Mahadevpur of Karimnagar, District, Telangana on 8 July 2015. This project was sanctioned by the Department of Science and Technology (DST) and CSIR-Indian Institute of Chemical Technology (IICT), Hyderabad to promote tasar culture as well as to increase qualitative and quantitative cocoon production.

Dignitaries present during the program were Mr. A. Narsimha Reddy, Joint Director of Sericulture, Government of Telangana, Mr. Satyanarayana Rao, Scientist RTRS, CSB, Warangal, Mr. K.V. Mallikarjun, Assistant Director of Sericulture Karimnagar, Ms. Haseena Bano, ZPTC, Mr. K. Rajababu, Sarpanch, Mr. Sripathi Bapu, Single Window Chairman from Mahadevpur, Dr. Sunil Misra, Scientist, Mr. K. Sriram,



Dignitaries during inauguration of the workshop

Sr. Technical officer and Dr. K. Madhusudhan Rao, Sr. Technical Assistant, from CSIR-IICT, Hyderabad.

Addressing the gathering of Tasar sericulture farmers and the dignitaries Dr.

Sunil Misra, Scientist, CSIR-IICT, Hyderabad gave a vivid description of the project and its essence in promoting Tassar sericulture and the necessity to render a helping hand to the Tassar farmers. He said that the aim of the project was to promote Tassar sericulture

He urged the farmers to make use of this opportunity and produce better quality cocoons so as to improve their economic condition.

In his address the Joint Director, Warangal, Mr. A. Narsimha Reddy thanked profusely the Department of Science and Technology (DST), Government of India and CSIR-IICT, Hyderabad for taking up such a noble cause of supplying the chemicals and implements for the benefit of Tassar farmers of Karimnagar District. He advised the farmers to adopt scientific methods to enhance their produce so that they can have better economic status. He wished that such a facility should be extended to other districts also where Tassar is being reared.

Mr. Satyanarayana Rao, Scientist "C" of RTRS, Warangal, spoke in detail about the activities of his parent organisation and requested the farmers to adopt scientific methods to rear the silkworms. He wanted the farmers to make use of the given implements in an appropriate way so that they get good yield. He stressed that if nets are used properly during the chawki rearing of the worms the farmers would be benefitted with 40% more yield.

Speaking on the occasion Mr. Mallikarjun, Assistant Director, Karimnagar insisted that to make a very good profit the farmers should strive to



Distribution of kits to farmers

to improve the socio economic conditions of the tribal farmers, particularly women. He said that during this one-day program some important items required for management of food plant as well as during the silkworm rearing like (1) Bleaching Powder (5 kg), (2) Lime Powder (20 kg), (3) Secature, (4) Tarpaulin, (5) Bio-fertiliser (1 litre), (6) Chlorine dioxide (5 liters) and (7) 200 DFLs (Disease free layings supplied by state department) are required by the Tassar farmers for better cocoon yield.



A woman farmer interacting with experts



Cocoons at Tassar centre for sale

get 45 to 50 cocoons per DFLs. He lauded the role of CSIR-IICT and DST for taking up such a wonderful program. He wanted that the Tasar yield should be on par with mulberry, so that the Tasar farmers will make huge profits and will be financially sound and economically

developed.

All the political representatives present on the dais lauded the efforts of CSIR-IICT and DST and said more such programs should be taken up for the benefit of the farmers. The dignitaries distributed farming kits to 150 farmers.



Farmers during the workshop

Meetings

CSIR-NIO and Dhaka University, Bangladesh Joint Meeting on “Bay of Bengal Oceanography”

A three-day meeting on the Bay of Bengal Oceanography was jointly organized by the CSIR-National Institute of Oceanography (CSIR-NIO), India and the Department of Oceanography, Dhaka University (DU) at Dhaka, Bangladesh during 11-13 May 2015.

The inaugural function, held at Nabab Nawab Ali Chowdhury Senate Bhaban Auditorium of the Dhaka University (DU) on 11 May 2015, was presided over by Dr. A.A.M.S. Arefin Siddique, Vice Chancellor, Dhaka University. The special guests at the inaugural function included Dr. S.W.A Naqvi, Director, CSIR-NIO; Mr. Sandeep Chakravorty, Deputy High Commissioner of India; Prof. Md.



