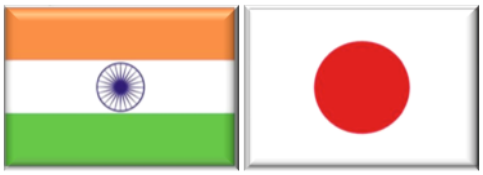
ISAJ 2nd Symposium 2011



India-Japan Symposium on
Global Challenges in Health and Environment

October 7, 2011
Indian Embassy Auditorium, Tokyo, Japan

Program and Abstracts Book

Organized by
Indian Scientists Association in Japan (ISAJ)

Supported by
Embassy of India

October 7 2011

ISAJ 2nd Symposium

India-Japan Symposium on Global Challenges in Health and Environment

(Dedicated to the victims of the Great East-Japan Earthquake/Tsunami)

Plenary Sessions:

- Challenges and Innovations in Health Sciences
- Health and Environment
- Natural Disasters and Environment
- Energy and Environment

Organized by:

ISAJ
INDIAN SCIENTISTS ASSOCIATION IN JAPAN

Information and updates: http://www.isaj.org

Table of contents

Welcome Messages pages 2-9

- Dr. R. Chidambaram, Principal Scientific Advisor to the Govt. of India.
- H.E Shri Alok Prasad, Ambassador of India to Japan
- Prof. Toshio Yamagata, Dean School of Science, University of Tokyo
- Prof. Kiyoshi Kurokawa, Professor Emeritus, the University of Tokyo
- Dr. Sunil Kaul, Chairman, ISAJ
- Prof. Ruby Pawankar, Convener, ISAJ
- Prof. S. Behera, Co-convener, ISAJ

Program pages 9-10

Plenary Session Abstracts pages 11-21

Poster Presentation Abstracts pages 22-57

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एवम्
डी.ए.इ. - होमी भाभा प्रोफेसर
Dr. R. Chidambaram
Principal Scientific Adviser to the Govt. of India
&
DAE - Homi Bhabha Professor

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Message

I am delighted to learn that ISAJ is organizing the "India-Japan Symposium on Global Challenges in Health and Environment" in Tokyo on October 7th, 2011. Since its launch in January 2009 – I recall with great pleasure being there on that occasion – ISAJ has been very active in promoting scientific collaboration between India and Japan. Health security is an important aspect of national security while environmental security extends beyond national borders. Research generates new knowledge and innovation adds economic valve and societal benefit to existing or newly generated knowledge – we need both research and innovation. We also need collaborative research and collaborative innovation between India and Japan. In the case of health and environmental issues, the collaboration should be altruistic, without being circumscribed by IPR issues.

India has always admired Japan for its rapid industrial development, particularly after the Second World War. More recently, Japan has also developed excellent advanced facilities for basic research, many of which are accessed by scientists from India. India's admiration for Japan has grown after watching the way Japanese people have responded to the recent earthquake/tsunami disaster. I am also very happy to see our Ambassador in Japan and his colleagues playing a very pro-active role in promoting Indo-Japanese scientific collaboration.

R. Chidambaram

(R. Chidambaram)
20th September, 2011

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AMBASSADOR OF INDIA
भारत का राजदूत

सत्यमेव जयते

26 September 2011

MESSAGE

I am very happy to learn the Indian Scientists Association in Japan (ISAJ) is holding the 2nd ISAJ Symposium on ***Global Challenges in Health and Environment*** on October 7 in Tokyo. Since its inception in January 2009, ISAJ has been playing an active role in promoting Indo-Japan scientific co-operation and dialogue.

Science has no boundaries and it is through such scientific collaboration that one can apply new knowledge into developing innovative and meaningful end products for the society. The ISAJ Symposium on Global Health and Environment covering two major topics 'Health' and 'Environment ' is well timed as it relates to human welfare and productivity that are being increasingly challenged by the evolving changes in the environment we live in and with related.

I hope that the scientific deliberations will lead to more strategic collaborations between the two countries. The Symposium will also be a unique opportunity to develop further the Indo-Japan bilateral relations and friendship in this important sector.

I wish the organizers of the Symposium all success.

Alok Prasad
(Alok Prasad)

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CHALLENGE OF HEALTHCARE POLICY

Healthcare is a fundamental policy of any nation, but there arise major obstacles though they represent 'Progress' in medical sciences, public health and technologies, and the way of our life style. Many affluent countries face major difficulties in reform with a variety of innovations while growing economies must prioritize its policy agenda.

Kiyoshi Kurokawa, MD, MACP, FRCP
Professor Emeritus, the University of Tokyo
Academic Fellow, National Graduate Institute for Policy Studies
Chair, Health and Global Policy Institute
Chair, Impact Japan

THE UNIVERSITY OF TOKYO

Toshio Yamagata
Dean, School of Science

MESSAGE

I am very happy to know that the Indian Scientists Association in Japan (ISAJ) is holding its 2nd India-Japan symposium on Global Challenges in Health and Environment. It was a wonderful opportunity for me to have delivered the keynote lecture in the 1st symposium last year. I fondly remember my interactions with many talented young colleagues from India, and, in particular, my brief interaction with the minister of Indian Science and Technology.

Indian scientists have always impressed me by their superb scientific ability and intelligence with diligence and sincerity. I am sure these advantages and virtues are rooted in the long cultural history of India. In my long research life, I have enjoyed working with many Indian scientists in oceanography and climate dynamics and I observed them to grow internationally with my pleasure. Many of them are now holding high research positions in India as well as other places on this globe. I am sure that such successful interactions will grow further in many disciplines and establish a stronger tie between India and Japan.

Climate related environmental variations affect our health and security. Recent heat waves related to climate variations are example of such climate impacts on the society. Half of the human population lives in urban areas and the ever-increasing urban population generating new challenges for maintaining and improving our well-being. Therefore, it is important for us to develop better applications of climate information in health and environmental issues. This is a global challenge and cannot be achieved by a single country. We can only address these challenges through bilateral, multilateral and international collaborations. Considering that the General Assembly of the International Council for Science just recently endorsed plans for a new global initiative on " Health and Wellbeing in the Changing Urban Environment: A Systems Analysis Approach", the ISAJ symposium is quite timely.

I wish a memorable as well as successful ISAJ symposium.

山形俊男
Toshio Yamagata

Indian Scientists Association in Japan (ISAJ)

Chairman's Welcome

I, on behalf of ISAJ family warmly welcome all the delegates to the India-Japan Symposium 2011 on Global Challenges in Health and Environment. Having taken its birth only three years ago and formally inaugurated by Prof. Chidambaram, Principal Scientific Adviser to Government of India in January 2009, ISAJ is now a registered Non Profit Organization (NPO) in Japan with its functional chapters spreading all over Japan. "Though very young, ISAJ is making sincere efforts to live up to its true potential in networking scientists from India and Japan." We believe that cross-disciplinary interaction and integration are the best sources of innovation and hence we are all together here today on one platform joining heads and hands to generate best of science and society.

Realizing the challenges facing the world at the present time, today's event is focused on health and environment. We will have 10 plenary lectures, in addition to 9 oral presentations and more than 35 poster presentations. Needless to say that this will be a great opportunity to network amongst scientists of both countries and to build the foundation for future India-Japan research collaborations.

We sincerely appreciate the initiative of the then (2007-2011) Indian Ambassador Shri Hemant Krishan Singh and S&T Counsellor Dr. Pankajakshan Thadathil in structuring and and helping ISAJ. We also feel privileged now to have His Excellency Indian Ambassador Shri Alok Prasad and S&T Counsellor Dr. Chadaram Sivaji as our honorary patron and honorary advisor, respectively, and to have their enthusiastic support to take it up further. We had a very successful first symposium last year followed by regular ISAJ chapter meetings that also include regular scientific presentations and interaction in many chapters such as Tsukuba and Tokyo. All the members of ISAJ are dedicated to the cause of this forum in creating congenial milieu for the scientists and young researchers of both India and Japan in pursuing true and long-standing partnership in scientific and technological research.

The idea of this symposium would not have materialized without you, all the delegates. I extend my warm welcome and thanks to you all for taking time out of your busy schedule for this event and I hope that you participate actively and most importantly enjoy it. I sincerely hope that the symposium will challenge and inspire, and result in furthering collaborations and friendship.

With best regards,

Sunil Kaul.

(Sunil Kaul)
Chairman
ISAJ

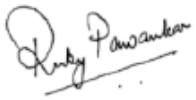
Prof. Ruby Pawankar, MD, Ph.D, FAAAAI
President-Elect, World Allergy Organization
Director, Asian Allergy Asthma Foundation
Nippon Medical School. Tokyo, Japan
Kyung Hee University School of Medicine, Seoul, Korea

CONVENOR'S MESSAGE

Health and environment play major roles in our lives and sustainable maintenance of the environment is vital for healthy living in the 21st century. Inequality in health care systems, knowledge gap, emergence of new diseases and syndromes especially an increase in non-communicable diseases are some of the factors that are a burden on the socio-economics of developing nations. Moreover, rapid urbanization, change in biodiversity, climate change, pose a greater threat to health of both urban and rural populations worldwide. At a time when the UN has launched the global campaign to curb death toll from non-communicable diseases, such a symposium is most timely

Understanding the genetics and molecular aspects of these diseases as well as newer approaches like Systems biology and alternative medicine, and knowledge sharing amongst scientists is essential for improved treatment strategies. Such information and adequate education will empower the policy makers and public for sustainable management of resources while keeping high-level standards of health and reduction of the global burden of diseases.

Global health issues have been at the forefront of Japanese research initiatives and much focus is given to translational research and applications. To develop stronger bilateral collaborations between India and Japan in science and share cutting-edge research outcomes, ISAJ is organizing this symposium under the patronage of the Embassy of India in Japan and with support from the co-sponsoring organizations. A warm welcome to all and sincere thanks to all who contributed to making this happen.



Ruby Pawankar

Swadhin Behera
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CO-CONVENOR'S MESSAGE

The unprecedented rate of recent global developments has increased pressures on the Earth environment and has been affecting the safety and comfort of our societies. Global environmental change is profoundly affecting supplies of food, water and energy, and has increased our vulnerability to diseases. In this era of rapid urbanizations, climate change and biodiversity losses are in particular raising deep concerns on global securities in "Food, Environment, Health and Energy". These interdisciplinary issues are not necessarily limited to local and regional boundaries. Therefore, there is a need now, more than ever before, to develop bilateral and multilateral cooperation for the sustainable management of the Earth environment.

Fortunately, we are in a very opportunistic time when modern technologies are helping us to monitor parts of earth environment that were otherwise inaccessible a few decades ago. High-performance computing systems are giving us the opportunity to predict climate and associated changes in the environment far ahead in time.

Considering the rapid progresses in these areas of research and societal applications, it is important for the research communities to develop crosscutting research themes to rip the benefit from the available information. We need to reduce the uncertainties, fill the gaps and improve forecasts through crosscutting research and integrated approaches. Only by actively engaging natural and social sciences we could provide a full understanding of global change and its impacts on human beings.

India and Japan have historical relationships through exchanges of culture and heritage. With rapid progresses in science and technology, Japan is established as one of the leading centers in the world for scientific research. This excellent research environment has already benefited many of us. By further strengthening the growing scientific collaborations between Japan and India, we can address some of the global challenges in health and environment that are the very basis of our existence and happiness.

