

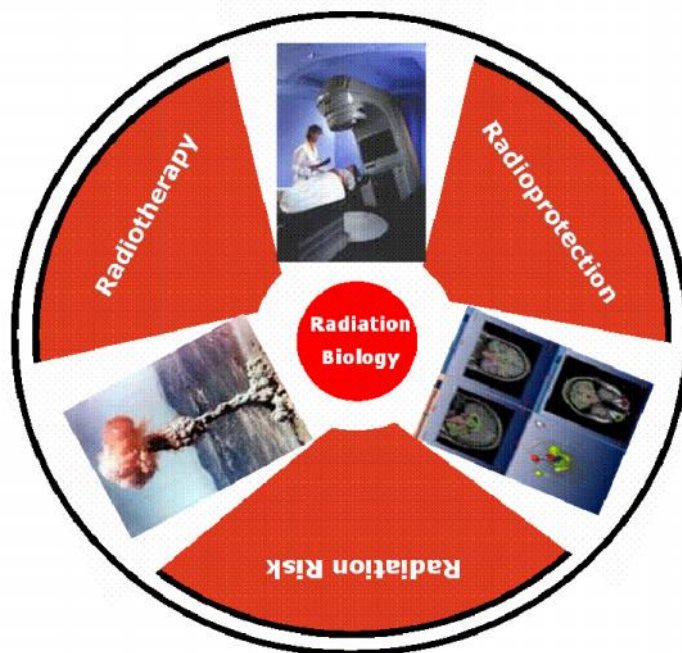


RADIATION SCIENCE TODAY

A Quarterly eNewsletter

published by

INDIAN SOCIETY FOR RADIATION BIOLOGY



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Radiation Science Today

October-December Issue: 16 Year: 2011

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1. Report of ISRB Conferences/Workshop

Report of 'National Science Day' celebration as 'Workshop on Recent Advances in Radiation Biophysics' Feb. 28, 2011

Organizer: Department of Biophysics, University of Mumbai, Vidynagari Santacruz (E), Kalina, Mumbai 400098 under the aegis of Indian Society of Radiation Biology and International Society of Science and Technology, Mumbai

Highlights of the program are as following:

The programme was started as per with University song. Dr **Rajpal Hande**, Director BCUD, Dr **Nagraj Huilgol**, Vice President, Indian Society of Radiation Biology & Chief, Division of Radiation oncology have lighted the lamp and inaugurated the workshop, there were more than 150 participants from various colleges/Institutes.

Dr **P M Dongre**, Head, Department of Biophysics had given introductory remarks of Workshop such as importance of National Science Day celebration, Dr C V Ramana's Discovery of light scattering and his noble award etc. The Chief Guest of the Workshop Dr **Rajpal Hande, Director, BCUD** spoke about the application of radiation in various fields such as medical, research and other areas, importance of ionizing radiation. Dr Hande spoke about various research schemes of Mumbai University. How faculty and Research student can submit research proposals. He also mentioned that university of Mumbai has made special budget for research. Further he spoke about new initiatives of Mumbai University like starting of International Research Journal, accession of journals through internet etc. Dr **Nagraj Huilgol** had highlighted on about various modalities in cancer treatments. Dr **Varsha Kelkar Mane**, Head, Department of Biotechnology had talk on progress of Department of Biophysics, facilities available in the Department, research projects and collaboration with various Institutes etc. etc. The inaugural function was ended with vote of thank.

Invited speakers delivered talks on various topics and Prof S. Sivakami, Prof Sanjay Deshmukh, Prof D C Kothari were Chairpersons of scientific sessions.

Dr **B. S. Rao**, Adjunct Professor, Mumbai University, Mumbai had given lecture on **Radiation induced DNA damage and its Implications on Human Health**. He stressed on how the damage DNA plays crucial role in the health of human being. DNA accumulates variety of damage as results of exposure of variety of environmental agents. Monitoring of the DNA damage is very important to assess the impact of human exposure to variety of environment agents. Further he explained about advanced techniques available for measurement of DNA damage. Finally he explained about abnormalities takes place by DNA damage.

Dr **B. N. Pandey**, Bhabha Atomic Research Centre, Mumbai delivered his talk on **Radiation induced membrane damage and its consequences: Cell death to cancer radiotherapy**. Dr Pandey showed evidence that how cell membrane initiates molecular signal when it is damaged by ionizing radiation. He showed (his own results) that alteration in fluidity of liposome membrane could modify membrane signaling and radiosensitivity. Further Dr Pandey explained that radioprotection to cell membrane using antioxidants such as eugenol results in prevention of membrane signaling as well as cellular radiation damage

including induction of apoptosis. He also presented some recent report of his research laboratory that radiation exposure affects cytoskeleton and membrane in human breast cancer, which results in metastatic phenotype in cancer cells. In his concluding lecture he told that the membrane not only act boundary but act as a crucial hub of controlling various signaling events. The alteration in membrane associated signaling events in irradiated cells can decide the ultimate fate of cell, which may play crucial role in induction of apoptosis, cancer induction and may have significant implication in cancer radiotherapy.

Dr Nagraj Huilgol, Nanavati Hospital, Mumbai had delivered his talk on **"Physical and Biological Principles of Hyperthermia in Cancer Therapeutics"**. Dr Nagraj had emphasized about history of hyperthermia, how the ancient people use hyperthermia for treatment of infectious diseases? He showed that hyperthermia can be delivered local region or even whole body treatment for cancer. Dr Nagraj had explained the techniques used in hyperthermia, such as infrared tents, circulation of hot water bath, microwave, Radio Frequency, ultrasound etc. Further he stressed that hyperthermia can be delivered as a single modality or in conjunction with chemotherapy and radiotherapy. He concluded that radiation and chemo sensitizing potential of hyperthermia can enhance survival of cancer patients.

Dr Murli Krishna, Advanced Centre for Training Research Education on Cancer, Kharghar, Navi Mumbai had delivered his talk on **"Raman Spectroscopy: A Potential Tool in Radiation Research"**. Dr Murli showed that how the discovery of Raman effect that analysis of idealistically scattered light from the simplest molecule H_2O could provide unique fingerprint of molecular structure? He emphasized that in last couple of decades, popularity and versatility of Raman Scattering spectroscopy have increased in many ways and a diverse Raman based techniques have been developed. The latest development in light sources (lasers) and detectors (CCD's), have made Raman Spectroscopy of even weakly scattering samples like tissues and cells easy and good Raman Spectra can be recorded without much efforts. He emphasized that Raman Spectroscopy is an ideal tool in biomedical application.