From left to right: Prof. A.S.M. Maksud Kamal, Dean, Earth and Environmental Sciences, DU; Mr. Sandeep Chakravorty, Deputy High Commissioner of India; Dr. A.A.M.S. Arefin Siddique, Vice Chancellor of DU; Dr. S.W.A Naqvi, Director CSIR-NIO; Prof. Md. Kawser Ahmed, Chairman, Department of Oceanography, DU.

Kawser Ahmed, Chairman, Department of Oceanography, DU and Prof. A.S.M. Maksud Kamal, Dean, Earth and Environmental Sciences, DU. The function was attended by a six-member team from CSIR-NIO, India led by Dr. S.W.A. Naqvi, Director, CSIR-NIO and several leading experts from both the countries.

The objective of the meeting was multi-fold: (1) to identify mutually interesting scientific topics and questions on the Bay of Bengal

Oceanography that could be studied through mutual collaboration, (2) to deliberate on the Memorandum of Understanding (MoU) between CSIR-NIO and Department of Oceanography, DU and (3) to discuss about the possibilities of organizing a joint cruise to collect oceanographic data from the data-sparse Bangladeshi-shelf slope regions and also regions beyond the slope but within the exclusive economic zone (EEZ) of Bangladesh.

The technical session had presentations by CSIR-NIO experts and students and faculty from Dhaka University and was well attended by over 50 participants. The meeting also recommended expediting the MoU, preparation of joint cruise proposal and its submission to relevant competent authorities in their respective countries by both the parties in run-up to the joint cruise. Each party agreed to do their best to achieve desired results. The meeting concluded with both the CSIR-NIO and DU teams expressing happiness in achieving the meeting objectives that hopefully would pave the way for future collaboration on Bay of Bengal Oceanography.



CSIR-NIO Team (standing left to right: Dr. V. Ramaswamy, Dr. P.S. Rao, Dr. N. Ramaiah, Dr. S. Prasanna Kumar, Dr. Rajiv Nigam) with (sitting) Vice Chancellor of DU, Dr. A.A.M.S. Arefin Siddique (centre), Prof. Kawser (right), Chairman, Department of Oceanography, DU and Dr. S.W.A. Naqvi (left), Director CSIR-NIO

Foundation Day Celebrations

CSIR-CECRI Celebrates Foundation Day-2015

The 68th Foundation Day of CSIR-Central Electrochemical Research Institute, Karaikudi was celebrated with fervour on 24th July 2015. Prof. S. Vasudevan, Department of Inorganic and Physical Chemistry, Indian Institute of Science, Bangalore graced the occasion as Chief Guest. His foundation day lecture dwelt upon aqueous dispersions

of 2-dimensional nanosheets for device applications. Functionalization by anchoring with organic molecules can be extended to nanomaterials to obtain new hybrid materials that can express enhancement in desired properties, he said. He elaborately dealt with the manoeuvrability of graphene and graphene oxide borne of 2D nanosheets.



Stable aqueous dispersions of 2D nanomaterials, graphene and graphene analogues, are an important consideration for applications that require large concentrations. He focused on the factors responsible for the dispersibility of these materials by considering two classes of materials: graphene oxide/reduced graphene oxide and MoS_2 . He highlighted how a molecular level understanding of the factors responsible for aqueous dispersibility helps in understanding a variety of associated phenomena and in tailoring the properties of materials. In the case of graphene oxide, the identification of the oxygen functionalities responsible for its aqueous dispersibility also provides an understanding of its intriguing photo-physical properties and an explanation for the different states of aggregation of the dispersions. It also provides a clue to engineering water-dispersible and electrically conducting reduced graphene oxide. Stable aqueous dispersions of atomically-thin layered MoS_2 nanosheets can similarly be obtained by sonication, in the presence of ionic surfactants. The dispersions are stabilized by electrostatic repulsion between the sheets. The sign of the charge on the MoS_2 nanosheets, either positive or negative, can be controlled by the choice of the surfactant. Finally, he explained how simple physical chemistry measurements and spectroscopy can contribute, by providing a molecular perspective, to macroscopic phenomena.

Earlier, Dr. Vijayamohan K. Pillai, Director, CSIR-CECRI welcomed and introduced the guest of honour as a renowned inorganic and physical chemist. He added that the foundation day was an occasion to introspect and to look forward. According to

him, the way forward was to strive for higher goals and to persevere in translating the research findings to benefit common people.