Swadhin Behera

Swadhin Behera

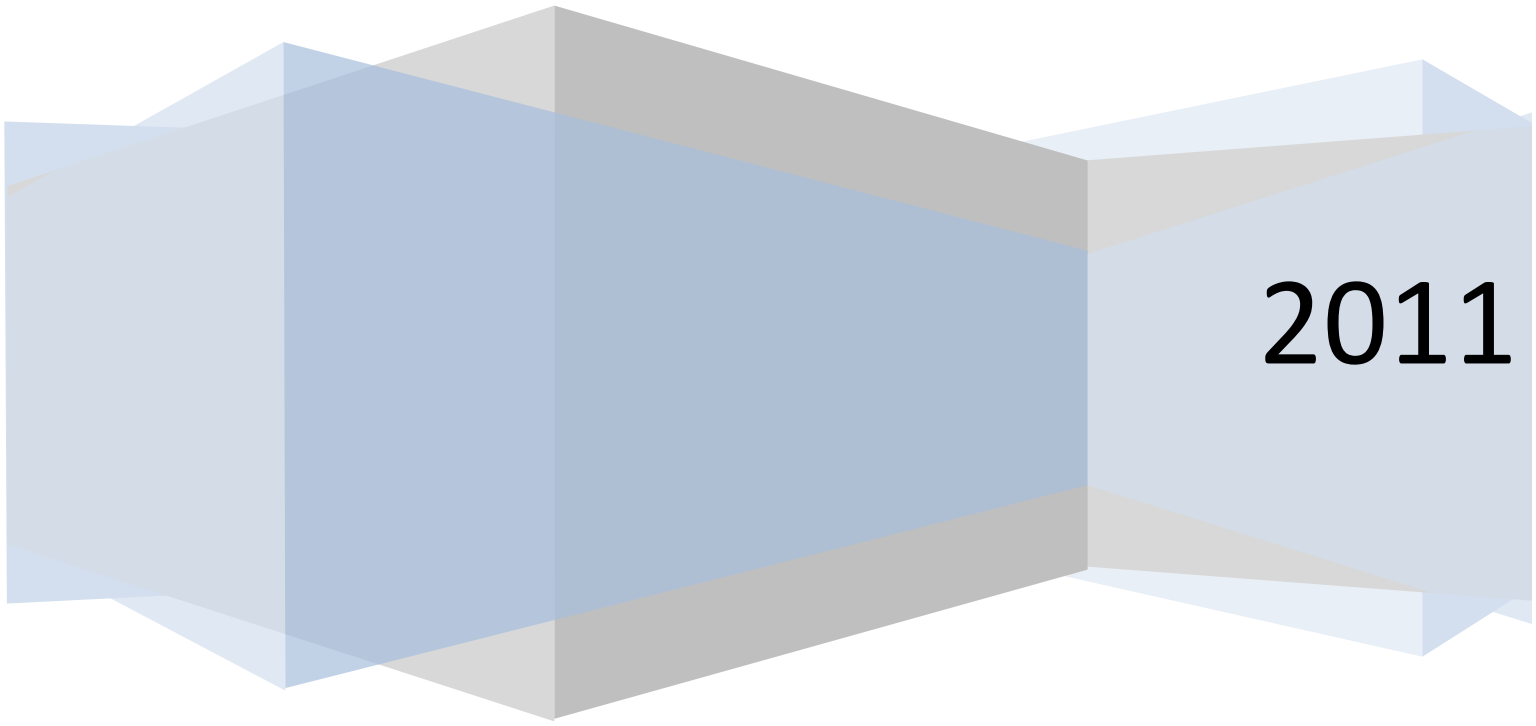
PROGRAM

8:00 - 9:00	Registration	
9:00-9:01	**Observation of a moment of silence in commemoration of the victims of the March 11 disaster**	
9:01-9:05	**Lighting of the lamp**	
9:05 - 10:30	**Inaugural Session**	
9:05 - 9:15	Welcome Address	S. Kaul, Chairman, ISAJ
9:15- 9:30	Address	C. Sivaji, Science Counsellor, Embassy of India, Japan
9:30- 9:40	Address	MEXT official
9:40 - 10:00	Address	R. Pawankar and S. Behera, Convenors, ISAJ 2011 Symposium
10:00- 10:15	Inaugural Address	H.E Shri Alok Prasad, Ambassador of India to Japan
10:15-10:20	Address	Message from Honorable Health Minister of India
10:20-10:30	Vote of Thanks	A. Singh, Vice-Chairman, ISAJ
10.30-10.35		*GROUP PHOTO*
10.35-10:50		***COFFEE BREAK***
10:50-12:45	**Plenary Session 1**	**Challenges and Innovations in Health Sciences**
	Chairs: T. Maekawa and D. Sakthi Kumar	
10.50 -11.10	*H. Kitano* Sony Computer Science Laboratories	Novel scientific approaches in chronic diseases: Systems biology
11.10 -11.30	*R. Pawankar* Nippon Medical School	Novel therapeutic targets: Immunomodulators and Biologics in allergic diseases
11.30-11.50	*M. Tamari* RIKEN	Genetics and genomics overview: Genome-Wide Association Studies (GWAS)
11.50-12.10	*R. Wadhwa* AIST	Understanding the effects of alternative medicine through biotechnology and bioinformatics
12:10-12:30	*K. Kurokawa* Former Science Advisor to the Cabinet of Japan	Challenges and innovations in clinical research in changing environment
12.30-12.45	*Short Presentations* *A. Aravind, R. Gao and M. Sasaki*	*(3 Presentations, 5 min each)*
12:45-14:10		***POSTER SESSION + LUNCH***
14:10-15:05	**Plenary Session 2**	**Health, Environment and Environmental Hazard**
	Chairs: A. Suzuki and S. Kaul	
14.10-14.30	*M. Hashizume* Nagasaki University	Climate impact on human health: Some case studies from the Indian Ocean sector
14.30-14.50	*S. Sahoo*	Overview of radiation physics from the viewpoint of

	National Institute of Radiological Sciences	radiation protection and consequences of nuclear accidents
14.50-15.05	*Short Presentations* *A. Mathew, V. Krishnan and J.M. Rosalie*	*(3 Presentations, 5 min each)*
15:05-15:20	***COFFEE BREAK***	
15:20-16:35	**Plenary Session 3**	**Natural Disasters and Environment**
	Chairs: T. Saito and A. Singh	
15:20-15:40	*M. Fukasawa* RIGC/JAMSTEC	Comprehensive ocean research for sustainable management of the earth environment
15:40-16:00	*Y. Masumoto* RIGC/JAMSTEC	Prediction of climate and ocean variations for societal benefit
16:00-16:20	*K. Mahapatra* Tokai University	Impact of natural disasters in coastal zone management
16:20- 16:35	*Short Presentations* *S. B. Ratna, R.L. Verma and A. Jana*	*(3 Presentations, 5 min each)*
16:35-16:55	**Plenary Session 4** **Chair: T. Yao**	**Energy and Environment**
	S. Konishi GCOE, Kyoto University	Energy education in Kyoto University under global COE program
17:05-17:35	**Panel Discussion** Chair: Shri Sanjay Panda, Deputy Chief of Mission, Embassy of India, Tokyo Panelists: TBA Moderator: S. Behera	
17.35- 17.40	**Closing Remarks**	

PLENARY SESSION

ABSTRACTS



PL-01

Novel Scientific Approaches in Chronic Diseases: Systems Biology

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Systems-level understanding of biological processes as well as disease status are critically important for discovery of more effective and efficient counter-measures for diseases (Kitano, 2002a, Kitano, 2002b). Chronic diseases such as diabetes are increasingly common not only in industrialized countries but also in emerging economics. Significant portion of Type-II Diabetes can be classified as normal physiological responses against unexpected lifestyle, and considered to be the fragility of the system that is optimized for near-starving and high energy consumption life style exposed for most of evolutionary time-span (Kitano et al., 2004).

At the same time, personal genomics approach is now coming to be practical that potentially impacts on how we can recognize individual risk factors and take appropriate counter-measures and treatments. Combining personal genomics and systems biology is the way clear option for future of medicine where healthcare and disease treatment can be optimized for individuals based on their life style that affects epigenetic status and genetic background. The concept of robustness and fragility of biological systems as illustrated in the theory of biological robustness plays very important role in understanding how disease finally outbreak and progress (Kitano, 2004). In addition, heterochromatin island hypothesis proposed over a decide ago is now shown to be the case in reality where heterochromatin reorganization driven by sirtuins control the level of fragility, hence affects age-related phenotypes (Kitano and Imai, 1998, Imai and Kitano, 1998).

Kitano and Imai, Journal of Experimental Gerontology, 33(5) 393-419, 1998
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PL-02

Novel Therapeutic Targets: Immunotherapy, Immunomodulators and Biologics in Allergic disease

Ruby Pawankar

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Allergies occur as a result of aberrant immune reactivity against common harmless environmental proteins called allergens. A key component of the pathomechanisms of allergic diseases is the production of Th2 cytokines, generation of allergen-specific IgE, crosslinking of the IgE molecules by allergen, activation of mast cells with the release of potent mediators which in turn elicit the acute allergic reactions and promote the development of chronic inflammation. Most therapeutic approaches for allergic diseases focus primarily on symptom control and suppressing inflammation. Specific allergen immunotherapy (SIT) is the only disease-modifying treatment for allergic rhinitis and asthma where the benefits may persist years after treatment is discontinued. Allergen immunotherapy has been used for almost a century as a desensitizing therapy for allergic diseases. Administration of appropriate concentrations of standardized purified allergen extracts has been shown to be reproducibly effective in carefully selected patients. Studies suggest that allergen immunotherapy induces a reduction in inflammation, nonspecific hyper responsiveness, prevents new sensitivities and progression of allergic rhinitis to asthma. The potential disease-modifying effects of SIT are particularly compelling in children, considering their likely long duration of allergic symptoms, which require years of medications. In addition to the benefit of sustained remission of symptoms, SIT may offer a significant cost-benefit due to reductions in medication and other costs. However, SIT is limited by its drawbacks of safety concerns and the inconvenience of repeated clinic visits over several years. Therefore, attempts are underway to improve on the safety and convenience while still retaining the benefits of subcutaneous immunotherapy (SCIT). Sublingual immunotherapy (SLIT) appears to be one of these forms of immunotherapy associated with a lower incidence of systemic reactions, and safe enough to allow for home administration. More recently, the use of non-allergen specific immunotherapy namely anti-IgE monoclonal antibody has been approved for patients with allergic asthma. Other immunomodulatory methods under study are microbial adjuvants like bacterial DNA conjugated allergen immunotherapy (CpG conjugated), peptide immunotherapy, TLR9-based immunotherapy, as well as molecules that interrupt the activity of key cytokines like monoclonal antibodies against IL-5, IL-17A, IL-33, TSLP, chemokine receptors like CCR4 and other Th2 mediators.

PL-03

Genome-Wide Association Studies of Asthma in the Japanese Population

Mayumi Tamari and Tomomitsu Hirota

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Human genetic variants are referred to as either common or rare, and common variants are also called polymorphisms, defined as variants with a minor allele frequency of at least 1% in the population. Among the various different types of genetic polymorphisms, single nucleotide polymorphisms (SNPs) are the most prevalent class of genetic variations among individuals. There is one SNP for every 1000 base pairs in the entire human genome. It is thought that SNPs found around a gene may cause variations in the timing, amount, and function of the protein product and influence human health and diseases. The international HapMap project started from 2002 to develop a public resource that will help researchers to find genes associated with human diseases. The HapMap consortium has determined the linkage disequilibrium (LD) patterns of four major human populations. Genotyping arrays have been developed with reference to LD, which can now assay up to ~2 million variants. The data from the HapMap project and the development of dense genotyping chips have enabled us to conduct Genome-wide association studies (GWAS) on a large number of samples. GWAS, which comprehensively assess genes related to multifactorial diseases and drug reactivity, have enhanced understanding of human diseases.

Bronchial asthma is a common inflammatory disease caused by a combination of genetic and environmental factors. To discover the genes and cellular pathways underlying asthma, a large number of genetic studies have been conducted. From 2007, GWAS of susceptibility to bronchial asthma in Caucasian, Mexican, and African-ancestry populations have been conducted and several susceptible loci were identified. In 2011, we conducted GWAS in the Japanese population and reported five candidate loci associated with susceptibility to adult asthma (Hirota T, et al. Nat Genet. 2011;43:893-896).

Chromosome 6p21 ($P = 4.07 \times 10^{-23}$): The most significant association with adult asthma was observed at rs404860 in the major histocompatibility complex (MHC) region, which is close to rs2070600 previously reported for association with FEV_1/FVC by GWASs for lung function. Reduction of FEV_1/FVC is a characteristic of obstructive lung diseases such as asthma. There might be an important common genetic determinant of lung function in both healthy individuals and asthma at the locus.

Chromosome 5q22 ($P = 1.24 \times 10^{-16}$): TSLP promotes T helper type 2 (Th2) cell responses and is involved in the pathogenesis of asthma. We found for the first time an association of asthma with the TSLP/WDR36 locus at a genome-wide significant level. Furthermore, a SNP in the *TSLP/WDR36* locus was associated with adult asthma in populations of both Japanese and Caucasian decent.

Chromosome 4q31 (combined $P = 1.87 \times 10^{-12}$): The locus on chromosome 4q31 contains *USP38-GAB1*. *USP38* encodes ubiquitin-specific peptidase 38, whose function is unclear. GAB1 is a scaffolding adopter protein that plays an important role in the signaling pathway activated by cytokine receptors for IL-3, IL-6, interferon α and γ, and B-cell and T-cell receptors.

Chromosome 10p14 ($P = 1.79 \times 10^{-15}$): The locus on chromosome 10p14 is a gene desert and is located 1 Mb down-stream of *GATA3*, a master regulator of Th2 differentiation.

Chromosome 12q13 ($P = 2.33 \times 10^{-13}$): Recent association studies have shown that rs1701704 at this locus is associated with type I diabetes and alopecia areata. Rs1701704 is located 2 kb upstream from *IKZF4* (also known as *EOS*), which was shown to be involved in differentiation of regulatory T cells as a coregulator of FOXP3-directed gene silencing. Regulatory T cells maintain pulmonary homeostasis and prevent harmful immune responses to innocuous inhaled antigens

Systemic, well-powered, genome-wide surveys using GWAS have explored the relationship between SNPs and disease susceptibility. Those implicated genes by GWAS suggested a role for communication of epithelial damage to the adaptive immune system and activation of airway inflammation. Although a more complete collection of associated genes and pathways is needed, biologic insights revealed by GWAS provide valuable insights into the pathophysiology of asthma and contribute to the development of better treatment and preventive strategies.

PL-04

Understanding the Effects of Alternative Medicine (Ayurveda) through Biotechnology and Bioinformatics

Renu Wadhwa

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Loss-of-function screening involves the use of siRNA, ribozyme or antibody libraries that target specific proteins or signaling pathways. It is an extremely powerful way to identify genes involved in a defined phenotype *in vitro* and *in vivo*. We here demonstrated the use of loss-of-function screening to understand the molecular biology of Ashwagandha (*Withania somnifera*) effects. Ashwagandha is a tropical herb that enjoys more than 5000 years of history of use in Indian home medicine 'Ayurveda'. It is extensively used to promote physical and mental health. However, laboratory evidence of its health promoting activities is lacking. We first identified an anti-cancer activity in the alcoholic extract of Ashwagandha leaf extract (i-Extract) and found that only cancer cells were killed with i-Extract, normal cells remained unaffected. In order to identify the anti-cancer components of i-Extract and its cellular targets in cancer cell killing, we used combined chemical and cell-based loss-of-function screenings using human siRNA and randomized ribozyme libraries. By further merging with the powers of bioinformatics, we demonstrated that the i-Extract and its component 'withanone' kill cancer cells by, at least, two mechanisms involving selective activation of (i) tumor suppressor protein p53 and (ii) ROS signaling. Biochemical and visual assays conducted to validate the involvement of selected cellular targets will be discussed.