Dr Vinay Kumar, Bhabha Atomic Research Centre, Mumbai had delivered his talk on **"Structural biology using X-rays"**. Dr Vinay Kumar showed that how 3-D structures useful to define biological concepts explaining molecular and biochemical functions to study biochemical mechanisms and macromolecular interactions. It also helps to unravel evolutionary relationship promoting 3-D modeling of biological molecules and characterization of orphan gene, development of new pharmaceuticals and in rational engineering of the protein. He showed that the development of new method for protein expression using highly intense X-ray radiation synchrotron sources have provided the necessary impetus in field of structural biology. The worldwide structure genomics efforts have immensely contributed to the development of new methods as well as initiated well coordinated high throughput structural biology program. He talked that in the year 2010 alone nearly 8000 structures were submitted to protein data bank and majority of them were the contributions using single crystal X-ray diffraction method.

Dr Dullal Panda, IIT, Mumbai delivered his lecture on **"Drug protein interaction and its implication in cell division"**. He showed how the protein assembly dynamics affects cell division and its physiological significance of protein drug interaction. Further he stressed on

some important biophysical techniques such as Fluorescence spectroscopy and Confocal Microscopy useful in protein-protein, protein drug interaction and cell division etc.

Dr D. Bahadur, IIT, Mumbai discussed on **Warm treatment to cancer with drug through nanoparticles and Hybrids**. Dr Bahadur explained procedures of preparation of magnetic nanoparticles with different shapes, composites, hybrids, core shell structure and magnetic fluids. He showed that how magnetic nanostructure with sufficient biocompatibility are best for several therapeutic and diagnostic applications such as treatment of cancer through hyperthermia, targeted and sustained drug delivery, as contrast agents and other bio-sensing applications etc. Dr Bahadur mentioned that nanostructures when properly functionalized can be used as effective vehicle for biological entities *in vivo*. He emphasized on the mechanisms of cell death during controlled experimental conditions for hyperthermia treatment of cancer.

The following Colleges/University participated in the Workshop:

RKT College, Ulhasnagar, CKT College, Panvel, Institute of Science, Mumbai, MGM CET Navi Mumbai, Advance Cancer Training Research Centre, Kharghar, Sophia College, VJTI, Khalsa College, Bombay College of Pharmacy, Sathe College, HBB College Marine Lines, Dy Patil Medical College, Kolhapur, Institute of Science, Aurangabad, Bandekar College of Science, BARC Hospital, Nair Hospital, JNU New Delhi, Department of Zoology, University of Pune and University Departments : Chemistry, Life Sciences, Biotechnology , Physics.

Colleges/University from other States participated:

MS College, Vadodara, MBM Science & Home Science College, Rajkot , Department of Zoology, University of Baroda, JNU, New Delhi.

The program was concluded by Dr B N Pandey, BARC, Mumbai

Report prepared and submitted by

Prof. P M Dongre

Head, Department of Biophysics

University of Mumbai, Mumbai



Inauguration Function



Scientific session: Frame 1 (top left): Informal discussion by Prof. Kothari, Dr B. N. Pandey, Dr Hande and Dr Huilgol, Frame 2 (top right) Dr B. N. Pandey, Frame 3 (bottom left): Dr N. Huilgol, Frame 4 (bottom right) Dr Vinay Kumar delivering talks



Scientific session: Frame 1 (top left): Dr Huilgol delivering talk, Frame 2 (top right) audience, Frame 3 (bottom left): Dr Murali Krishna delivering his talk, Frame 4 (bottom right) audience

2. FROM ARCHIVES OF RADIATION SCIENCES

Paper: The Radiological Treatment of Cancer: 1928-1935, Methods and Results, I. The Biological Conception of Dosage in Radiotherapy

Source: Canadian Medical Association Journal. Year: 1936, Vol.: 35, Pages: 299-305
(<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1561855/pdf/canmedaj00516-0149.pdf/>)

Authors: G. E. Richards

Laboratory: Professor of Radiology, University of Toronto; Department of Radiology and Institute of Radiotherapy, Toronto, Canada

Highlights of the paper

This is one of initial papers in which assessment of cancer radiotherapy was performed when application of radiation in cancer therapy was rapidly growing and rather in 'infant' period. The situation and importance of need to address the issues could be sensed by author's statement that *'There still exists much misunderstanding not only as to the natural limitations inherent in this form of therapy..... This can no doubt be gradually corrected by the presentation of accurate records. But most necessary of all, is a better understanding of the conditions which determine success or failure in cases referred...'*. During early days of cancer radiotherapy (1896-1920), when impression of damaging effects of radiation (X-ray, radium) was dominated over its beneficial effects, dose applied during radiotherapy was too low to show remarkable substantial clinical response while radiotherapy. However, in later period of ~10 years, significant progress was made for perfection of instruments and its dosimetry.

Author emphasized radiation treatment of malignant disease using a sufficiently heavy accurately measured dose. Other issues which might be encountering those days in cancer radiotherapy were the demand of skilful radiologists, individualization in radiotherapy and careful clinical control for patients. Tissue reactions after radiotherapy was more confusing was suggested to be recognized as an essential part of the treatment, not as an indication of negligence or lack of skill on the part of the radiologist.

Significance of the paper

The influential paper was to assess the clinical scenario and radiobiological problems faced during cancer radiotherapy, which was emerging amongst confusions and apprehensions. Author addressed some of the very pertinent fundamental questions and provided a realistic opinion in clinical radiobiology.

by

Badri N. Pandey

Radiation and Cancer Biology Section

Radiation Biology and Health Sciences Division

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Note: Interested readers may submit similar articles. This column is aimed to highlight the salient points and significance of seminal research articles/events in radiation biology and allied sciences, which further substantially changed the understanding in that particular research field.