Dr. Vijayamohan K. Pillai, Director, CSIR-CECRI delivering the presidential address

Dr. M. Jayachandran, Chief Scientist delivered the welcome address and recalled the contributions of philanthropist Dr. R.M. Alagappa Chettiar. Mr. R. Meenakshisundaram, Senior Principal Scientist, proposed the vote of thanks.



Dr. M. Jayachandran, Chief Scientist, CSIR-CECRI delivering the welcome address



Professor S. Vasudevan, IISc, Bangalore delivering the Foundation Day Lecture

CSIR News is profiling all the CSIR laboratories throwing light on the significant areas they work in and their achievements.

Central Food Technological Research Institute (CFTRI), Mysore

CFTRI's efforts in the area of food technology helped the nation to consolidate the gains accruing from the promising high crop and horticulture yields after the Green Revolution. The premier national institute has also always been in the forefront at times of national calamities such as tsunami or earthquakes.

The Institute that gave to the nation Amul Baby Food—the first infant food developed from buffalo milk—was instrumental in promoting food conservation, food protection and nutritional enhancement of food products in independent India making the country one of the largest food

producers in the world. Whether it is food crops—grains, pulses, oilseeds, spices, plantation produce, fruits & vegetables—or even meat, fish and poultry, CFTRI has played a major role in orchestrating the value addition to agri-food sources.

It is the only institute in the South Asian region where research is carried out in every conceivable aspect of Food Science and Technology starting from food chemistry,

quality analysis, food safety, protein engineering, design of food machineries, sensory evaluation of food and so on.

CFTRI's endeavours have always had a strong public interface. Some of its broad-based achievements in the area of food science and technology are discussed here briefly.

Nutritional Intervention

The technology to manufacture spray-dried infant food from buffalo milk – marketed as Amul – helped in establishing a network of dairies for utilization of surplus buffalo milk paving the way for the White Revolution which has placed India as the leading milk producing country. Other notable products to roll out from the precincts of the CFTRI include lactose-free infant foods, multi-purpose food, composite protein food, weaning foods and low-cost nutrient supplements.

Scientists at CFTRI have over the years developed several food formulations to supplement the diet of children. As part of the nutrition intervention programme, CFTRI released energy food formulations, high protein biscuits and *Suruchi Meetha* targeted at school children. Energy foods also had large impact on the wellbeing of mother and child under the Integrative Child Development Services (ICDS) scheme. Fortification of wheat flour with iron, calcium, thiamine, riboflavin and niacin was also taken up to combat nutritional deficiencies prevailing in large sections of the population.



Food supplements



High-protein biscuit

Energy foods, protein isolates and vegetable toned milk, *Miltone*, are some of the other nutrition foods that have found widespread use in community feeding programmes of various State Governments.

In the area of nutraceuticals and probiotics, there are many leads already from the laboratory. Preparation of oil blends with balanced fatty acid composition as a health oil and cardio-protective functional foods and probiotics beneficial to human health are in the pipeline. The Institute also came up with many products targeted at the health-conscious and diabetic population, which include low-fat, sugar-free and high-fibre biscuits.

Value Addition to Agri-resources

Scientists at the CFTRI have vastly improved the performance of the hullers in which more than 30% of the paddy is milled in the country. The improvements have helped to achieve higher rice yields, reduced broken and enhanced value for by-product such as rice bran.

A mini dal mill developed at the Institute can dehusk 100-150 kg of pulses in one hour, and is thus a boon to the rural sector where about three million tonnes of pulses are processed. More than 230 of the CFTRI designed mini dhal mills have been installed in rural and semi-urban areas directly contributing to rural economy. One tonne/hour capacity dry maize mill plant and gota separator are the other ventures that found useful applications in the agri-food processing sector.

CFTRI's other contributions to food grain processing include improved parboiling methods for manufacture of parboiled paddy overcoming the colour and smell problem, technology for improved flaking and puffing method, and a mini grain mil for processing coarse grains. CFTRI has also developed

processes for fumigation to protect grains from insect pests and prevents fresh infestation.