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PL-05

Climate Impact on Human Health: Some Case Studies from the Indian Ocean Sector

Masahiro Hashizume

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Human health is influenced by weather and climate in addition to changes in social, political, economic, environmental and technological factors. Outbreaks of some diseases and other threats to human health are largely dependent on modes of climate variations. Local climate condition such as the extreme temperatures can lead to loss of human lives as was observed in the 2010 summer over Europe. Besides such a direct impact, climate-related disturbances in ecological systems, such as changes in the range of infective parasites, can indirectly induce the incidences of serious infectious diseases. In addition, climate related variations in rainfall and moisture of a region could seriously impair human lives through vector-borne and waterborne diseases.

Malaria resurgence in the African highlands has raised questions about the underlying drivers of the increase in disease incidence in these regions. Climate change is suspected to be a major factor in the recent resurgence of malaria. The El-Niño-Southern Oscillation, characterized by unusually warm sea surface temperatures in the eastern tropical Pacific, has been connected to malaria epidemics in several highland regions. However, there are other factors associated with malaria risk and there is increased interest in the influences of the Indian Ocean Dipole (IOD), a climate mode of coupled ocean-atmosphere variability, on East African rainfall. There is also increased interest in the influence of the IOD on regional ocean climate in the Bay of Bengal and on Indian monsoon rainfall, which recently appeared to lead to cholera epidemics in Bangladesh. In the presentation, I will introduce impacts of IOD on infectious disease incidence in Asia and east Africa and provide some insights in the possible pathways.

PL-06

Overview of Radiation Physics from the Viewpoint of Radiation Protection and Consequences of Nuclear Accidents

Sarat Kumar Sahoo

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Nuclear technologies are considered by many countries as one of the most effective ways to meet the growing needs in energy supplies, to cut down the discharge of greenhouse gasses, to mitigate the climate change, and to act as counterbalance to fluctuation of prices of fossil fuels. Yet at the same time the consequences of the disaster at the Nuclear Power Plant must never be forgotten. Any nuclear power plant accident has the potential to release substantial amounts of radionuclides to the atmosphere. This could lead to extensive contamination of the environment. The activity level of radionuclides in the environment gradually declines due to radioactive decay. At the same time, there exists movement of radionuclides within the environments - atmospheric, aquatic, terrestrial and urban- and among environments such as in the case of Chernobyl catastrophe. The accident at unit 4 of the Chernobyl Nuclear Power Plant took place shortly after midnight on 26th April 1986 and caused extensive spread of radionuclides. On March 11, 2011, a 9.0 magnitude earthquake (The Great East Japan Earthquake) struck the east coast near Iwate, Miyagi and Fukushima, Japan. This natural disaster, besides claiming large number of human lives and extensive damages to properties, caused a serious damage to the Fukushima Dai-ichi Nuclear Power Plant. Radioactive elements have been released by hydrogen detonation following the incident. It is early to compare those two incidents since the evaluation of environmental contamination and contributory external exposure after the Fukushima incident is in progress.

Ionizing radiation is one of the most studied and ubiquitous carcinogens in our environment. The main basis for radiation protection recommendations is the study of survivors of Japanese atomic bomb (A bomb), a population exposed primarily at high dose rates. The primary public health concern, however, is the protection of people from low dose, protracted or fractionated exposures such as those received by the public in the general environment, by patients through repeated diagnostic procedures and by radiation workers.

Therefore, it is essential to understand radiation physics such as disintegration of radioisotopes, dose distribution in body, fate of radiation, unit and definition, dose calculation, dose limit, three essential elements for protection, safety culture, ambient radiation and comparison of relevant radioactivity.

PL-07

Comprehensive Ocean Research For Sustainable Management of the Earth Environment

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Oceans cover 71 percent of the Earth surface and are integral parts of the planetary system including climate and weather. Marine eco-systems constitute nearly 50 percent of all species on Earth. A large part of human population 60% of which reside within 200 km of the coast are also dependent on sea state and marine resources. Therefore, it is necessary to have adequate ocean monitoring and research systems for sustainable management of marine resources and predictions of ocean and climate states.

In JAMSTEC, there are three research institutes for global change, evolution of solid earth and bio-geo-sphere, respectively. More than 300 scientists are working in these three institutes. Though field of research is extended so widely, it should be emphasized that most of JAMSTEC's efforts are focused on ocean oriented science themes. Also observation and research systems are strongly supported by a fleet of seven ocean research vessels and numerous monitoring instruments. This system of JAMSTEC research allowed us to make a considerable contribution to the society, which includes the monitoring of coastal waters on the face of the destructive disaster in March 11. The information available through the ocean observations help the state of the art numerical models to accurately predict ocean states, tracer advections and climate variations. JAMSTEC's super computers, one of which (the Earth Simulator) was the leading computer of the world sometime ago, allow long integrations of numerical models useful for short term climate predictions and long-term climate projections.

PL-08

Prediction of Climate and Ocean Variations for Societal Benefit

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Our society is quite susceptible to variations in natural environment. Climate conditions over the globe and regional/local areas are one of the most concerned issues in recent years. In addition, predictions of ocean currents and tracer fields are indispensable for many societal applications in countries surrounded by the ocean, such as India and Japan. In this presentation, examples of climate and ocean predictions and their relevance to the society are introduced.

Climate modes in the tropical regions, which are characterized by coherent structures in the atmosphere-ocean coupled system, are a key building block for predictability of the climate variations. Indian Ocean Dipole (IOD) mode is an important example of such the climate modes, affecting the Indian summer monsoon and the summer climate conditions over the far-east Asian region. We have been providing experimental predictions of the Indo-Pacific regions since 2006. The results demonstrate certain predictability of one to two seasons ahead for the IOD events and more than one year for the El Nino events. Interactions between the IOD and El Nino events are also suggested.

The recent accident at Fukushima Daiichi Nuclear Power Plant (FDNPP) is creating a new link between the prediction of the upper-ocean conditions and the society. Japan Coastal Ocean Predictability Experiment (JCOPE) model is utilized for dispersion simulations of radionuclide from FDNPP in the northwestern Pacific Ocean. The results demonstrate complex current fields and their variability associated with local wind forcing, tides, and meso-scale eddies in the area off Fukushima. The radionuclides are significantly dispersed due to strong mixing effects of the surface current variability.

The information from the climate and ocean prediction efforts should be delivered in appropriate and prompt ways to the society, with scrupulous care to prevent any unnecessary actions.

PL-09

Impact of Natural Disasters in Coastal Zone Management

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The coastal zone of the World occupies less than 15% of the Earth's land surface, yet it accommodates more than 60% of the world's population. Furthermore, only 40% of the one million-km of coastline is accessible and potentially habitable. As a result, coastal zones are marked by above-average concentrations of people and economic activity. This coupled with their proximity to the ocean makes them one of the most sensitive zones for coastal hazards. Coastal hazards are those natural and man-made hazards that occur at the interface between the ocean and the shoreline. These chronic and episodic hazards pose serious threat to human life and property and also to stability of coastal ecosystems.

Devastating tsunami of March 2011 in Japan and The Indian Ocean Tsunami of December 2004 raised awareness worldwide of the potentially devastating impacts of tsunamis. Coastal communities around the world are increasingly at risk from natural disasters, both infrequent such as tsunamis and frequent ones including severe storms, storm surge, floods, and shoreline erosion. Some of the human-induced frequent hazards are shoreline erosion, oil-spills and coastal pollution. Short- and long-term climate variability such as El Niño, La Niña and Indian Ocean Dipole (IOD) mode can also cause abrupt disruptions in the coastal zone through floods, droughts, or tropical storms. The impact of climate change on precipitation pattern, increased intensity and frequency of extreme weather events, rising sea level, and ocean acidification are expected to result in consequential environmental, economic, and social impacts in the coastal zone.

The human-induced pressure of the coastal population could further exacerbate the impact of global climate change on the coastal inhabitants. In developing countries, human activities within areas of productive coastal resources such as reefs, mangroves, wetlands, and tidelands contribute to the degradation of these crucial resources. Reactive and stand-alone efforts to reduce disaster related risks to coastal systems are less effective than responses that are part of integrated coastal zone management (CZM), including long-term planning. Environmentally effective CZM requires accurate, up-to-date and comprehensive multi-disciplinary scientific data on which policy decisions can be based. Remote sensing data because of their repetitive, synoptic and multi-spectral nature have been widely used in providing spatial information on various components of coastal environment. However, the CZM requires data dealing with various aspects of coastal zone as discussed above. Such data are often available in non-spatial format. For management related decision-making, it is necessary to integrate remote sensing based spatial and non-spatial data through geographic information system (GIS) to derive management modules. We address some critical issues involved with using remote sensing data through the case studies undertaken in coastal zone of India and Japan. The usefulness and limitation of remote sensing data in CZM are discussed with special focus on coastal natural disaster related issues.

PL-10

Energy Education in Kyoto University

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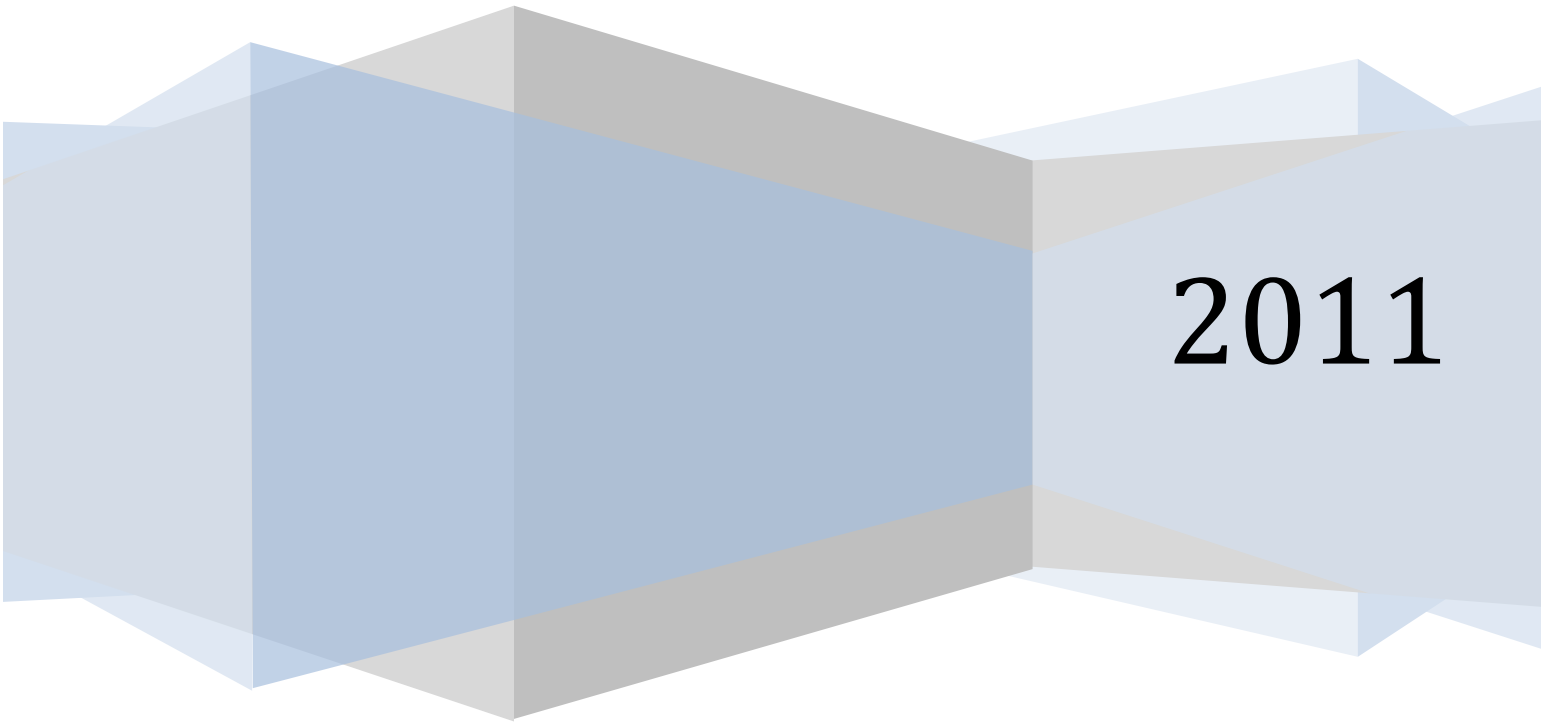
From 2008 in Kyoto University, a Global COE (Center of Excellence) program named "Energy Science in the Age of Global Warming - Toward CO2 Zero-emission Energy System -" has been implemented. Under this program, we intend to establish an international education and research platform to foster educators, researchers, and policy makers who can develop technologies and propose policies for establishing a scenario toward a CO2 zero-emissions society no longer dependent on fossil fuels, by the year2100. In our program in Kyoto university, Graduate School of Energy Science, Institute of Advanced Energy, Department of Nuclear Engineering, and Research Reactor Institute have jointly established special education course for doctoral students. For Energy Science Research toward no CO2 emission, we particularly emphasize Renewable Energy (Solar Energy and Biomass Energy), Advanced Nuclear Energy (Fission and Fusion), and Socio-economic Study of Energy. by scenario study, group study, field research, and internship in various institutes.