3. NEWS AND VIEWS

Radiation and Cancer Biology

Radiation exposure and cancer risk

- Magnitude of radiation induced dna damage in peripheral blood leukocytes and its correlation with aggressiveness of thymic lymphoma in Swiss mice
<http://www.ncbi.nlm.nih.gov/pubmed/21913818>
- The role of miRNA in the direct and indirect effects of ionizing radiation
<http://www.ncbi.nlm.nih.gov/pubmed/21928045>
- Interaction between ionizing radiation and estrogen: What we are missing?
<http://www.ncbi.nlm.nih.gov/pubmed/21903337>

Radiation exposure and non-cancer diseases

- Risk of cancer and non-cancer diseases in the atomic bomb survivors
<http://rpd.oxfordjournals.org/content/146/1-3/272.abstract?etoc>

Radiation induced Bystander effect

- Increased frequency of spontaneous neoplastic transformation in progeny of bystander cells from cultures exposed to densely ionizing radiation
<http://www.ncbi.nlm.nih.gov/pubmed/21738697>
- Mitochondrial Gene Expression in Directly Irradiated and Nonirradiated Bystander Cells
<http://www.ncbi.nlm.nih.gov/pubmed/21830943>
- A role for p53 in the response of bystander cells to receipt of medium borne signals from irradiated cells
<http://www.ncbi.nlm.nih.gov/pubmed/21831006>
- Analysis of the common deletions in the mitochondrial DNA is a sensitive biomarker detecting direct and non-targeted cellular effects of low dose ionizing radiation
<http://www.ncbi.nlm.nih.gov/pubmed/21843534>

- Track structure calculations on intracellular targets responsible for signal release in bystander experiments with transfer of irradiated cell-conditioned medium
<http://www.ncbi.nlm.nih.gov/pubmed/21951050>
- Reactive oxygen species-induced release of signalling factors in irradiated cells triggers membrane signalling and calcium influx in bystander cells
<http://www.ncbi.nlm.nih.gov/pubmed/21294691>
- Radiation induced bystander effects in mice given low doses of radiation in vivo
<http://www.ncbi.nlm.nih.gov/pubmed/21731538>

Low Dose Radiation Biology

- The effect of non-targeted cellular mechanisms on lung cancer risk for chronic, low level radon exposures
<http://www.ncbi.nlm.nih.gov/pubmed/21770704>
- The effect of low-dose exposure on germline microsatellite mutation rates in humans accidentally exposed to caesium-137 in Goiânia
<http://mutage.oxfordjournals.org/content/26/5/651.abstract?etoc>

Accidental radiation exposure

- Uncoupling p53 Functions in Radiation-Induced Intestinal Damage via PUMA and p21
<http://mcr.aacrjournals.org/content/9/5/616.abstract?etoc>
- Analysis of White Blood Cell Counts in Mice after Gamma- or Proton-Radiation Exposure
<http://www.bioone.org/doi/abs/10.1667/RR2413.1>

Carcinogenesis

- MiR-21 plays an important role in radiation induced carcinogenesis in BALB/c mice by directly targeting the tumor suppressor gene Big-h3.
<http://www.ncbi.nlm.nih.gov/pubmed/21494432>
- Curcumin decreases cholangiocarcinogenesis in hamsters by suppressing inflammation-mediated molecular events related to multistep carcinogenesis.
<http://www.ncbi.nlm.nih.gov/pubmed/20824699>

- Mutations in the p53 Tumor Suppressor Gene: Important Milestones at the Various Steps of Tumorigenesis
http://gan.sagepub.com/content/2/4/466.abstract?utm_source=Email&utm_medium=article&utm_content=articletitle&utm_campaign=1118110JA2&priorityCode=1118110JA2

Cancer Biology and Therapy

- Caspase 3-mediated stimulation of tumor cell repopulation during cancer radiotherapy
http://www.nature.com/nm/journal/v17/n7/full/nm.2385.html?WT.ec_id=NM-201107
- Beyond reverse pharmacology: Mechanism-based screening of Ayurvedic drugs.
<http://www.ncbi.nlm.nih.gov/pubmed/21731372>
- Differences in integrin expression and signaling within human breast cancer cells
<http://www.biomedcentral.com/1471-2407/11/293/abstract> (*Open access*)
- Angiopoietin-1 and 2 exert antagonistic functions in tumor angiogenesis, yet both induce lymphangiogenesis
<http://cancerres.aacrjournals.org/content/early/2011/07/20/0008-5472.CAN-10-4635.abstract?papetoc>
- Radiation-enhancement of MDA-MB-231 breast cancer cell invasion prevented by a cyclooxygenase-2 inhibitor
http://www.nature.com/bjc/journal/v105/n4/abs/bjc2011260a.html?WT.ec_id=BJC-201108
- A novel transferrin receptor-targeted hybrid peptide disintegrates cancer cell membrane to induce rapid killing of cancer cells
<http://www.biomedcentral.com/1471-2407/11/359/abstract>
- Curcumin suppresses proliferation and induces apoptosis in human biliary cancer cells through modulation of multiple cell signaling pathways
<http://carcin.oxfordjournals.org/content/32/9/1372.abstract?etoc>

- Caloric restriction reduces growth of mammary tumors and metastases
<http://carcin.oxfordjournals.org/content/32/9/1381.abstract?etoc>
- Plumbagin inhibits invasion and migration of breast and gastric cancer cells by downregulating the expression of chemokine receptor CXCR4
<http://www.molecular-cancer.com/content/10/1/107> (open access)
- SPHINGOSINE KINASE INHIBITORS AND CANCER: SEEKING THE GOLDEN SWORD OF HERCULES
<http://cancerres.aacrjournals.org/content/early/2011/09/21/0008-5472.CAN-11-2364.abstract?papetoc>

Cancer Radiotherapy

- Radiotherapy: Repopulating tumor cells—dying for caspase 3
http://www.nature.com/nrclinonc/journal/v8/n9/full/nrclinonc.2011.112.html?WT.ec_id=NRCLINONC-201109
- Efficacy and safety of intratumoral thermotherapy using magnetic iron-oxide nanoparticles combined with external beam radiotherapy on patients with recurrent glioblastoma multiforme.
<http://www.ncbi.nlm.nih.gov/pubmed/20845061>

Cancer: Prognosis and Diagnosis

- Fatty acid binding proteins (FABPs) in prostate, bladder and kidney cancer cell lines and the use of IL-FABP as survival predictor in patients with renal cell carcinoma
<http://www.biomedcentral.com/1471-2407/11/302/abstract>
(Open access)
- Intrinsic resistance to tyrosine kinase inhibitors is associated with poor clinical outcome in metastatic renal cell carcinoma
<http://www.biomedcentral.com/1471-2407/11/295/abstract>
(Open Access)
- Late symptoms in long-term gynaecological cancer survivors after radiation therapy: a population-based cohort study
http://www.nature.com/bjc/journal/v105/n6/abs/bjc2011315a.html?WT.ec_id=BJC-201109
- Long-lived inflammatory signaling in irradiated bone marrow is genome dependent

<http://cancerres.aacrjournals.org/content/early/2011/09/07/0008-5472.CAN-11-1926.abstract?papetoc>

- Experimental α -particle radioimmunotherapy of breast cancer using ^{227}Th -labeled p-benzyl-DOTA-trastuzumab

<http://www.ejnmires.com/content/1/1/18>

Technological advancement/note

- Current progress of the biological single-ion microbeam at FUDAN
<http://www.springerlink.com/content/I310840p37045486/>
- Scanning irradiation device for mice in vivo with pulsed and continuous proton beams
<http://www.springerlink.com/content/y0j737308n236316/>
- Dosimetry of a ^{238}Pu -based alpha-particle irradiator and its biological application in a study of the bystander effect