Although India is a major producer of fruits and vegetables, almost 10-30% of the crop is lost due to spoilage every year. Scientists at the Institute have developed a complete package of technologies, right from the harvesting stage to the packing stage, to minimise such losses. These include the optimum time for harvesting fruits like bananas, mangoes, oranges and guavas; applying an antifungal formulation on the cut ends of banana bunches, and techniques of dehydration of bananas, grapes, carrot, potato and onion.

One such technology protocol, called Controlled Atmosphere Storage, has paved the way for the successful export of Indian Alphonso, Banganapalli and Kesar varieties of mangoes by sea to distant foreign markets, cutting down the formidable air cargo fares. This includes standardization of harvest maturity, handling, transportation, pre-packaging treatments, packing in specially designed corrugated material boxes and refrigerated containers for shipment with a shelf-life of 35-40 days. A similar technology package for export of bananas has also been developed.

Development of food flavours and colours has also been a CFTRI stronghold. Asafoetida in both powder and tablet forms; natural colours from safflower petals, blue grapes, Kokum fruits and beetroot for use in syrups, jams,



Variety fruit products



The Institute that gave to the nation Amul Baby Food—the first infant food developed from buffalo milk—was instrumental in promoting food conservation, food protection and nutritional enhancement of food products in independent India making the country one of the largest food producers in the world. Whether it is food crops—grains, pulses, oilseeds, spices, plantation produce, fruits & vegetables—or even meat, fish and poultry, CFTRI has played a major role in orchestrating the value addition to agri-food sources.

jellies, sauces, soft drinks, beverages and dairy products; and flavour blends for carbonated beverages like orange and lime-lemon have found ready markets. The institute also has technologies for fruit-based products like clarified juices, beverages, fruit bars, fruited cereal flakes and juice powders.

CFTRI has also developed and transferred technology for the manufacture of *Spirulina platensis*, the fresh-water blue-green algae which has emerged in world markets as a much sought after health food source, which is in great demand by pharmaceutical industries.

Technologies for the extraction of spice oils and oleoresins from indigenous spices that contribute to a large chunk of India's import earnings have been developed at CFTRI. Majority of the pepper oleoresin and pepper oil extracting plants in the country utilize the Institute's processes. CFTRI has a cryogenic process for pepper powder and white pepper. Processes for extracting the medicinal

component of pepper (piperine), turmeric, and ginger have also been developed here.

Automation & Convenience Foods

Modernisation of the traditional food sector is one of the challenges

undertaken by CFTRI. Scientists at CFTRI have successfully designed machineries for the bulk manufacturing of popular cuisines like idli, dosa and chapati. Some of the other machineries the institute has devised include vada frying, coffee roaster, infrared drying of cashew nuts, continuous popping machine, laddu making and chikki making machineries. Bioplates from agri-horti wastes, sunflower dehuller and papad making units have become popular with the farming community and Small Scale Industrial units.

Convenience foods like dosa, idli, vada, gulab jamun and many other crispies and snacks are very popular today. They have not only reduced drudgery, but have also made working in the kitchen a pleasurable chore. It was CFTRI that conceived and developed convenient mixes for these popular Indian dishes more than two decades ago. Today, 90% of the annual production of convenience food products worth several millions of rupees is based on CFTRI technologies. Processes for the large-scale manufacture of pickles from various vegetables, jams, and jellies from Indian fruits, dehydrated vegetables and soup mixes from native vegetables have ensured better utilization of these farm produce in the country.

Biotechnology

CFTRI has standardized various processes for the extraction of natural colorants from plant, microbial and algae

sources for use in food, which include phycocyanin, betalin, annatto dye, and so on. Technologies have been developed for the micropropagation of Vanilla, Gardenia and *Decalepis hamiltonii*



Convenience foods



Dry maize mill



Dosa-making machine

plants. Biodegradable packaging materials such as Polyhydro-xyalkanoates (PHA) and Chitosans as environmentally friendly packaging materials are under various stages of technology absorption.

CFTRI also undertakes quality testing of food products. Microbial contamination, pesticide residues and heavy metal contamination, which are potential health hazards, are analysed in the Institute. The Institute has a full complement of analytical techniques backed by the most modern instrumentation. A variety of analytical methods have been devised to detect food contamination. The use of biosensors, ELISA test for pesticide residues and PCR probes for food pathogens are recent additions to ensure food safety.