In this Global COE program, students are receiving special educational experiences and expected to acquire the faculty to understand the comprehensive "energy system" through participation. The fundamental principle of the GCOE Unit for Energy Science Education is to foster a human resource with: 1)comprehensive ability and profound knowledge regarding the energy and environmental issues , 2) capability to organize a research group for the intended research, 3)an international perspective, a communication ability, and a world-class standard research ability, and 4)potential to contribute in solving the energy and environmental issues. For this purpose, students are involved in the cutting edge research activities with latest facilities and knowledge base, together with various support systems. Adding to the regular research activities by individuals, group research on the social aspects of the energy encourages students to work together, with members from different countries. This program is open for foreign students that already occupy the significant fraction of our graduate school students. As our activity on the energy is focused on renewable, nuclear and their basic science including innovative materials so that zero-carbon energy portfolio suitable for various circumstances and society are pursued. Study in energy scenario planning and interaction with researchers from other fields, and to reflect the experience to the students' own research worked efficiently. This approach is expected to become a major feature of human resources cultivation for those intend to be a leading researchers and engineers not only in Japan but also in many countries where emerging economy and rapid growth with energy consumption is anticipated. Kyoto university can provide the opportunity for the students to be involved in the advanced research environment on this emerging technology field of energy. This program will be concluded in 2012, however collaboration with Asian countries and support system for foreign students are established under this program and we will continue to welcome students from outside of the country.

POSTER SESSION

ABSTRACTS

Date: October 7



P-01

Nanoparticle-Aptamer Bio Conjugate based Tumour Targeted Drug Delivery

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Abstract: Targeted drug delivery is considered to be a very potential and desired requirement in cancer chemotherapy. The application of nanotechnology in chemotherapy may pave the road for more effective yet safer chemotherapeutic options in cancer therapy. One of the main goals of nanomedicine is to develop a nanocarrier that can ameliorate drug bioavailability, enable accurate drug targeting and control the release of drug through nanosystem-mediated drug delivery. Our work focuses on the advanced drug delivery options using aptamer-labelled polymeric nanospheres for cancer treatment. Poly (lactic-co-glycolic acid), (PLGA) encapsulated paclitaxel nanoparticles were formulated by a single emulsion/solvent evaporation method and was highlighted with aptamer targeting tumour cells using a simple functionalization protocol. The present study explains the advantages of overcoming the surface functionalization hurdles in the synthesis of PLGA nanoparticles along with the solubility issues faced by paclitaxel. This work also signifies the high specificity achieved by aptamer-mediated cancer targeted drug delivering strategy.

Paclitaxel, a highly potent chemotherapeutic drug widely used against various tumours showed limited clinical success owing to its low therapeutic efficiency and low solubility in many pharmaceutical solvents. Upon incorporation within PLGA nanoparticles, they demonstrated enhanced therapeutic index of the drug and lack of the toxic effects caused by its commercial adjuvant Cremophor®EL. Additionally, the limitation of PLGA nanoparticles in surface functionalization using suitable targeting ligands is overcome by inserting a homo-bifunctional spacer during the synthesis of particles. Utilizing the functional groups presented by the spacer, amine modified aptamers are conjugated to the paclitaxel loaded nanoparticles for site specific drug delivery.

P-02

Folate Conjugated Biocompatible Fluorescent Carboxymethyl Cellulose Nanoparticles

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Background
Multi-functional nanoparticles are considered as an alternative system for drug delivery that has great potential for cancer therapy. Coupled with imaging agents nanoparticles offer opportunities for multi-functionalization to allow for the targeted delivery of drugs.

Methods
We have synthesized folate conjugated carboxymethyl cellulose nanoparticles and encapsulated with a model anticancerous drug, 5FU and fluorescence was attributed to nanocomposites by conjugating with quantum dots, for bioimaging studies. Characterization studies were performed to analyze the size, morphology and the bonding present in the nanocomposites. The biocompatibility of nanocomposites, *in vitro* drug delivery studies and imaging with nanocomposites were performed.

Results
Nanocomposites of size around 150nm were obtained and particles exhibited strong fluorescence. The drug was encapsulated efficiently and sustained drug was released over a period of 5 days. The bioimaging studies proved that the particles were internalized via the folate receptors present in the cancer cells and the nanocomposites was biocompatible.

Conclusion
We could successfully synthesize a multifunctional nanocomposites that was biocompatible, that could efficiently deliver drug to the targeted cancer cells and could perform targeted bioimaging.

P-03

Plantation Based Natural Forests Biomass Estimation for Redd Policies Implementation

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ABSTRACT: Forests play an important role in the climate regulation. Monitoring of forest biomass from local to global scale is a major stake in the context of climate change. In this study, we have investigated the backscattering properties of ALOS/PALSAR data in cashew and rubber plantation area of Cambodia. The result shows, that PALSAR σ^0 has the different response for both the plantation types because of difference in their biophysical parameters. The PALSAR σ^0 indicates the high correlation and less saturation in cashew plants than rubber plants. To monitor the deciduous forest biomass, multi-linear regression model approach has been applied using the cashew plants ground based biomass and PALSAR σ^0. The model was validated based on deciduous forest inventory data of Cambodia. The validation results indicate a strong correlation ($R^2 = 0.64$) with RMSE = 23t/ha. The application of this model is to estimate biomass of deciduous forests in Cambodia for UN-REDD (United Nations Reducing Emission from Deforestation and Forest Degradation) policies implementation.

METHODOLOGY: (a) Forest inventory data: Based on the analysis of Landsat satellite spectral signature 22, 20 and 18 sample plots with an area of 30x30m were selected in cashew, rubber and deciduous forests of Cambodia. Forest inventory data (DBH, height, age, crown diameter) were collected in November 2010 and January 2011. **(b) Satellite data:** Three scenes of PALSAR FBD 1.5 level data acquired on December 05th, 2010 (cashew area), November 18th, 2010 (rubber area) and November 01st, 2010 (deciduous forest) with 34.3^0 look angle was used in this study. We selected PALSAR data in the dry season to minimize the effects of soil moisture. Landsat and AVNIR-2 was also used to identify the spectral signature of plantation area.

RESULTS AND DISCUSSION: PALSAR data with HH and HV polarization were analyzed for their relation with the cashew and rubber plants biophysical parameters. High penetration of L-band SAR shows a positive relation with cashew and rubber plantation biophysical parameters. The sensitivity of σ^0 HV is higher than σ^0 HH in both plantation area because of an increase in volume scattering with the growth of cashew and rubber plants. Low backscattering and high variations are seen at juvenile stage of cashew and rubber plants, and they are mainly due to the high growth rate during the juvenile stage. HV shows saturation at 100t/ha biomass for cashew whereas at 50t/ha for rubber plants. This saturation might be because of saturation of PALSAR signal after 12 years of growth in cashew and rubber plants. Based on cashew plans biomass multi-linear regression model [Y (Biomass (t/ha)) = 260.52 + (11.4 x σ^0 HH) + (5.53 x σ^0 HV)] was developed and applied to the deciduous forests of Cambodia.

CONCLUSION: The relationship between biophysical parameters and PALSAR σ^0 were investigated for cashew and rubber plantation area. The σ^0 HV has shown a high positive correlation. The validation results indicate a strong correlation ($R^2 = 0.64$) with RMSE = 23t/ha for deciduous forests of Cambodia.

P-04

Nitroxide Probes as Redox Sensors for Imaging of Brain Neuroblastoma In Vivo

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Background: The present study is directed to development of rapid and simple methodology for non-invasive evaluation of this parameter *in vivo* (in intact animals), that allows a differentiation of cancer development from normal (healthy) condition in a single measurement. The method is based on redox cycle of nitroxide probes and their MRI (magnetic resonance imaging) contrast properties, which makes them useful molecular sensors for tissue redox activity

Methods: The mice were separated in two experimental groups - healthy mice (controls) and cancer-bearing mice (with brain neuroblastoma). Three nitroxide probes were used as redox-sensitive MRI contrast agents: (i) strongly hydrophobic, cell and BBB (blood-brain barrier) permeable, DNA-annealing SLENU; (ii) slightly hydrophobic, cell and BBB permeable TEMPOL; (iii) hydrophilic, cell and BBB non-permeable CMP. After the 5^{th} frame of MRI imaging (scan-time ~1 min 40 sec) during continuous scanning, the nitroxide probe was injected (100 mL per 25 g b.w.; single fast injection – within 15-20 sec) and the imaging continued up to 40-80 frames (total scan-time ~14-25 min). Two regions of interests (ROI) were selected – brain tissue (cortex) and soft tissues surrounding the brain.

Results: In cancer-bearing mice, the profiles of time-dependent MRI signal dynamics of SLENU in the brain and surrounding tissues were completely different from the reference profiles. The MRI signal intensity increased after the injection of nitroxide and remained high and stable over 14 min, without decay. The histograms were same in the cancer hemisphere of the brain, "normal" (non-cancer) hemisphere, and "normal" surrounding tissues. These profiles and τ 1/2 values are indicative of a low reducing activity of the brain and surrounding "normal" tissues of cancer-bearing animals to the nitroxide probe. The "normal" tissues around the tumor have a different metabolic activity from the pre-cancer state, making them more sensitive to damage. It was also observed that CMP, which is hydrophilic and non-permeable for cellular membrane and BBB, was not appropriate for MR imaging of tissue redox activity in vivo.

Conclusions: The present study demonstrates a development of new diagnostic approach for carcinogenesis based on the different tissue redox activity of normal and cancer-bearing mammalians and its imaging by cell permeable nitroxide probes and MRI.

P-05

Material Designed for Medical Applications: ZEIN - SWCNT Nanocomposite Scaffold

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Background: The design of blood compatible surfaces is required to minimize platelet surface interactions and increase the thromboresistance of foreign surfaces when they intended to use as biomaterials especially for artificial blood prostheses. Antithrombogenicity is very important for tissue engineering scaffolds used in situations involving contact with blood [1]. This work is the first study on the behaviors of blood platelets at the nanostructured surface generated by electrospinning. Bionanotechnology, especially the electrospinning technique [2], is believed to be a promising route to fabricate nanofibrous scaffolds and structurally mimic the extracellular matrix. This property has created great interest for their use in tissue engineering applications.

Methods: The spinning solutions were prepared from single solvent system. The spinning dope was prepared by sonicating 0.2 - 1 wt% SWNT's in TFE for 2 hrs respectively. Zein (22 wt%) was added to the SWNT-TFE mixture and further sonicated for an hour and mechanically stirred for another hour. In this study, Single wall carbon nanotube (SWCNTs) and Zein fibrous nanocomposite scaffolds were fabricated by electrospinning and evaluated its antithrombogenicity and hydrophilicity. Composite nanofiber with and without SWCNT were characterized through a variety of methods including scanning electron microscopy, transmission electron microscopy, thermogravimetric analysis and tensile mechanical testing.

Results: The uniform and highly smooth nanofibers of Zein composited with different SWCNTs content (ranging from 0.2wt% to 1wt%) were successfully prepared by electrospinning method without the occurrence of bead defects. The resulting fiber diameters were in the range of 100-300 nm without any beads. The uniform fibers with smooth surface morphology were obtained for all experimental materials. Thermal analysis shows that the improvement in thermal stability in case of Zein-SWCNT nanocomposite than that of pure zein nanofiber. The mechanical properties of zein nanofiber can be improved by the addition of SWNTs. The prepared 3D nanocomposite scaffolds based on zein showed significant water uptake ability. Water retention ability of zein scaffold was higher when compared to SWCNT-zein scaffolds. Hemolytic property and platelet adhesion ability of the nanocomposite (Zein-SWCNTs) was explored.

Conclusions: The novel Zein-SWCNTs composite scaffolds combined with good mechanical and biocompatibility properties of the scaffold. We have demonstrated a significant reduction in platelet adhesion with the absence of platelet activation on zein-SWCNT composite. This suggested that platelet activation could be efficiently suppressed on this nanostructured composite with its excellent anti-adhesion and subsequently low platelet activation may possibly hold great promises as useful antithrombotic material and promising biomaterials for potential biomaterial for implant applications.

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P-06

Phenomena of Exchange Field Penetration in $Fe_{73.5}Cu_1Mo_3Si_{12.5}Al_1B_9$

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Background: FINEMET alloys, namely FeCuMSiB (M = Mo, Nb etc.,) are materials with wide technological applications because of their excellent soft magnetic properties. They have Fe-Si nanocrystals dispersed in an amorphous ferromagnetic matrix and the nanocrystals are exchange coupled through the amorphous matrix. Extensive research to understand the microstructural aspects of these alloys is being pursued in order to engineer these alloys for better magnetic properties. This paper discusses the effect of the formation of nanocrystals on the amorphous phase Curie temperature of FINEMET alloys.