<http://www.ncbi.nlm.nih.gov/pubmed/21737630>

Nuclear Technology & Safety

Radiation Safety

- Dynamic model for tritium transfer in an aquatic food chain
<http://www.springerlink.com/content/w655750262qw02q0/>
- Doses from beta radiation in sensitive layers of human lung and dose conversion factors due to $^{222}\text{Rn}/^{220}\text{Rn}$ progeny
<http://www.springerlink.com/content/02w528076wj84821/>
- Fukushima's economic fallout shutter Britain's Sellafield mixed-oxide facility.
http://www.nature.com/news/2011/110810/full/476140a.html?WT.c_id=NATURE-20110811
- Summary Report of the Preliminary Findings of the IAEA Mission on remediation of large contaminated areas off-site the Fukushima Dai-ichi NPP
http://www.iaea.org/newscenter/focus/fukushima/pre_report.pdf

Science and Society

Indian Science and Technology

- **Developing world: Educating India**
http://www.nature.com/news/2011/110405/full/472024a.html?WT.c_id=NATURE-20110407
- **Beyond reverse pharmacology: Mechanism-based screening of Ayurvedic drugs.**
<http://www.ncbi.nlm.nih.gov/pubmed/21731372> (*Free on Pubmed Central*)

Science in General

- **The roles of herbal remedies in survival and quality of life among long-term breast cancer survivors - results of a prospective study**
<http://www.biomedcentral.com/1471-2407/11/222/abstract>
- **Management of cosmic radiation exposure for aircraft crew in Japan**
<http://rpd.oxfordjournals.org/content/146/1-3/123.abstract?etoc>

4. ARTICLE OF THE ISSUE

- **Summary Report of the Preliminary Findings of the IAEA Mission on remediation of large contaminated areas off-site the Fukushima Dai-ichi Nuclear Power Plant**

In response to the request made by the Government of Japan, the International Atomic Energy Agency (IAEA) organized the second fact-finding mission to support the remediation of contaminated areas off-site the Fukushima Dai-ichi Nuclear Power Plant (NPP). The Mission Team involved 12 international experts. The mission team has submitted the Pre-Report and the final report will be provided to Japan by 15 November 2011. The highlights of 12 points advice suggested by Team in Pre-Report are as following:

- Cautiously balance the different factors that influence the net benefit of the remediation measures to ensure dose reduction.

- Encourages the relevant authorities to revisit the issue of establishing realistic and credible limits (clearance levels) regarding associated exposures. Residues that satisfy the clearance level can be used in various ways, such as the construction of structures, reclamations, banks and roads.
- Encourages the Japanese authorities to continue the useful monitoring of freshwater and marine systems

Read the full Pre-Report on following link:

http://www.iaea.org/newscenter/focus/fukushima/pre_report.pdf

5. ARTICLE SERIES/REVIEWS

- **Targeting hypoxia in cancer therapy**
http://www.nature.com/nrc/journal/v11/n6/abs/nrc3064.html?lang=en?WT.ec_id=NRC-201106
- **Calcium in tumour metastasis: new roles for known actors**
http://www.nature.com/nrc/journal/v11/n8/abs/nrc3105.html?lang=en?WT.ec_id=NRC-201108
- **Chemotaxis in cancer**
http://www.nature.com/nrc/journal/v11/n8/abs/nrc3078.html?lang=en?WT.ec_id=NRC-201108
- **Cyclin D as a therapeutic target in cancer**
http://www.nature.com/nrc/journal/v11/n8/abs/nrc3090.html?lang=en?WT.ec_id=NRC-201108
- **Nanotechnology: Tag teams**
http://www.nature.com/nrc/journal/v11/n8/full/nrc3111.html?WT.ec_id=NRC-201108
- **New challenges in radiobiology research with microbeams**
<http://www.springerlink.com/content/l603g56549825842/>
- **Fasting vs dietary restriction in cellular protection and cancer treatment: from model organisms to patients**
http://www.nature.com/onc/journal/v30/n30/abs/onc201191a.html?WT.ec_id=ONC-201107

- **Radiation-Induced Bystander Effects: What Are They, and How Relevant Are They to Human Radiation Exposures?**
<http://www.bioone.org/doi/abs/10.1667/RR2548.1>
- **Applications of particle accelerators in medicine**
<http://rpd.oxfordjournals.org/content/146/4/440.abstract?etoc>
- **Interaction of tumor cells with the microenvironment**
<http://www.biosignaling.com/content/9/1/18> (*Open access*)
- **Warburg Meets Autophagy: Cancer Associated Fibroblasts Accelerate Tumor Growth and Metastasis Via Oxidative Stress, Mitophagy and Aerobic Glycolysis.**
<http://www.ncbi.nlm.nih.gov/pubmed/21883043>

6. LETTER(S) FROM THE READERS

7. UPCOMING CONFERENCE & WORKSHOP OF ISRB

International Conference on Cancer Prevention, Diagnosis & Treatment, Jaipur

Jan, 21-22, 2012

Contact Person:

Prof. (Dr.) P. K. Goyal
President- ISRB and Convener, Radiation & Cancer Biology Laboratory
Department of Zoology, University of Rajasthan, Jaipur 302 004 (INDIA)
Tel: +91-141-2651199 (R), 09829134133 (M); Fax: +91-141-2656273
Email: pkgoyal2002@gmail.com
or visit to our web page:
<http://www.isrbindia.com/upcoming-events-of-the-society/>

International Conference on Emerging Frontiers & Challenges in Radiation Biology, Department of Zoology, Government Dungar College, Bikaner (Rajasthan)

Jan, 24-25, 2012

Contact Person: Dr. Rajendra Kumar Purohit, Radiation Biology Laboratory,
Department of Zoology, Government Dungar College, Bikaner (Rajasthan); Email:
dr_rajendra_purohit@yahoo.co.in or visit to our web page:
<http://www.isrbindia.com/upcoming-events-of-the-society/>

**International Conference on Radiation Biology: (ICRB- 2012) and
11th Biennial Meeting of Indian Society for Radiation Biology
Theme: Cosmic To Clinical Radiation Biology
Advanced Centre for Training, Research and Education on Cancer
(ACTREC), Navi Mumbai, Mumbai, India**

September 28-30, 2012

Contact details:

Dr. Nagraj G. Huilgol, Chief Radiation Oncologist

Department of Radiation Oncology, Dr. Balabhai Nanavati Hospital, S.V.Road, Vile
Parle (W), Mumbai - 400 056.