Work on probiotics in the Institute has been aimed at primarily developing food supplements based on lactic acid bacteria, which can inhibit many harmful bacteria detrimental to human health. Transformation of coffee for low caffeine content, nutritional improvement of eggplant, enzymatic regulation and identification of Capsaicin biosynthesis were also pursued by different groups.

Centers of Futuristic Studies

CFTRI has promoted several state-of-the-art facilities with sophisticated analytical equipments as the backbone of the competitive research in the field of food science and technology. Notable among them are:

Nodal Codex Food Laboratory: This is a referral food analysis center for the country. This laboratory is an information center for national and international Food Standards, and food legislations. The laboratory closely interacts with FAO/WHO on safety evaluation of food additives and monitoring and surveillance of contaminants. Analytical services are offered to industries for the

evaluation of food proximate composition, mycotoxins, pesticide residues, trace metals, food additives, minerals and vitamins, microbial contaminants, water analysis, and nutritional labelling. A GM Food Referral centre is also taking shape to help the nation formulate mandatory and legal requirements in the case of genetically modified organisms in processed foods. The center will also devise analytical methods and protocols for the detection and quantification of GMOs in food materials and processed foods derived from cereals, pulses and dairy products.



Cell Culture Facility: A sophisticated Cell Culture Facility has been set up at CFTRI for culture of plant and animal cells. The cell culture facility is to evolve mechanisms to reap health benefits of dietary constituents; mechanism of action of nutraceuticals; functional role of anti-diabetic, anti-cardiovascular and anti-cancer dietary constituents; toxicity studies on diet ingredients; and evaluation and understanding of health food formulations.

For further details contact:

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Appointments

Dr. Madhu Dikshit Appointed Director of CSIR-CDRI



Dr. Madhu Dikshit has been appointed as the Director of the CSIR-Central Drug Research Institute (CDRI), Lucknow.

Dr. Dikshit's area of specialization is Molecular and Cardiovascular Pharmacology. She is currently Co-ordinator of the National Project on "Development of Potential Drugs from the Ocean" sponsored by the Ministry of Earth Sciences.

She has received several awards including Young Scientist Award (Medical Sciences), INSA (1989); Shakuntala Amir Chand Prize, ICMR (1994); National Bioscience Award, DBT, Ministry of Science & Technology (2000); Vigyan Ratna, UP-CST (2010) and Vasvik Award 2012.

She is a Fellow of the Indian

Academy of Sciences, National Academy of Sciences, India and Indian National Science Academy and also Elected Member of the National Academy of Medical Sciences, India.

An anti-ulcer compound (proton pump inhibitor) developed by Dr. Dikshit was selected for joint development by Cadila Pharmaceuticals. Two anti-platelet compounds of CDRI are also under development mode under her leadership.

Dr. Dikshit has supervised 27 PhD theses and seven students are currently working for their PhD under her. She has 158 Research Publications, 9 Book Chapters and 9 Patents to her credit. She is also member of the editorial boards in the *Indian Journal of Pharmacology*, *Cytometry Part A*, and *Redox Biology*.

Forthcoming Events

Indian Ocean Sea Level Science Workshop and Fourteenth session of the Group of Experts for the Global Sea Level Observing System

The fourteenth session of the Group of Experts for the Global Sea Level Observing System (GLOSS) will be held at the CSIR-National Institute of Oceanography (Goa, India) during the week of 19-23 October 2015. The session is being organised by the CSIR-NIO and the Intergovernmental Oceanographic Commission of UNESCO.

A workshop dedicated to Indian Ocean Sea Level Science would be organised during 19-21 October 2015. The workshop will have presentations covering many aspects of global and regional sea level variability including:

- Global sea level change
- Indian Ocean Sea Level changes, Mean sea level changes and Climate variability
- Extreme sea level changes, storm surges, tsunamis
- Sea level measurements (tsunami/ sea level network), continuous GNSS
- Impacts (Low-lying areas, mangroves, coral reefs) and Paleo sea level (Holocene), Archeological studies
- Special session on SARAL/AltiKa satellite altimetry data analysis for sea level studies

The GLOSS GE meeting will follow on Wednesday, 21 October (afternoon) to Friday, 23 October.

For more information: <http://ioc-unesco.org/gloss-ge-14> and <http://www.nio.org/>

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