Method: The $Fe_{73.5}Cu_1Mo_3Si_{12.5}Al_1B_9$ FINEMET type alloy, in the form of ribbons, has been synthesized using single wheel melt spinning technique. The amorphous nature of the ribbons was confirmed using XRD. The changes in microstructure upon thermal annealing were examined by transmission electron microscope (TEM) [JEOL 2000 FXII]. The ribbons were isothermally annealed at 723 K, which is about 40 K lower than that of its crystallization temperature, for various durations ranging from 30 min. to 2 hours. The Curie temperatures of the as-spun and the annealed ribbons were measured using a vibrating sample magnetometer (VSM) [EG & G PARC 4500] with an applied field of 5 mT. The ^{57}Fe Mössbauer spectra of the specimens were recorded at 298 K with a constant acceleration Mössbauer spectrometer [Wissel, MDU 1200]. The low temperature thermomagnetization measurement was carried out using a SQUID magnetometer.

Results: Magnetization was traced as a function of temperature for the as-spun and annealed samples. Following observations were made from the M vs T curves. The magnetization value of the samples increases with annealing duration. The T_C of the amorphous phase in the alloy for the annealed ribbons has been found to be higher than that of the as-spun ribbon and the same is found to increase with annealing duration. The value of magnetization above T_C does not drop to zero for the annealed samples in the temperature range of our measurements and also the residual magnetization is found to increase with annealing duration. X-ray diffraction measurements in conjunction with TEM observation clearly proved the amorphous nature of the as-spun sample and the coexistence of amorphous and nanocrystalline phases in the annealed sample. The formation of shoulder peaks in the hyperfine field distribution of the annealed samples also suggests the formation of nanocrystalline phase on annealing. The observed enhancement in magnetization with annealing is due to the formation of Fe_3Si nanocrystalline phase. The decrease in inter crystalline distance calculated using the Hernando model[1] clearly proves the enhancement in the number density of these nanocrystals. The presence of the nanocrystalline Fe_3Si phase with a Curie temperature of 802 K much higher than the amorphous phase Curie temperature has the effect of inducing ferromagnetic ordering on the layers of the matrix adjacent to the interface between the Fe_3Si nanocrystals and the amorphous matrix. Low temperature magnetization measurements prove that nature of these exchange interaction is of the Heisenberg model favoring parallel alignment of next neighbor spins[2].

Conclusion: Ribbons of the $Fe_{73.5}Cu_1Mo_3Si_{12.5}Al_1B_9$ alloy have been prepared using melt spinning technique and their amorphicity has been confirmed by X-ray diffraction and TEM. The increase in Curie temperature of the amorphous phase, upon annealing, has been attributed to the effect of exchange field penetration arising due to the formation of Fe3Si nanocrystallites with a Curie temperature higher than that of the amorphous phase of the alloy[3].

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452

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P-07

Potential Anti-Cancer shRNAs Identified by Mortalin Staining as a Reporter

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Increasing rate of cancer and complexity of its treatment has prioritized the search for new anticancer reagents. Induction of senescence (i-Senescence) is considered as anti-cancer strategy and hence can be employed for identification of new anticancer reagents. We have earlier reported that mortalin, a member of heat shock 70 family protein, exhibit pancytoplasmic distribution pattern in normal and perinuclear in human cancer cells. Furthermore, cancer cells when induced to senesce by either chemicals or stress conditions show shift in mortalin staining pattern from perinuclear to pancytoplasmic type. Using such shift in mortalin staining as a model reporter for i-Senescence, we screened human shRNA library for candidate anti-cancer shRNAs and have identified nine candidate anti-cancer shRNAs by four rounds of screenings. The isolated shRNAs were further validated using a variety of cultured cancer cell lines. By combinational approaches involving molecular analyses including Comparative Genomic Hybridization, Gene specific PCR analysis, specific gene activities and bioinformatics, we identified DNA damage pathway as a candidate target for cancer therapy.

P-08

Membrane-Associated RING-CH 10 (MARCH10) is a Microtubule-Associated E3 Ubiquitin Ligase of the Spermatid Flagella

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Mammalian spermatogenesis is a very complex, well-coordinated process that involves the formation of male gametes (spermatozoa) from spermatogonia. Recent discoveries have pointed out the importance of ubiquitination during spermatogenesis. However, the mechanisms involved in this have not been clearly elucidated. Here we identified a novel RING-finger type E3 ubiquitin ligase, namely Membrane-Associated RING-CH 10 (MARCH10), which is highly expressed in the testis of rats. Immunohistochemistry of rat testis showed that expression of MARCH10 is upregulated in elongating spermatids but is absent in mature spermatozoa. The immunostaining was localized in the cytoplasm and the principal piece of elongating spermatids. Moreover, MARCH10 undergoes proteasomal degradation by autoubiquitination in transfected COS7 cells, but this activity was abolished upon microtubule disassembly. These results suggest that MARCH10 is involved in spermatogenesis by regulating the formation and maintenance of the flagella in elongating spermatids.

P-09

Health Seeking Travel Behaviour and Health Care Facility Choice Owing to Different Service Providers- A Case Study on West Bengal, India

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Background: In order to improve the health condition of the people, Government of India has framed the national health policy. The rural and the urban areas are explicitly covered under the National Rural Health Mission (2005) and the National Urban Health Mission (2010). For the 'Low income group' and the 'economically weaker sections', the public hospitals provide free health services, yet the analysis showed that a substantial amount of the people do not avail the service and rather do nothing. In spite of the efforts of the government, the equity of health accessibility is yet to be achieved.

Methods: The NSSO survey datasets on "Health and morbidity" and "Domestic Tourism" provides valuable insight to the disaggregated level understandings. In this regards, the survey datasets has been analyzed for the state of West Bengal. The samples were screened to study the decision making behavior of the adults above 18 years of age. The descriptive statistical analyses of the dataset were undertaken to understand the choice variation due to the different socio-economic and socio demographic factors. The illnesses were categorized in four groups as per the definitions of the World Health Organization. The dataset on "Domestic tourism" revealed that the Health trips can be categorized as "same day trip" and the "overnight trips". The analysis was undertaken to understand the travel behavior and expenditure pattern in both the categories.

Result: Cross tabulation analysis of the datasets revealed the following a) On the event of falling sick, it was found people are forced with six choices which include availing public health centers, private health centers, traditional options, consultations with others, medicine shops and lastly doing nothing. b) In case of same day trips, in 97% of the cases, the medical expenditure is more than transportation expenditure; however, it reduces to 66% in case of overnight trips. c) In case of the overnight trips, more than 60% of the trips are within the same district, whereas it is more than 90% in case of same day trips. d) Around 60 % of all health trips in West Bengal, at least one household member accompany the patient. Education directly influences the choice of the people. This is not only because of awareness, but also because of production benefits. The lack of health infrastructure and manpower in the public facilities forces the people to bypass the facility and avail the costlier services. The impedance of travelling, both in terms of travel time and cost are hindrance, especially for the urban and rural poor. The mobility problem of the people, especially for the elderly, needs to be considered explicitly, as this influence the choice significantly. The efforts of increasing the number of health care centers should be coupled with the initiative to improve health care quality. However, the accessibility to the Health centers needs utmost attentions, as substantial numbers of people cannot complete the health trips in one day although they reside in the same district.

P-10

Carbon Nanotubes Mediated Cancer Therapy

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BACKGROUND :
A Multiphysics simulation of the cancer therapy using CNT and NIR is done in COMSOL 4.1

METHODS:
Carbon nanotubes (CNTs) hold great promise for their use as a platform in nanomedicine, especially in drug delivery, medical imaging and cancer targeting and therapeutics. Due to the CNTs unique intrinsic physical and chemical properties, they have been intensively explored for biomedical applications in the past few years. CNTs emit heat when they absorb energy from near-infrared (NIR) light especially between 700-1100nm, where body tissues are most transparent which suggests that targeting CNTs to tumor cells, followed by noninvasive exposure to NIR light, will ablate tumors within the range of NIR. In this study, a Multiphysics simulation of the cancer therapy using CNT and NIR is done in COMSOL 4.1, to help research move at a faster pace and in a cost effective way with increased accuracy.

RESULTS:
A simulation results and experimental data are compared and the results are studied,it is found that the results are matching with each other.

CONCLUSION:
Visualization of electromagnetic wave propagation,temperature distribution and temperature value output can be done with COMSOL Multiphysics 4.1.The above study will help research move at a faster pace and in a cost effective manner with increased accuracy.

P-11

Controlled Alignment of Fullerene Nanowhiskers Through Self Assembly at Air Water Interface

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Controlled fabrication of nanoscale materials through self-assembly is a key process in the bottom-up approaches to nanotechnology.[1] In particular, controlled unidirectional alignment of rod-shaped materials is mandatory for realizing any technological applications. In this regard, fullerene based materials play a key role especially due to their unique mechanical, electrical and many other properties. In the current work, long (length > 100 um) and thin (diameter ~300-500 nm) fullerene nanowhiskers (FNW) were prepared by liquid-liquid interfacial precipitation method using C_{60} dissolved in toluene and isopropyl alcohol.[2] The prepared FNW were later dispersed in isopropyl alcohol and spread at the air-water interface to achieve unidirectional alignment of FNW through self-assembly. It is noteworthy to mention that good alignment can be achieved even in the absence of externally applied surface pressure, thereby demonstrating the simplicity of the developed approach for controlling the alignment of rod-shaped materials. The FNW aligned at the air-water interface can be subsequently transferred onto a variety of substrates including Si wafer, glass, quartz etc. for further characterization. The aligned FNW show interesting optical properties wherein birefringence is enhanced illustrated by the angle-dependent polarization effects. Potential high-end technological applications of these materials are currently under investigation.

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P-12

One-pot Protein Synthesis and Arraying using Puromycin and Pure Technology for on Chip Proteomics

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Background

This study describes the development of an approach that enables fabrication of functional protein arrays for proteome analysis. The foundation of this study is the ability to directly capture in-situ synthesized proteins onto substrate, by C-terminal incorporation of puromycin-containing small molecules which act as acceptor substrate for the peptidyl-transferase reaction. [1]

Methods

The C-terminal incorporation of puromycin-biotin molecule was carried out using E. coli based cell-free translation system in the absence of Release Factors (RF1, RF2, and RF3) in order to increase incorporation efficiency. The synthesized protein was then captured onto streptavidin-coated surface by spotting.

Results

The yield of puromycin-conjugated protein was found to be dependent on the concentration and the structure of the puromycin derivative used. The yield of conjugated protein was found to decrease for puromycin concentration above 50μM and this is due to the pre-mature termination of protein synthesis at high puromycin concentration. Absence of release factors led to a favourable condition for puromycin incorporation. Capture of synthesized protein onto streptavidin-coated surface generated the corresponding protein array.

Conclusion

This study describes a simple approach to synthesize and directly capture proteins via C-terminal incorporation of puromycin derivatives. Further, integration of puromycin and PURE technology with micro-reactor array technology [2] offers a general and universal procedure for proteome analysis.

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P-13

Nontypeable Haemophilus Influenzae-Induced Inflammatory Responses in Lung Epithelial Cells is Controlled by Muci Mucin through Suppression of Toll-Like Receptor 2

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MUC1 (MUC in human and Muc in nonhuman species) is a membrane-tethered mucin expressed on the apical surface of mucosal epithelium including the lung. It has an ability to suppress Toll-like receptor (TLR) signaling. Nontypeable Haemophilus influenzae (NTHi) is a Gram-negative bacterium often responsible for the respiratory tract infection in both adults and children, a common cause of otitis media in children, rhinosinusitis in adults and children, and pneumonia in adults. In this study, we sought to determine whether the anti-inflammatory effect of MUC1/Muc1 is operative during NTHi infection and if so, which TLR signaling is involved, by treating A549 cells (human lung epithelial cell line) or primary mouse tracheal surface epithelial (MTSE) cells with a NTHi lysate under various conditions. Our results revealed that: 1) NTHi lysate increased both IL-8 release and MUC1 protein expression in a dose- and time-dependent manner; 2) NTHi-induced IL-8 release was suppressed by overexpression of MUC1 but enhanced by knockdown of MUC1; 3) Both IL-8 release and MUC1 upregulation induced by NTHi lysate were abolished in the presence of TLR2 siRNA but not TLR4 siRNA; 4) The similar effects of NTHi lysate were also observed in MTSE cells. Based on these results, we conclude that NTHi-induced IL-8 release was mediated by activation of TLR2 and then suppressed by MUC1 in a time-dependent manner. This is the first report suggesting that MUC1 may play an important role in the resolution of airway inflammation during NTHi infection through suppression of TLR2 signaling. (Supported by a grant from NIH HL-47125)

P-14

Curcumin Nanoparticles For Treating Alzheimer's Disease- A Way of Herbal Renaissance

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Background:
Alzheimer's disease is a growing concern in the modern world. It is the most prevalent form of dementia which affects mainly the elderly over the age of 65 years. Due to the multifactorial nature of the disease, most of the current medications are not very efficient in curbing the disease. In our work, we are using the curcumin as a potential therapeutic agent against Alzheimer's disease.

Methods:
PLGA encapsulated curcumin nanoparticles were synthesized by solvent evaporation method and characterized. Anti-amyloid activity, anti-oxidant activity and in vitro toxicity of the particles were studied.

Results:
We have synthesized water-soluble PLGA coated curcumin nanoparticles which were 150-200nm in size. We have found that there is no chemical interaction taking place between the two compounds. We have found that curcumin nanoparticles bind to amyloid protein aggregates. The anti-oxidant capability of the curcumin nanoparticles are conserved in the nanoparticles. The nanoparticles were bio-compatible and not cytotoxic.