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: 261883352 (dir) **Cell** : +91 9820450969

Fax : +91 22 26119363

Email : nagrajhuilgol@gmail.com

For updated information visit web page:

<http://www.isrbindia.com/upcoming-events-of-the-society/>

8. UPCOMING MEETINGS/ WORKSHOPS

- **Frontiers in Cancer Prevention Research**

October 22-25, 2011, Boston Convention and Exhibition Center, Boston,
Massachusetts

<http://www.aacr.org/home/scientists/meetings--workshops/frontiers-in-cancer-prevention-research.aspx>

- **Translational Cancer Research for Basic Scientists**

October 30-November 4, 2011, Omni Parker House Hotel, Boston, MA

<http://www.aacr.org/home/scientists/meetings--workshops/educational-workshops--special-courses/translational-cancer-research-for-basic-scientists.aspx>

- **Tumor Microenvironment Complexity: Emerging Roles in Cancer Therapy**

November 3-6, 2011, Hilton Orlando Hotel, Orlando, FL

<http://www.aacr.org/home/scientists/meetings--workshops/special-conferences/tumor-microenvironment-complexity-emerging-roles-in-cancer-therapy.aspx>

- **Miami, FL 33101-6960 New Horizons in Cancer Research: Biology to Prevention to Therapy, December 13-16, 2011, Gurgaon, Delhi (NCR), India**

<http://www.aacr.org/home/scientists/meetings--workshops/new-horizons-in-cancer-research.aspx>

- **International Conference on Cancer Prevention, Diagnosis & Treatment, Jaipur, January 21-22, 2012**

Contact Person: Prof. (Dr.) P. K. Goyal, President- ISRB and Convener, Radiation & Cancer Biology Laboratory, Department of Zoology, University of Rajasthan, Jaipur 302 004 (INDIA)

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Email: pkgoyal2002@gmail.com

- **International Conference on Emerging Frontiers & Challenges in Radiation Biology, Department of Zoology, Government Dungar College, Bikaner (Rajasthan), January 24-25, 2012**

Contact Person: Dr. Rajendra Kumar Purohit, Radiation Biology Laboratory, Department of Zoology, Government Dungar College, Bikaner (Rajasthan); Email: dr_rajendra_purohit@yahoo.co.in

- **International Conference on Radiation Biology: (ICRB- 2012) and 11th Biennial Meeting of Indian Society for Radiation Biology, Theme: Cosmic To Clinical Radiation Biology, Advanced Centre for Training, Research and Education in Cancer (ACTREC), Navi Mumbai, Mumbai, India, September 28-30, 2012**

Contact details:

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Important Notice: Are you organizing any Workshop/Meeting related to Radiation Research or in related research areas? You can add the announcement of event to this eNewsletter **free of cost!!** The announcement would reach to ISRB Community as well many more in India and abroad. The details of announcement may be communicated to:

isrb_enewsletter@yahoo.co.in. Moreover, the information would be included to web page as and when it would be available.

9. AWARDS/HONORS TO ISRB MEMBERS

Name of the ISRB Member	Affiliation	Award/Honors	Year/Period
Prof. A. B. Prasad	Center for Bioinformatics, Jerath Compound, Hinoo, Ranchi, Jharkhand, India	<ul style="list-style-type: none"> Chairman symposium session- VI: "Genetic Polymorphism and Sensitivity to Genotoxic Carcinogens", 2nd AAEMS, Pattaiya, Thailand. Member : Executive Council EMSI. Executive Council, AAEMS. Executive Council IAEMS. Commemoration Volume: "Biotechnology for Sustainable Development: Achievements and Challenges" authored by Eminent Scholars was dedicated to Professor A. B. Prasad on his 75th Birthday 	15th-18th Dec, ' 2010 (2010-11) 25th Feb, '2011
Prof. P. K. Goyal	Radiation & Cancer Biology Laboratory, Department of Zoology, University of Rajasthan, Jaipur	<ul style="list-style-type: none"> Member, Advisory Committee of World Cancer Research Forum for Plant based Research on Cancer Management President of Indo Global US Health Care Research Foundation Director, P.G. School of Life Sciences, University of Rajasthan, Jaipur 	August 2011

Congratulations to the Life Members of Indian Society for Radiation Biology for prestigious Awards and Honors!!

May God bless you many more in future!!

10. RECENT PUBLICATIONS/PATENTS OF ISRB MEMBERS

Author/Affiliation	Title	Citation	Key words
<u>Annapurna Agrawal and P. K. Goyal*</u> Radiation & Cancer Biology Laboratory Department of Zoology, University of Rajasthan Jaipur, India *Email: pkgoyal2002@gmail.com	Know the facts about cancer	Mritunjaya, April, 2011 (Scientific article)	
<u>Annapurna Agrawal and P. K. Goyal*</u> Radiation & Cancer Biology Laboratory Department of Zoology, University of Rajasthan Jaipur, India *Email: pkgoyal2002@gmail.com	Oral cancer and: An alarming Cancer in India	Smarika, Asha Kiran, May, 2011 (Scientific article)	
<u>Jyoti Parmar, Priyanka Sharma, Preeti Verma, Priyanka Sharma and P. K. Goyal*</u> Radiation & Cancer Biology Laboratory Department of Zoology, University of Rajasthan Jaipur, India *Email: pkgoyal2002@gmail.com	Anti-tumor and anti-oxidative activity of <i>Rosmarinus officinalis</i> in 7,12 dimethyl benz(a) anthracene induced skin carcinogenesis in mice	American Journal of Biomedical Sciences. 3(3), 199-209, 2011	
<u>Preeti Verma, Jyoti Parmar, Priyanka Sharma, Priyanka Sharma, Annapurna Agrawal and P. K. Goyal*</u> Radiation & Cancer Biology Laboratory Department of Zoology, University of Rajasthan Jaipur, India *Email: pkgoyal2002@gmail.com	Amelioration of Radiation induced hemaotological and biochemical alterations in Swiss albino mice by <i>Panax ginseng</i> extract	Integrative Cancer Therapies.10, 77-84, 2011.	
R. Velho-Pereira ¹ , <u>A. Kumar², B. N. Pandey², A.G. Jagtap¹, K.P. Mishra^{2,3,*}</u> ¹ Mumbai College of Pharmacy, ² Radiation Biology and Health Sciences	Radiosensitization in human breast carcinoma cells by thymoquinone: role of cell cycle and apoptosis.	Cell Biology International 2011; 35(10):1025-9. Pubmed link:	Thymoquinone, Radiosensitization, cell cycle, apoptosis

Division, Bhabha Atomic Research Centre, Mumbai, ³ Nehru Gram Bharati University, Allahabad, India *Email: mishra_kaushala@rediffmail.com		http://www.ncbi.nlm.nih.gov/pubmed/21557727 (Free access)	
Runa Ghosh ² , Lina Pradhan ² , Yensenbam Priyabala Devi ¹ , S. S. Meena, R. Tewari, <u>Amit Kumar²</u> , Sachil Sharma, N. S. Gajbhiye, R. K. Vatsa ¹ , <u>Badri N. Pandey^{2,*}</u> and R. S. Ningthoujam ^{1,*} ¹ Chemistry Division, ² Radiation Biology and Health Sciences Division, Bhabha Atomic Research Centre, Mumbai *Email: bnp@barc.gov.in , rsn@barc.gov.in	Induction heating studies of Fe ₃ O ₄ magnetic nanoparticles capped with oleic acid and polyethylene glycol for hyperthermia	Journal of Materials Chemistry., 2011, 21, 13388-13398 Link: http://pubs.rsc.org/en/content/articlelanding/2011/jm/c1jm10092k	Magnetic nanoparticles, induction heating, oleic acid, PEG, tumor cytotoxicity

11. CAREER FORUM

Grants and Awards

- Looking for **Grants, Funds, Fellowships** related to **Radiation Research**, visit the Radiation Research Web page or following link
http://www.radres.org/ECOMradres/timssnet/common/tnt_JobsFundingandFellowships.cfm
- Pre- and Post Doctoral Fellowships from NIH**
<http://grants.nih.gov/training/extramural.htm>
- AACR-Gertrude B. Elion Cancer Research Award**
<http://www.aacr.org/default.aspx?p=3859>
- AACR Career Development Awards**
<http://www.aacr.org/default.aspx?p=3858>
- AACR seeks nominations of outstanding scientists for prestigious Landon-AACR Prizes for Basic & Translational Cancer Research.**

Call for nominations now open through August 25, 2008

For information, visit <http://www.aacr.org/page13893.aspx>

- **Science Foundation Ireland, (SFI)**

The national foundation for excellence in scientific research is investing in academic researchers and research teams who are most likely to generate new knowledge, leading edge technologies, and competitive enterprises.

www.sfi.ie

- **Pancreatic cancer research centre funding over 2 million dollars**

Please view individual grant mechanisms for eligibility and deadlines.

Grants provide funding for outstanding pancreatic cancer research .

<http://www.aacr.org/home/scientists/research-funding--fellowships.aspx>

- **AACR, Research Funding & Fellowships**

<http://www.aacr.org/home/scientists/research-funding--fellowships.aspx>

Article related to career issues

- **Education: The PhD factory**

http://www.nature.com/news/2011/110420/full/472276a.html?WT.ec_id=NATURE-20110421

- **Education: Rethinking PhDs**

http://www.nature.com/news/2011/110420/full/472280a.html?WT.ec_id=NATURE-20110421

- **Seven ages of the PhD**

http://www.nature.com/nature/journal/v472/n7343/full/472283a.html?WT.ec_id=NATURE-20110421

- **Developing world: Educating India**

http://www.nature.com/news/2011/110405/full/472024a.html?WT.ec_id=NATURE-20110407

- **Postdoctoral training: Time for change**

http://www.nature.com/ncb/journal/v13/n7/full/ncb0711-735a.html?WT.ec_id=NCB-201107

Important Web Sites

- **AACR Research Fellowships**
<http://www.aacr.org/default.aspx?p=3860>
- **GrantsNet** is resource to find funds for training in the sciences and undergraduate science education. Through the support of HHMI and AAAS, this service is completely free.
http://www.grantsnet.org/start.cfm?session_id=844615
- **Naturejobs** the career magazine from Nature with the hottest science jobs and details of career related issues.
<http://www.nature.com/naturejobs/index.html>
- **Post Doc Jobs**, a site providing opportunities about Post Doc Jobs. It is a platform to bring students, Professionals and Research Institutes together.
<http://www.postdocjobs.com/>
- **Science's Next Wave** is a weekly online publication that covers scientific training, career development, and the science job market. *Next Wave* is published by *SCIENCE* magazine and the American Association for the Advancement of Science.
<http://nextwave.sciencemag.org/?CFID=789744&CFTOKEN=78870222>
- The National Academy of Sciences offers Research Associateship Awards to doctoral level scientists and engineers (US and foreign nationals). For more information go to
<http://sites.nationalacademies.org/pga/RAP/index.htm>
- **Science careers**
http://sciencecareers.sciencemag.org/tools_tips/outreach/relationships_booklet

Important Notice: If you have any vacancy in your laboratory/Institute, you can advertise the post through this eNewsletter. In addition, any award in these fields may be also announced. **It is absolutely free!!** The advertisement would reach to Members of ISRB and many more, who may be interested about the vacancy. The details of vacancy may be communicated to: isrb_enewsletter@yahoo.co.in.

12. USEFUL LINKS

- **Radiation Research Podcast**

You can listen, the telephone interviews to author(s) of selected paper published each month from the latest issue of international scientific journal ***Radiation Research***, official journal of the Radiation Research Society. In addition, you can also listen, the interviews by eminent scientists in radiation research about the current topics.

<http://lsmr1.lbl.gov:8080/xwiki/bin/view/Radiation+Research+Society/>

Or Look for Journal Podcast under category 'Journal' and then 'Journal Podcast' on following web page

<http://www.radres.org/podcast/>

Or Look for 'Radiation Research Podcast' in Google Search

- **Radiation Research Society SIT Discussion Board**

Another site, which may attract you to get information related to Scientific Meetings, vacancies and discussion in Radiation Sciences.

<http://www.radres.org/ECOMradres/timssnet/phpBB2/index.php>

- **Science's Next Wave** is a weekly online publication that covers scientific training, career development, and the science job market. *Next Wave* is published by *SCIENCE* magazine and the American Association for the Advancement of Science.