Conclusion:
Curcumin is a versatile compound used in various therapeutic applications. Curcumin- PLGA nanoparticles are highly soluble in water making it highly beneficial in therapeutic applications. Encapsulation in PLGA does not cause any chemical alteration to curcumin and retains its characteristic properties. Due to its amyloid binding properties, curcumin can be used as a potential drug in Alzheimer's disease.

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P-15

Fluorescent Nanomaterial Uptake and Translocation in *Jatropha Curcas*- Creating New Opportunities in Health and Environmental Domains

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Background: Plants have ruled the frontline in a majority of disciplines as health, food, drugs, construction, environmental monitoring etc., thereby elevating them to one of the most remarkable and sought after bioresources. Nanotechnology has opened up new vistas to add to this already never ending list of contribution of the phyto community towards the sustenance of our planet. Nanoparticulate delivery into plants is still very juvenile, yet highly lucrative for a variety of application oriented features as imaging, drug delivery, growth and yield enhancement, imparting resistance against pathogens etc. In this context, we present here the uptake and translocation of fluorescent nanomaterials into the plant system.

Methods: The biodiesel plant-*Jatropha curcas* was employed as the investigative source. The nanomaterials tested for uptake were quantum dots (QDs) and Fluorescien isothiocyanate (FITC) in their natural form as well as encapsulated in a biocompatible coat of silica. QDs and silica-QDs were prepared by the microemulsion technique and silica-FITC by template directed synthesis. Murashige and Skooge (MS) basal medium augmented with different concentrations of the fluorescent nanomaterials were prepared and solidified by phytagel. Healthy, surface sterilized seeds of *J.curcas* were inoculated onto the test media under asceptic conditions. 2 weeks old auxenic seedlings were sectioned and observed under a co focal microscope. Further characterization was carried out by scanning electron microscopy.

Results: The seedlings were healthy and growing at a competent rate without any signs of nanomaterial toxicity. Sections of root, stem and petiole were investigated and a high level of fluorescence was recorded in all the concentrations of nanomaterials tested. The translocation of the silica nanomaterials was confirmed by scanning electron microscopy and EDS reaffirmed the presence of Si, thus presenting evidence that the nanomaterials had been transported through the vascular tissues to different parts of the plant body.

Conclusion: On the basis of these exciting results, we would like to emphasize the imminent applications of such nanomaterials for transporting drugs, fertilizers, growth enhancers, inscet/pesticides, genes of interest etc, in phytoremediation, imaging and in a range of bio-agro related fields, also providing access to target specific organelles and understand in greater depth the metabolic events staged in the plant system.

P-16

Expression of Matrix Metalloproteinase (MMP) 2, 9 and 13 in the Nasal Mucosa of Patients With Allergic Rhinitis

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Background: Allergic diseases like asthma and allergic rhinitis are a cause of morbidity and mortality globally, rising to epidemic proportions with a profound increase in their complex nature, especially in the youth. Moreover asthma and allergic rhinitis are interlinked as co-morbid conditions. A better understanding of the mechanisms is crucial to better treatment strategies. Matrix Metalloproteinases are extracellular matrix proteins that are involved in tissue remodeling and cell infiltration. Tissue inhibitors of MMPs known as TIMP regulate MMP function. Allergic rhinitis and asthma share many similarities in their inflammatory response but epithelial shedding, basement membrane thickening and fibrosis are not seen in allergic rhinitis. By contrast, nasal polyps share some features with asthma. As in asthma, we demonstrated an increased expression of MMP-9 and low TIMP in nasal polyps. We hypothesized that the differential expression of MMPs may at least in part contribute to the differences between allergic rhinitis and asthma.

Methods:: We performed nasal allergen challenge (NAC) in patients with allergic rhinitis using mite allergen discs and control discs. We analyzed the number of MMP 2,9,13 and TIMP 1,2 in nasal biopsies 30 min, 6 hours and 12 hours post NAC. By ELISA, we examined the levels of MMP-2, 9 and 13, and TIMP1,2 in the nasal mucosa of AR patients.

Results: At 30 min post NAC, MMP-2 were increased. At 6 hours post NAC, MMP-2 showed a tendency of increase. At 12 hours post NAC, MMP-13 was significantly increased. TIMP-1 and TIMP-2 were significantly increased at 30 min. At 6 hours post NAC, the MMP-9 : TIMP-1 ratio was high, and at 12 hours post NAC, the MMP-13 : TIMP1,2 ratio was high. The levels of MMP-2 and MMP-13 but not MMP-9 were high in the allergic nasal mucosa.

Conclusions: These results suggest that MMP-2 and MMP-13 may play an important role in the pathomechanisms of allergic rhinitis. Despite the similarities between allergic rhinitis and asthma, this differential expression of MMP may contribute to the differences at least in part between allergic rhinitis and asthma

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P-17

Potentials of Ashwagandha Leaf Extract

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The present day lifestyle is heavily dependent on the use of chemicals in food, cosmetics, agriculture and many other everyday products that have led to exponential increase in the rate of stress and diseases such as cancer. There is an urgent need to understand the mechanisms of chemical toxicity and invent new economic ways to protect human health. Our research is focused on the identification of bio-active reagents in Ashwagandha, understand their molecular mechanism of action and put it in use to protect human health. We earlier identified the anticancer activity in the leaf extract of Ashwagandha and demonstrated its mechanism of action. We identified Withanone as the component that selectively kills cancer cells and is safe for normal cells. In cell based chemical toxicity model, we identified that Withanone can protect normal human cells against premature senescence caused by industrial chemicals and hence can be developed into a health supplement.

P-18

Highly Luminescent GD Conjugated Quantum Dots Based Tumor Multimodal Imaging

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Background: Cancer diagnostics have been considered as very important area in medical imaging due to increasing mortality rate. Multimodal nanoparticle mediated targeted imaging and therapies have gained momentum and is vast explored. Targeted imaging of cancer using folate conjugates have been discussed in our work.

Methods: Highly luminescent quantum dots of cadmium chalcogenides are prepared by hot injection organo-metallic route. These quantum dots are functionalized with PEG based targeting moieties and Gadolinium ions. Usually quantum dots are highly toxic due to release of cadmium ions. We have reduced the toxicity of quantum dots by coating PEG brushes around them. The quantum dots serve fluorescent imaging, Gd-DTPA for magnetic resonance imaging and PEG Folate to target cancer cells.

Results: The targeted quantum dots were characterized using UV-Vis, PL spectra, TEM, EDS, XPS, VSM. Cytotoxicity assays are carried out using normal, LAG and cancer cell line, MCF7 and no toxicity rendered by the quantum dots was observed. The confocal microscopy was carried out to analyse the uptake the targeted quantum dots inside live cells. We found fluorescence rendered by quantum dots specifically in cancer cell proving the efficiency of targeting mechanism. The time dependent uptake of bare and targeted quantum dots was studied along with the endosomal accumulation of these nanoprobes. By using Gd ions, we propose their use in MRI imaging too.
Conclusion: Biocomaptible multimodal highly luminescent targeted quantum dots were successfully synthesized and reported for cancer cell imaging.

P-19

Withanone - A Natural Antidote for Industrial Chemical Induced Bio-toxicity

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Present day lifestyle heavily depends on the industrial products that pose a variety of health risks in a direct and indirect way. One of these is the biotoxicty of industrial chemicals and their metabolites. Ester phthalates are a class of industrial chemicals used in a large variety of consumer products including variety of household products (building materials, plastic objects, textiles, adhesives, paints and deodorants), food and personal care products including agricultural adjuvant, pesticides, cosmetics and perfumes, electronics (coatings, stabilizers and surfactants) and pharmaceuticals (enteric coating of oral pills, viscosity control agents, surfactants and stabilizers). Globally, more than 18 billion pounds of ester phthalates are used annually and toxicity of these chemicals occurs through ingestion, inhalation, intravenous injection and dermal exposure on a daily basis. MAA, a common metabolite of ester phthalates has been shown to cause physical, reproductive, skeletal and hematopoietic abnormalities in rat test models. Many Ester phthalates (Monoethyl phthalate, monobutyl phthalate, monobenzyl phthalate) have been detected in house dust and in urine specimens from pregnant and lactating women living in New York City. These reports have raised the requirement of search and development of reagents that could protect the bio-systems from Industrial toxins. We report that steroidal lactone Withanone from Ashwagandha (an Ayurvedic herb) protected normal human cells from MAA-induced damage and extended their health-span. Withanone and withanone-rich Ashwagandha is a strong candidate for health food industry

P-20

Dynamical Seasonal Simulation of Indian Summer Monsoon Circulation and Rainfall Using an Atmospheric General Circulation Model

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Background: To evaluate potential predictability of Indian summer monsoon circulation and rainfall using an atmospheric general circulation model.

Methods: The NCEP atmospheric general circulation model (T170/L42) was used for making the seasonal simulation of monsoon for the 20-year period from 1985 to 2004. An ensemble of the seasonal simulations was made using five initial conditions of the 00 UTC of 1, 2, 3, 4 and 5 May, and integrated up to 30 September for the 20-year period from 1985 to 2004. The initial conditions for the model were provided by the NCEP- NCAR reanalysis-2 (Kalnay *et al*., 1996) data and this data was interpolated from 2.5×2.5^0 resolution to the model resolution. The global Reynolds-observed SSTs (Reynolds and Smith, 1994) were used as the lower boundary condition for the model.

Results: The model simulates the monsoon trough and the cross equatorial flow across Arabian Sea, which passes through western and central AS and across the south peninsular India into the Bay of Bengal (BoB), close to observations. The model is able to simulate the position of the Tibetan high and its extensive ridge over the Asian region, which agrees with the observed climatology. The simulated seasonal rainfall features are close to the observed climatology. The model simulated areal average of rainfall over the Indian landmass are calculated and compared with the observation. The model simulates slightly higher rainfall amount for June, but lower rainfall amounts in the months of July, August and September. However, the model is able to capture the sign of the difference in inter-monthly rainfall variations. The climatology based on the ensemble averaging is very similar to the climatology based on individual member simulations. However, interannual variability of the climatology based on ensemble average is small. Monsoon onset and advance phases are critical in the evolution of monsoon. Monsoon advance to northwest India could be exceptionally late or early after the monsoon onset over Kerala (MOK). Model simulations are analysed with respect to MOK as well as duration of spread of the monsoon rains from MOK to northwest India. Model captures the date of MOK well, which agrees with observations within 2 days. The magnitude of interannual variability of the simulated and observed MOK agrees very well with each other. As the spread of the date of MOK within individual members is quite large, ensemble averaging provides better agreement with observations on average basis. The advance of monsoon over India after MOK is well captured by the model as represented by the duration of spread of monsoon rains from Kerala to northwest India.

Conclusions: A high-resolution atmospheric general circulation model forced with observed SSTs as boundary conditions are used to test the climatology and interannual variability of Indian summer monsoon circulation and rainfall. Dominant features of the monsoon circulations at 850 and 200 hPa levels are found to be well simulated by the model. Model climatology of rainfall agrees with observations in terms of monthly as well as seasonal basis. Model captures the date of monsoon onset over Kerala and advancement of monsoon to northwest India, which agrees with observations. The comparison between the observation and model for their climatology and interannual variability is in good agreement suggesting that the model can become a good candidate for dynamical long-range monsoon prediction with initial condition in the beginning of May.

P-21

Anticancer Studies of Mauran and its Applications in Nanotechnology

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Background: Extraction of mauran from *Halomonas maura* for the synthesis of nanoparticles and its stabilization as well as studying their anticancerous and cytotoxic effect.

Methods: Anticancer activities of sulfated polysaccharides have been reported since decades. Therapeutic activities of bacterial sulfated polysaccharides are less reported compared to that of algal polysaccharides. Here we have extracted mauran, a sulfated exopolysaccharides produced by *Halomonas maura* and used for anticancer studies as well as for various nanotechnological applications. Mauran as a biologically compatible polymer can be used for the synthesis of novel nanoparticles for cancer therapy and drug delivery applications. In present study we have used mauran for cell toxicity and anticancerous studies using colorimetric assays and deduced the percentage of cell viability after using the same. In another work we have developed chitosan - mauran hybrid nanoparticles and characterized for drug encapsulation purposes. The versatile physico- chemical properties of mauran ensures its application as a stabilizing agent in nanotechnology. Thus we have applied mauran for the stabilization of gold nanoparticles, which are widely used in the biomedical field for the imaging and drug delivery applications.

Results: Sulfated polysaccharides, mauran from *Halomonas maura* was extracted and synthesized nanoparticles in combination with chitosan. So formed novel hybrid nanoparticles were found to be spherical in shape and were characterized using TEM, SEM, FTIR and XPS. Similarly, gold nanoparticles were stabilized with mauran and were characterized using TEM and XPS. The cytotoxic and the anticancerous activity of mauran were studied using various normal and cancer cell lines respectively by colorimetric assays.

Conclusion: Extremophilic bacterial sulfated polysaccharides are ideal for nanotechnological and biomedical applications.

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P-22

Growth of High Density in As/Sb:GaAs Quatum Dots Emitting in the 1.3 μm Band on Germanium-on-insulator-on-silicon (GeOI) Substrate for Energy Efficient Silicon Photonics Application

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Research in the growth of quantum dots (QDs) and its application to the next-generation photonics devices has received considerable attention since the proposal by Arakawa and Sakaki due to their unique property of 3-D quantum confinement. Integration of III-V photonics devices with Si-based electronics has become necessary due to ongoing advances in the microprocessor technology. Recently, germanium-on-insulator-on-silicon (GeOI) substrate has been proposed as a potential platform for silicon photonics application [1].