<http://nextwave.sciencemag.org/?CFID=789744&CFTOKEN=78870222>

- **Link to related other Professional / Academic Societies related to Radiation Biology and Oncology**

http://www.radres.org/ECOMradres/timssnet/common/tnt_RelatedSocieties.cfm

- **Nuclear India**

A publication by Department of Atomic Energy, Government of India about nuclear energy and various other related issues

<http://www.dae.gov.in/ni/nimain.htm>

- **Video presentation titled "Radiation Hormesis and Life-Mild Radiation Stress Makes You Stronger."** Video and a pdf file of the slides presented are available on link:

<http://dspace.lrrri.org:8080/xmlui/handle/123456789/891>

One more Video Commentary related to radiation adaptive responses (hormesis)

<http://www.dose-response.org/conference/2010/videos.htm>

<http://www.radiation-scott.org/phototour/radiation/radgloss.htm>

13. IMPORTANT JOURNALS

- **Annals of Oncology**
<http://annonc.oxfordjournals.org/>
- **Acta Oncologia**
<http://www.informaworld.com/smpp/title~content=g779470932~db=all>
- **BMC Cancer (Open Access Journal)**
<http://www.biomedcentral.com/bmccancer/>
- **Cancer Discovery**
<http://cancerdiscovery.aacrjournals.org/>
- **Cancer Epidemiology Biomarkers & Prevention**
<http://cebp.aacrjournals.org/>
- **Cancer Prevention Research**
<http://cancerpreventionresearch.aacrjournals.org/>
- **Cancer Research**
<http://cancerres.aacrjournals.org/>
- **Cell Death & Disease (Open Access Journal)**
<http://www.nature.com/cddis/index.html>
- **Cell Growth and Differentiation**
<http://cgd.aacrjournals.org/>
- **Clinical Cancer Research**
<http://clincancerres.aacrjournals.org/>
- **Clinica Chimica Acta**
http://www.elsevier.com/wps/find/journaldescription.cws_home/506018/description#description
- **DNA and Cell Biology**
<http://www.liebertpub.com/products/product.aspx?pid=13>
- **Free Radical Biology and Medicine**
http://www.elsevier.com/wps/find/journaldescription.cws_home/525469/description#description
- **Free Radical Research**
<http://www.tandf.co.uk/journals/authors/gfrrauth.asp>
- **Genome Integrity**
www.genomeintegrity.com

- **Human Gene Therapy**
<http://www.liebertpub.com/products/product.aspx?pid=19>
- **Indian Journal of Radiation Research**
For manuscript submission and, subscription and free sample copy of the Journal contact, Editor: Dr K. P. Mishra, Email: mishra_kaushala@rediffmail.com, Assistant Editor: Dr. H. D. Sarma Email: hdsarma1162@yahoo.com
- **International Journal of Radiation Biology**
<http://www.informaworld.com/smpp/title~content=t713697337>
- **International Journal of Radiation Oncology, Biology and Physics**
http://www.elsevier.com/wps/find/journaldescription.cws_home/525471/description#description
- **Iranian Journal of Radiation Research**
<http://www.ijrr.com/>
- **Japanese Journal of Clinical Oncology**
http://www.oxfordjournals.org/our_journals/jjco/about.html
- **Journal of Cancer Research and Therapeutics**
<http://www.cancerjournal.net/>
- **Journal of Experimental and Clinical Cancer Research**
<http://www.jeccr.com/>
- **Journal of Radiation Research**
http://www.journalarchive.jst.go.jp/english/jnltop_en.php?cdjournal=jrr1960
- **Molecular Cancer Research**
<http://mcr.aacrjournals.org/>
- **Molecular Cancer Therapeutics**
<http://mct.aacrjournals.org/>
- **Radiation Measurements**
http://www.elsevier.com/wps/find/journaldescription.cws_home/286/description#description
- **Radiation Oncology**
<http://www.ro-journal.com/>
- **Radiation Physics and Chemistry**
http://www.elsevier.com/wps/find/journaldescription.cws_home/331/description#description

- **Radiation Protection Dosimetry**
<http://rpd.oxfordjournals.org/>
- **Radiation Research**
<http://www.rrjournal.org/perlserv/?request=get-archive>
- **Radiotherapy and Oncology**
http://www.elsevier.com/wps/find/journaldescription.cws_home/506042/description#description
- **Science Signaling**
<http://stke.sciencemag.org/>

14. RECENT BOOKS

- **Units of measurement past, present and future. International system of units**
<http://rpd.oxfordjournals.org/content/145/4/426.extract?etoc>
- **Human Radiation Injury**, edited by Dennis C. Shrieve and Jay S. Loeffler
<http://www.bioone.org/doi/abs/10.1667/RRXX31.1?journalCode=rare>
- **The History of Oncology** by Theo Wagener
<http://annonc.oxfordjournals.org/content/22/8/1933.extract?etoc>
- **Further consideration of the incidence of childhood leukemia around nuclear power plants in Great Britain**
<http://www.bioone.org/doi/abs/10.1667/RRXX34.1>

15. NOTICE BOARD

- **Update your email and contact address**

Dear Members of ISRB,

The eNewsletter would be send to ISRB Members by email only. If your email address is getting changed or you have any other preferred email, please communicate to us as soon as possible on isrb_enewsletter@yahoo.co.in. In case, any other ISRB Member, who is not receiving eNewsletter, please intimate us his/her email address.

In addition, if any other friend or colleague is interested to receive the eNewsletter, please let us know his/her email address to be included in our mailing list. The eNewsletter is free to ISRB Members as well as non-Members too. **The subscription of eNewsletter is absolutely free!!!**

In addition, it is frequent problem to communicate with ISRB members due to change in address. If your contact address has been changed please intimate to Secretary, ISRB. This would help us to reach you and communicate, when ever needed.

- **Join ISRB**

Are you/your colleague/friend working in Radiation Research or related field and still not a Member of Indian Society for Radiation Biology? Join ISRB.

As Member of ISRB, (a) you would join with scientific community working in Radiation Research and related research areas. (b) You are entitled to participate in Meeting/Workshops of ISRB at reduced Registration Fee (c) Your interaction with Scientists and experts from India and abroad would help in your career.

To be a Member of ISRB, fill the attached application form (in last of eNewsletter) along with along with Membership fee to Secretary, ISRB. For details, contact Secretary or any of the Office Bearers of ISRB as given below.

The application form can be downloaded from the web page: www.isrbindia.com or click on following link:

<http://www.isrbindia.com/assets/Uplaods/ISRB-Membership-Application-Form.doc> (MS Word Version)

<http://www.isrbindia.com/assets/Uplaods/ISRB-Membership-Application-Form.pdf> (PDF Version)

- **Awards / Honors to ISRB Members**

Editorial Board '**Radiation Science Today**' is pleased to launch a column "**AWARDS/HONORS to ISRB Members**" in the eNewsletter. We hope the column would make us more aware with each other about our awards/ scientific achievements.

This column is only for Members of Indian Society for Radiation Biology. If you are Member of ISRB and received any award or scientific honor, you are requested to send details of same in following format on email address: isrb_enewsletter@yahoo.co.in, with **subject line**: Awards/Honors.

To avoid the verification of Membership and any ambiguity from non-ISRB Members, a line of statement is requested that 'I am a Member / Life Member of Indian Society for Radiation Biology'.

Details of award or scientific recognition can be submitted in prescribed format provided below as when received, which would be included in next upcoming issue of the eNewsletter.

Please circulate the announcement to your colleagues and friends, who are Members of ISRB. Please provide complete information to avoid unnecessary delay in publication in eNewsletter.

Name and Present Address of ISRB Member	Affiliation (if any)	Name of Award/Honor	Year/Period

Statement: I am Member/Life Member of Indian Society for Radiation Biology.

Name of the ISRB Member:

- **Recent publications/patents of ISRB Members**

Dear Members of ISRB,

It is our pleasure to mention that in last two years, '**Radiation Science Today**' the eNewsletter published by Indian Society for Radiation Biology, has made a significant contribution to link the Members of Society working in various research fields of radiation biology and allied sciences. To further strengthen the interaction amongst Members of ISRB, we have initiated a new Column '**Recent Publications of ISRB Members**' **beginning** from issue of eNewsletter i.e. **Jan-March , 2010 Issue 9**.

The publication/patents meeting following criteria would be included in the eNewsletter:

1. At least one author of citation should be Life Member of ISRB.
2. Citations only with final page number should be provided i.e. 'In Press' citations would not be considered.
3. It should be published in National/International Journals or Book/Book Chapters. No abstract or Conference Proceedings would be considered.
4. Names of ISRB Members names should be bold and underlined. The authors may provide maximum five key words. The email address of corresponding authors should be provided so that interested may contact to seek some clarification or to receive reprints.
5. Members should provide full citation(s) as and when it would be made available in the required format.

All ISRB Members are requested and encouraged to submit their recent publication(s) in format provided with **Subject Head line: Publication**. A copy of the format is provided below for your reference.

You may communicate the message to other ISRB members, if they could not receive this communication.

Authors/Affiliation/Email	Title	Citation	Key Words
Kumar A, Ali M, Mishra P, Pandey BN , Sharma P, Mishra KP . Email: mishra_kaushala@rediffmail.com Radiation Biology and Health Sciences Division, Bhabha Atomic Research Centre, Mumbai - 400085, India	Thorium-induced neurobehavioural and neurochemical alterations in Swiss mice.	International Journal of Radiation Biology, 2009, 85(4):338-347.	Thorium Toxicity; Neurobehavioral, neurochemical alterations; oxidative injury
Hazra B ¹ , Pandey BN , Kumar A, Ghosh S ¹ , Kumar B ¹ , Mishra KP Email: banasrihazra@yahoo.co.in Radiation Biology and Health Sciences Division, Bhabha Atomic Research Centre, Mumbai - 400085, India ¹ Department of Pharmaceutical Technology, Jadavpur University, Kolkata, India	Plant Products in modification of cellular damage by radiation: Implications in cancer radiotherapy.	In "Herbal Drugs: A Cancer Chemopreventive and Therapeutic Perspective" (Ed.: R. Arora, INMAS, New Delhi), Publisher: Jaypee Brothers Medical Publishers, New Delhi, 2009	Cancer radiotherapy; Natural Plant Products; Apoptosis

● You can contribute in this eNewsletter

You can send your contribution, which may be included in this eNewsletter under '**Reader's Column**'

Brief scientific article (maximum 1000 words, if reference needed, in 'International Journal of Radiation Biology' style) may be submitted for publication in eNewsletter. Your article may fall under following subject category: (i) radiation sciences or related research areas; (ii) your opinion on any scientific issue, technique or some general topics; (iii) any major finding or research concept from the archives of radiation sciences. The article should be original. It would be published in eNewsletter after general screening/reviewing of the article by the Editorial Board.

For any further clarification or submission of any article write to Editor on email address: isrb_enewsletter@yahoo.co

In addition, if you come across any recent journal / books published in radiation and related research areas, please send us the details of the book/journal on our email: isrb_enewsletter@yahoo.co. The details of books/journal would be included in the eNewsletter **free of cost!!!**

EDITORIAL BOARD 'RADIATION SCIENCE TODAY' ENEWSLETTER		
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INDIAN SOCIETY FOR RADIATION BIOLOGY

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Published by:

INDIAN SOCIETY FOR RADIATION BIOLOGY

(Reg. No. S-19927, dt. May 5, 1989)

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Web page: www.isrbindia.com

We hope you will find this Newsletter as a useful resource of information. However, we look forward for your active contribution and valuable comments/ suggestions for improvement of the eNewsletter on isrb_enewsletter@yahoo.co.in or any of the Member of Editorial Board.

Disclaimer: You are being sent the eNewsletter since either you are member of Indian Society for Radiation Biology or identified as potential reader of the eNewsletter. If you wish to discontinue receiving the eNewsletter in future write to us: isrb_enewsletter@yahoo.co.in.

Every effort has been taken to provide up-to-date and correct information in the Newsletter. However, readers are advised to check the related source of information.

Editorial Board

INDIAN SOCIETY FOR RADIATION BIOLOGY

(Regd. No. 5-19927, dt. May 5, 1989)

H.O.: Institute of Nuclear Medicine & Allied Sciences, Lucknow Road, New Delhi-110 054

Web page: www.isrbindia.com**Application for Membership**

To:
Secretary
Indian Society for Radiation Biology (ISRB)

Affix your
passport size
photo here

Dear Sir,

I wish to apply for **Life Membership** for the Indian Society for Radiation Biology. My particulars are given below:

1. Full Name (Block Letters)

.....

2. Present Position/Title

.....

3. Date of Birth ...

.....

4. Academic qualifications: Degree University
 Year

.....

.....

.....

.....

.....

.....

5. Field of Specialization

.....

6. Research Interest

.....

.....

7. Address: Official:

.....

.....

.....

Tel... ..Fax: E-mail

.....

Permanent

.....

8. Life Membership fee : Rs 2000.00 Foreign members: US\$ 200

Bank transfer/Draft/Cheque No.Date:Drawn on Bank.

.....in favor of 'Indian Society for Radiation Biology' is enclosed.

(Note: Outstation cheques would not be accepted. DD should be payable at Mumbai or Delhi.)

Place: Date:..... Signature:

Proposed byMembership No. and Signature

Seconded by Membership No. and Signature

For Use of ISRB Secretariat Only

Membership No.Type of Membership

Membership approved/not approved by Executive Council in its meeting held

on.....

Payment received vide on

.....

Secretary/Treasurer:

President, Indian Society for Radiation Biology

Please mail the Application for Membership along with recent passport size photographs to:

Dr B. N. Pandey, Secretary, ISRB, Radiation Biology and Health Sciences Division, Bhabha Atomic Research Centre, Mumbai 400 085, India. E-mail: isrbindia@yahoo.in; badrinarain@yahoo.co.in