Samples were grown by low pressure (76 torr) metal organic chemical vapor deposition (MOCVD) on GeOI substrate. The GeOI substrate consisted of 110 nm Ge layer (transferred by smart-cut^{TM} technique from a thick Ge epilayer grown on Si [100] substrate misoriented by 6 $^{\circ}$towards [011] direction) on top of 120 nm SiO_2 on a Si host substrate. InAs/Sb:GaAs QDs were grown according to antinomy-surfactant mediated growth (Sb-SMG) technique, described else where [2].

A high structural quality GaAs buffer layer with a smooth surface incorporating a single InAs QD layer as an antiphase domain filter was first grown on GeOI substrate. InAs QD growth was initiated on GaAs/GeOI wafer using Sb-SMG method. We obtained dot density above 7 x 10^{10} cm^{-2} with the ground state emission in the 1.3 μm band at room-temperature, and the peak yields a FWHM of 28 meV, indicating a narrow dot size distribution. This FWHM is small and close to the state-of-the-art values for QDs grown on GaAs substrate. InAs/Sb:GaAs QDs were also grown on reference GaAs substrate. Comparing the photoluminescence (PL) of QDs grown on GaAs/GeOI and GaAs substrates, we find that the PL intensity of QDs on GaAs/GeOI is almost comparable to that obtained on reference GaAs substrate. The achievement of comparable PL intensity shows that the optical quality of QDs on GeOI is identical to those on GaAs substrate.

Together, these results are very promising for potential realization of QD based III-V photonic devices on GeOI substrate for silicon photonics applications.

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P-23

Enhancing Precipitation Strengthening in Magnesium-Zinc Alloys Through Controlled Deformation

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The use of magnesium alloys in the automobile industry offers an attractive means of reducing vehicle weight and improving on-road efficiency. This can make an important contribution to mitigating greenhouse gas emission from the transport sector. The present work looks at optimising the strength and ductility of magnesium alloys through precipitation strengthening.

Nanometer-scale precipitates in magnesium-zinc alloys have been produced through controlled deformation and heat treatment and studied using transmission electron microscopy. The precipitate length, diameter and spacing were measured as a function of deformation. The strength and ductility of the alloys were then measured and correlated with the size and spacing of the precipitates. Although it has long been known that finer mixtures of precipitates—and greater strength—can be achieved by straining the alloys before precipitation, there has been no quantitative work on the amount, or type, of deformation that should be used. The effect of precipitation on ductility has also been largely neglected.

Moderate levels of deformation (up to 5%) were found to be sufficient to provide optimum strength, with little further improvement possible for higher levels of deformation. The type of deformation was also important and stretching the alloys was more effective than compression due to the formation of crystallographic twins in magnesium. The strength and ductility compared well with models for precipitation strengthening and fracture due to embedded particles.

The present work has clarified the relationship between deformation, precipitate size and mechanical properties in magnesium-zinc alloys. Such information is vital in the development of magnesium alloys in applications such as automobile components, where a balance of strength, ductility and light weight is essential.

P-24

Effect of Tetrodotoxin (TTX) on Enterobacteria, *Vibrio Parahaemolyticus* in the Digestive Tract of Puffer

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Background: Physiological function of tetrodotoxin (TTX) present in the digestive tract of puffer on *V. parahaemolyticus*, which is one of the enterobacteria, is yet to be understood properly. Purpose of present study is to elucidate function of the TTX on change in metabolic process of *V. parahaemolyticus* in the digestive tract of kusafugu, assuming that TTX plays an important role in metabolic activity of these enterobacteria.

Methods: We isolated *V. parahaemolyticus* from the contents of digestive tract of four specimens of kusafugu collected from the coast of Kannonzaki in Japan. The medium for bacterial culture was prepared by adding crude TTX extracted from the liver of the kusafugu specimens. In our experiment, we used two sets of culture medium for culture of *V. parahaemolyticus* such as crude TTX and non-TTX as standard. We added Buffered Peptone water (BPW) with 3% NaCl to each culture medium and the culture was conducted under both aerobic and anaerobic condition at the temperature of 25°C for a duration of 48 hours. Optical density of the medium was measured at the wavelength of 660nm (OD_{660}) by spectrophotometer. Microbial counts of the samples were performed by using plate count technique at the beginning and end of the experiment (after 48-hour interval) under aerobic condition and after 24-hour interval under anaerobic condition.

Results and Conclusions: The OD_{660} curves of *V. parahaemolyticus* of the TTX sample under the aerobic condition indicated distinct increasing trend after 20 hours compared to that of the non-TTX standard. Similarly, enhanced OD_{660} was also noticed in the TTX sample under anaerobic condition after 48 hours. However, there was no significant difference in the microbial counts between TTX sample and non-TTX standard under both aerobic and anaerobic condition. Such contrast clearly indicates that TTX has no significant influence on the growth process of the enterobacteria, *V. parahaemolyticus*. Increasing trend of OD_{660} in the TTX sample compared to that of non-TTX sample under both aerobic and anaerobic can be attributed to the byproduct substances produced by the change in metabolic activity of the *V. parahaemolyticus* under the influence of TTX during the experiment.

P-25

Post-Synthesis Dispersion of Intermetallic Pt_3Ti Nanoparticles by Poly(amidoamine) Dendrimer: Enhanced Catalytic Activity Towards Oxygen Reduction Reaction

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Background: Intermetallic nanoparticles (NPs) have drawn much attention in recent years owing to their outstanding catalytic, electronic and/or optical properties. High-performance exhaust/fuel-cell catalysts, intermetallic Pt_3Ti NPs are existed solely as clusters due to the electrostatic interactions and thus the surface area of Pt_3Ti catalyst was diminished considerably. Therefore, agglomeration-free NPs would be desired to realize Pt_3Ti as the practical catalyst centers. We discuss here that finely dispersed, individual Pt_3Ti NPs showed enhanced catalytic activity towards oxygen reduction reaction.

Methods: As-synthesized Pt_3Ti NPs were combined with generation 5, hydroxyl terminated poly(amidoamine) dendrimer (G5OH) in water to form finely dispersed, individual Pt_3Ti NPs. The samples were characterized by hard X-ray photoelectron spectroscopy (HX-PES), fourier-transform infrared spectroscopy (FTIR) and ^{1}H NMR spectroscopy (a Bruker spectrometer operating at 600.13 MHz for ^{1}H, 14.1 T). The morphologies and particle size distribution of the samples were characterized by using a high-angle annular-dark-field transmission electron microscope (HAADF-TEM, Tecnai G^2, acceleration voltage: 300 kV). The samples were coated on glassy carbon electrode (GCE) surface by electrochemically to evaluate the capability of oxygen reduction in an O_2-saturated aqueous 0.5 M H_2SO_4 solution.

Results: The Pt $3d_{5/2}$ emission at 2124.5±0.2 eV for the combination of Pt_3Ti NPs and G5OH largely shifted toward the higher binding energies by 2.2±0.2 eV relative to the as-prepared Pt_3Ti NPs. It is known that the photoemission from metal NPs or clusters, whose surfaces are entirely covered with insulating layers with atomic thicknesses, has a larger binding energy owing to the slow neutralization of holes (final-state effect). The observed deep-level shift is interpreted as a final-state effect on Pt_3Ti NPs included by the insulating pore of G5OH to form an endohedral molecule, Pt_3Ti@G5OH. HX-PES, FTIR and ^{1}H-NMR results is evidenced that the involvement of carbonyl oxygen of the pore surface in the formation of Pt_3Ti@G5OH. Pt_3Ti@G5OH coated GCE showed the positive shift in the O_2 reduction peak than bare GCE and G5OH coated GCE in O_2-saturated 0.5 M H_2SO_4 electrolyte solutions indicating that a significant electrocatalytic effect.

Conclusions: We successfully dispersed and solubilized Pt_3Ti NPs using G5OH as a post-synthesis surfactant. A strong interaction between the Pt_3Ti surface and the carbonyl groups on the pore surface resulted in the formation of a water-soluble, endohedral molecule, Pt_3Ti@G5OH. Pt_3Ti@G5OH would be a counter example of the widely accepted picture that PAMAM dendrimers above generation three can take in only small molecules or ions due to a steric hindrance by the highly dense terminal groups. Our results demonstrated that PAMAM dendrimers, even at generation five, are capable of ingesting metal NPs as long as the NPs are smaller than the pore size and the NP surface sufficiently interacts with the pore surface. O_2 is able to penetrate into Pt_3Ti@G5OH and then encounter reduction reaction on the Pt_3Ti catalyst surface. The post-synthesis dispersion with PAMAM dendrimers may be applicable to various kinds of functional NPs and will strongly prompt their future applications toward fluorescence imaging and/or fuel cell technologies.

P-26

Observation of Exosomes Released from Human Embryonic Kideney293 Cells Immobilized on a Glass Surface Using Atomic Force Microscopy

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Background: Exosomes, lipid-covered nanovesicles (30-100 nm) released from biological cells, have attracted considerable attention as diagnostic and prognostic biomarkers since they contain proteins and nucleic acids derived from the parent cell [1]. Although exosomes were too small to examine using optical microscopy, they can be observed using scanning electron microscopy (SEM) and scanning probe microscopy (SPM). Unfortunately, however, the sample preparation including immobilization is still at the state of art. In this research, we studied the immobilization of exosomes on glass surface and observation using atomic force microscopy (AFM).

Methods: For immobilizing exosomes, a glass surface was modified with biocompatible anchor for membrane (BAM) and polyethylene glycol (PEG). Exosomes were immobilized physically on the surface by insertion of oleyl chains of BAM into lipid bilayer of exosomes [2]. PEG was used for reduction of nonspecific adsorption. After human embryonic kidney 293 (HEK293) cells were cultured in serum free Dulbecco's modified eagle medium (D-MEM), the medium was centrifuged at 110,000 *g* for 70 min and the pellet including exospores was suspended in phosphate buffered saline (PBS). The suspension was placed on the BAM- and PEG-modified glass. Immobilized exospores were observed using AFM (NanoWizard II, JPK Instruments, Germany) by intermittent contact mode in fluid.

Results: A three-dimensional AFM image of exospores immobilized on the BAM- and PEG-modified glass surface was successfully obtained. Exospores, ranging from 50 to 150 nm in diameter and from 30 to 50 nm in height, were observed.

Conclusions: This result indicates the BAM-modified glass surface is useful for observation using AFM.

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P-27

Significance of Mortalin-Bcl-2/Bcl-xl Interactions in Human Cancer Cells

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Bcl-xl and Bcl-2 proteins of the Bcl-2 family have been looked upon as attractive anti-cancer targets since their high levels in cancer were found to increase resistance to a wide spectrum of therapeutic agents and radioactive therapy. The 2 anti-apoptotic proteins predominantly resides in mitochondria and have a significant role in preventing loss of mitochondrial membrane potential , cell death and mitochondrial integrity. Mortalin/mthsp70/GRP75 (mot-2)/PBP74 is a member of heat shock protein 70 (hsp70) family also predominantly found in mitochondria and is involved in mitochondrial import, control of membrane potential and ROS production. Mortalin was shown to interact with p53 causing its cytoplasmic sequestration and hence inactivation of its tumor suppressor function. Here we report that mortalin and Bcl-2; and mortalin and Bcl-xl interact with each other and these interactions cause release of p53 from mortalin-p53 complexes. Although both mortalin and Bcl-2; and mortalin and Bcl-xl are upregulated in cancer cells and are shown to have anti-apoptotic function, our study suggests that these anti-apoptotic proteins interact and bring in the tumor suppression at the same time. Interactions between Bcl-xl or Bcl-2 and mortalin abrogate mortalin-p53 complex, allowing p53 nuclear localization and subsequent activation, thus leading to senescence.

P-28

Can Ashwagandha Leaf Extract be Used As A Remedy for Old Age?

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Ashwagandha (*Withania somnifera*) is an evergreen shrub that is extensively used for various ailments in traditional and home medicine system (Ayurveda). We had previously detected anti-cancer activity in the alcoholic extract (i-Extract) of Ashwagandha leaves (Widodo *et al*., *Clinical Cancer Res.* 13, 2298-2306, 2007 and *Cancer Lett.* 262: 37-47, 2008). We found that whereas the cancer cells were killed by i-Extract; health spectrum of normal cells (*in vitro* lifespan, molecular damage and protection against oxidative stress) was increased. Furthermore, in contrast to the cancer cells that showed upregulation of tumor suppressor protein p53, normal cells showed its downregulation. In the present study, we examined the effect of i-Extract and its components, withanone and withaferin A on brain-derived cells during oxidative stress and neuro-differentiation models. We found that the i-Extract and withanone protect the cells against oxidative stress and induce differentiation. It was further confirmed by investigations on the glial and neuronal cell differentiation markers. The data suggests that the i-Extract and withanone can be recruited for safe and functional therapy for oxidative stress induced pathologies and old age brain disorders.

P-29

Is CARF a Biomarker for Cellular Senescence?

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CARF (Collaborator of ARF) was first cloned as an ARF-interacting protein. It was shown to regulate the p53-p21-HDM2 pathway that closely regulates senescence and apoptosis. CARF overexpression resulted in growth arrest of human cancer cells. It caused premature senescence in normal human cells. We demonstrated that it is an essential protein for cell division and viability.
CARF was upregulated during replicative, oncogenic and stress induced senescence in cultured cells. We examined whether CARF could serve as a novel biomarker for cellular senescence by undertaking induced senescence in culture cells as model system. We demonstrate that the induction of senescence by variety of chemicals is associated with increase in CARF levels that were closely related to upregulation of p53, p21 and H2AX and associated growth arrest in G1 phase of cell cycle. The results propose that the CARF could be a novel biomarker of senescence that may be employed in senescence inducing anti cancer drug screening.

P-30

Propagation of *Withania somnifera* (L.) Dunal Using Biotechnological Approaches

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Withania somnifera (L.) Dunal known as Ashwagandha or Asgandh has a high repute in traditional Indian medicine. It possesses immense therapeutic value against a large number of ailments such as mental diseases, asthma, inflammation, arthritis, rheumatism, tuberculosis and a variety of other diseases including cancer. It is also called 'Indian Ginseng' for its rejuvenating properties. The therapeutic potential of *W. somnifera* is attributed to presence of two major kinds of secondary metabolites i.e., tropane alkaloids and withanolides (steroidal lactones). In order to facilitate uniform production of plant materials round the year for subsequent experimentation and industrial applications an efficient protocol for its *in vitro* propagation is being developed. Extrinsic and intrinsic factors associated with the seed germination, use of different explants and effect of various plant growth regulators are being analysed for standardization of micropropagation protocol. Further a comparison of agar gelled and liquid culture system is being drawn with an aim to reduce the cost of micropropagation and laying foundation for automation. Work on analysis of clonal fidelity of micropropagated plants using RAPD will relate to their genetic uniformity and for maintaining stringent quality control of experimental plant materials. Development of a profuse root system is critical for overall growth and development of plant. The present study also focuses on the role of plant growth regulators on root system architecture. *In vitro* regeneration using various explants is being carried out to facilitate the genetic transformation process. In future, the *in vitro* propagation system will be used as a model to get insights into the accumulation and transport of secondary metabolites which in turn will immensely help in modelling the plant for higher commercial values.

P-31

Synthesis and Characterization of Biocompatible Carboxy Methyl Cellulose Coated Magnetic Nanoparticles.

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Background:

Magnetic nanoparticles are well-studied nanomaterials that offer controlled size, ability to be manipulated externally, and enhancement of contrast in magnetic resonance imaging (MRI). These nanoparticles have many potential applications in biology and medicine, such as drug delivery, protein purification, and medical imaging and treatment.

Methods:

We have synthesized magnetic nanoparticles particles and nanoparticles were coated with folate conjugated carboxy methyl cellulose. 5flurouracil was encapsulated to the nanocomposite. The nanocomposites were characterized in TEM, SEM, FTIR, VSM, etc. The biocompatibility of nanocomposite was studied by cell viability assays.

Results:

Magnetic nanoparticles around the size of 10 nm was obtained and coated with carboxymethyl cellulose. The average size of the resulting nanocomposite was around 150 nm. In vitro drug delivery study was performed. The nanocomposites were biocompatible when studied in normal cell line L929.

Conclusion:

We could synthesize biocompatible magnetic nanoparticles for efficient targeted drug delivery.

P-32

Effects of Shoseiryuto on Neuropeptide Production in TDI-Induced Allergic Rhinitis Model Rats

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Recently, patients with allergic rhinitis have been increasing recently in Japan, and it has been reported that about 40% of Japanese have allergic rhinitis. Some of Japanese medical doctors prescribe herbal (Kampo) medicines for the treatment of allergic rhinitis. Shoseiryuto is a well-known herbal medicine used for allergic rhinitis in Japan. Although there is circumstantial evidence that Shoseiryuto exerts suppressive effects on the production of both cytokines and neuropeptides, resulting in attenuation of clinical symptoms of allergic rhinitis, the precise mechanism of Shoseiryuto is not well defined. The present study was, therefore, undertaken to investigate the effects of Shoseiryuto on the production of neuropeptides in rats.

To induce allergic rhinitis, six-week-old male Sprague-Dawley (SD) rats were sensitized with 10% toluene 2,4-diisocyanate (TDI) once a day for 5 days in a volume of 5.0 ml/rat ,and this treatment was repeated totally twice. TDI can induce respiratory diseases such as asthma and allergic rhinitis. Shoseiryuto was mixed with rodent chow at concentrations of 1% and 3% and administered orally throughout the experiment. On day 22, TDI-sensitized rats were challenged nasally with 10% TDI and nasal symptoms were evaluated by counting the number of sneezes and nasal rubs for 10 min. Substance P (SP), calcitonin gene-related peptide (CGRP) and nerve growth factor (NGF) in the nasal lavage fluids obtained from rats on day 22 were measured with enzyme immunoassay.

Administration of Shoseiryuto at a concentration of 3% significantly suppressed sneezes, rubs, SP, CGRP and NGF as compared to those of controls. Shoeseiryuto at 1% concentration inhibited significantly the appearance of SP in nasal lavage fluids, which was increased by TDI sensitization.

These results strongly suggest that Shoseiryuto inhibits neuropeptide production in nasal cavities and results in the prevention of the development of allergic rhinitis.

P-33

Fluorescent MRI Responsive Magnetic Nanoparticles: Intracellular Uptake and Its Application in Multimodal Imaging

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Background: In the present decade, 12.7 million cancer cases have been diagnosed with nearly 7.6 million fatalities worldwide. With the advent of nanotechnology, recent years have witnessed significant strides in the nanoparticulate mediated multimodal therapy and imaging domains, having examined a vast spectrum of prospective nanoparticles expressing potential in diagnostic and therapeutic-theragnostic applications. Targeted nanoparticles have the potential to elicit high specificity and effective imaging, while minimizing off-target side effects caused by dosing of normal tissues.

Methods: We report the preparation and characterization of new magnetic fluorescent nanoparticles and our success in presenting them as live cell markers. The nanoparticles possess a porous silica shell encapsulated magnetic oxide core. The porous silica shell was loaded with anticancer drugs and is functionalized with PEG Folate, carboxy fluorescein PEG and DTPA-Gd lipids. The carboxy-fluorescein PEG serves as fluorescence moiety, Gd-DTPA for magnetic resonance imaging and Folate to target cancer cells.

Results: The morphology of targeted nanoparticles were characterized using TEM, elemental analysis was carried out using EDS and XPS, the magnetization property by VSM. The optical properties of fluorescent nanoparticles are characterized by carrying out UV and PL spectral measurement. Cytotoxicity assays are carried out using normal and cancer cells and no toxicity rendered by the multimodal nanoparticles was observed. The nanoparticles exhibited a high affinity for cancer cells (MCF7, Glioma and MDAMB), which was evidenced by fluorescence microscopy and VSM measurement, whereas negligible affinity was seen towards normal cell line, LAG and HUVEC. We observed two types of magnetic labeling: adsorption of the nanoparticles on the cell membrane (membranous fluorescence) and internalization of the nanoparticles inside the cell (intracellular vesicular fluorescence). VSM analysis revealed considerable magnetization in the nanoparticle administered cells, which opens up gateways for applications in nanosurgery. We also propose to carry out MRI imaging of treated cancer cell pellets.

Conclusion: Multimodal nanoparticles for cancer cell imaging and therapy was successfully synthesized and is found suitable for cancer therapeutic and theragnostics.

P-34

Transport of Black Carbon and Carbon Monoxide from the Asian Continent to the Western Pacific in the Boundary Layer

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Black carbon (BC) aerosols, formed through incomplete combustion of fossil fuels, biofuels, and biomass burning, absorb incoming solar radiation, acting as a direct radiative forcing agent in the atmosphere. The estimates from General Circulation Models suggest that BC is contributing to the global warming next to that of carbon dioxide (CO_2). BC as an indirect radiative forcing agent interferes with cloud microphysical processes by changing the size distributions and lifetimes of the cloud droplets. Additionally, BC has a deleterious effect on human health. A large portion of the global BC emissions are emitting from Asia, mainly from China and India. Asian BC is reported to be transporting to Arctic region, giving a signature of the impact of Asian BC at the global levels. The pattern of the transport, spatial distribution, and removal of BC are poorly known due to the lack of long term in situ measurements of the mass concentrations of BC and mixing ratios of carbon monoxide (CO). The residence time of CO in the atmosphere is more than that of BC. Thus the ratio of BC/CO can be can use as a measure of the transport of BC, if the emissions of CO are well known. In this study, we discuss the seasonal variations of the transport BC and CO from the Asian continent to the western Pacific in the boundary layer using the continuous in situ measurements of the BC and CO at Hedo, a remote site situated at Okinawa Island of Japan in East China Sea, from March 2008 to May 2009. We have shown wet removal of BC using the BC simulated by three-dimensional (3-D) Community Multiscale Air Quality (CMAQ) model. Asian CO emission inventory by *Zhang et al*. [2009] for the year 2006 have been evaluated using the CMAQ model simulation and observations made at surface (Hedo) and aircraft measurements.

The annual average concentrations of BC and CO observed at Hedo were 0.29 μg m^{-3} and 150 ppbv, respectively. The origins of the observed air masses determined by using 5-day back trajectories, suggesting that about 51% of the air masses arriving at Hedo were from the Chinese region during spring and winter, while about 78% of air masses were of Pacific Ocean during summer. Due to the more frequent transport of Chinese air to Hedo in spring and winter, the average and background levels of BC and CO in these seasons were higher by about a factor of two than those in summer and fall. Air masses from North China made the largest contributions to elevating the levels of BC at Hedo due to the high BC emission rate and frequency of transport. The observed ΔBC/ΔCO ratio systematically decreased with decreasing the model-calculated transport efficiency (TE_{BC}^{cal}). We derive region-specific ΔBC/ΔCO ratios by selecting data with TE_{BC}^{cal} > 80%. The annually averaged ΔBC/ΔCO ratios for air originated from North and South China were 7.0±3.3 and 7.5±4.6 ng m^{-3}/ppbv, respectively, about half the annual BC/CO emission ratio derived from the emission inventory of *Zhang et al*. [2009]. The ratio of the observed and CMAQ model-calculated CO suggest that CO emission inventory by *Zhang et al*. [2009] for China were underestimated by about a factor of two.

P-35

Molecular Mechanism of Mitochondrial and Nuclear Mortalin in Aging and Cancer

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Hsp70 family protein, mortalin, is an essential chaperone that exists in various subcellular sites including mitochondria, plasma membrane, ER and cytosol; functional significance of its multiple niches remains unknown. Whereas cancer cells show upregulation of mortalin expression, senescent cells and age-related disorders exhibit decrease in mortalin. Consistent with this, cancer cells compromised for mortalin enter growth arrest or apoptosis, the two innate checkpoints to carcinogenesis. We had earlier reported that mortalin inactivates tumor suppressor protein p53 that results in lifespan extension of normal human fibroblasts and increase in the malignant properties of human cancer cells.

In the present study, we have generated mortalin mutant that lacks the mitochondrial targeting signal peptide. Overexpression of non-mitochondrial mortalin in cancer cells revealed strong inactivation of tumor suppressor protein p53 and its down stream effector $p21^{WAF1}$, and acquisition of highly malignant tumor phenotypes in *in vitro* and *in vivo* assays. Cells overexpressing non-mitochondrial mortalin showed higher colony forming efficiency and faster mobility in cell transformation and cell invasion assays, respectively. In nude mice assays, using breast carcinoma (MCF7) cells overexpressing full-length mortalin formed tumors as compared to the control cells that were non-tumorigenic. Remarkably, we found that the non-mitochondrial mortalin overexpressing cells were highly tumorigenic and form very aggressive and multiple tumors in subcutaneous xenografts. When injected through tail vein, the non-mitochondrial mortalin overexpressing cells showed very high degree of metastasis. Electron microscopic examination revealed the formation of microfibrils in the non-mitochondrial mortalin overexpressed cells indicating their contribution to the invasive characteristics. The present study has shown for the first time that the nuclear mortalin may have important role in the tumorigenic properties of cancer cells.

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Health and environment play major roles in our lives and sustainable maintenance of natural environment is vital for healthy living in the 21st century. It is a great challenge for each and every country to meet the demands for food, water and energy while avoiding the consequences of industrialization on health and environment.

Inequality in health care systems, knowledge gap, ecological imbalance, emergence of new diseases and syndromes especially an increase in non-communicable diseases are some of the factors that pose a burden on the socio-economics of developing nations. Moreover, environmental issues related to rapid urbanizations, anthropogenic climate changes and natural disasters (such as the recent earthquake/tsunami in East Japan) add pose a greater burden on the health of both urban and rural populations worldwide. Local participation in sustaining health and environment needs national and global framework and efforts by sharing of resources and advanced knowledge emerging from research developments. Such information and adequate education will empower the policy makers and public for sustainable management of resources while keeping high-level standards of health.

Global health and environmental issues have been at the forefront of Japanese research initiatives and much focus is also given to translational research and applications. Relatively, the focus of translational research needs to increase in India. To develop stronger bilateral collaborations between India and Japan and share cutting-edge research outcomes among Japanese and Indian researchers, ISAJ is organizing this symposium in Tokyo in collaboration with its partners and co-sponsoring organizations. This will be the second in the series of ISAJ annual Symposia following the first successful launch in October 2010.

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