ACTREC’s 12th Open Day is scheduled to be held on Thu. 4th and Fri. 5th December 2014!
For over a decade now, ACTREC has been hosting an Open Day for college students at its Navi Mumbai campus, to provide them glimpses of the Centre’s research programs and the opportunity to interact with its scientists. During Open Day, groups of UG/PG students from science degree/medical colleges of Mumbai and Navi Mumbai, accompanied by their faculty - who have already confirmed their participation (NO Spot Registration) will visit ACTREC. Posters on cancer awareness, prevention, research and treatment strategies will be on display. Following an Introductory Talk about ACTREC, the college batches will be led by our student volunteers to the demonstrations in ten PI labs/facilities/departments in the basic and clinical research wings of ACTREC.

<table>
<thead>
<tr>
<th>1</th>
<th>Laboratory Animal Facility</th>
<th>Cancer Research using Laboratory Animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Common Instrument Room</td>
<td>Instrumentation used in Biological Research</td>
</tr>
<tr>
<td>3</td>
<td>Flow Cytometry</td>
<td>Flow Cytometry</td>
</tr>
<tr>
<td>4</td>
<td>Biorepository</td>
<td>Biorepository</td>
</tr>
<tr>
<td>5</td>
<td>Kalraiya Lab</td>
<td>Gel electrophoresis and Western blotting</td>
</tr>
<tr>
<td>6</td>
<td>Vaidya Lab</td>
<td>Immunohistochemistry in Identification of Cancer Biomarkers</td>
</tr>
<tr>
<td>7</td>
<td>Prasanna Lab</td>
<td>Structure and Function of Proteasome</td>
</tr>
<tr>
<td>8</td>
<td>Shilpee Lab</td>
<td>Migration of Cancer Cells</td>
</tr>
<tr>
<td>9</td>
<td>Radiation Oncology</td>
<td>Radiation in Cancer Treatment</td>
</tr>
<tr>
<td>10</td>
<td>Bioengineering Unit</td>
<td>Vascular Bioengineering in Cancer</td>
</tr>
</tbody>
</table>

Cancer Research using Laboratory Animals
Dr. Arvind Ingle, Officer-in-Charge, Laboratory Animal Facility, ACTREC aingle@actrec.gov.in

ACTREC maintains an in house Laboratory Animal Facility (LAF) to breed, maintain and supply quality rodents for its basic cancer research programs. Available animals encompass 26 strains of mice including transgenic, knock out, nude and SCID, as well as two rat and hamster strains, majority of which are inbred [http://www.actrec.gov.in/animal_main.htm]. Standard operating procedures are followed for all the activities of LAF, and stringent programs are in place for genetic monitoring, clinico-pathology, and assessment of microbiological status of laboratory rodents and animal feed. An embryo freezing program has been introduced for the animal strains maintained at ACTREC. LAF offers quality control services to outside facilities and provides surplus animal strains to CPCSEA-registered animal facilities in India. The facility is an “Institutional Member” and recognized Training and Education Center of the International Council for Laboratory Animal Science (ICLAS). Since 2005, LAF has organized seven workshops and two certificate courses for laboratory animal professionals. It also accepts M.Sc./M.V.Sc. students as dissertation trainees under its on-going quality control program. The LAF demonstration during Open Day 2014 will introduce some of the representative animal models maintained in the Laboratory Animal Facility of ACTREC, their characteristics, and usage for the biomedical/cancer research. The demonstrators will also detail the numbering system, environment, food and water requirements, and housing enclosure conditions for different animal models.

Instrumentation used in Biological Research
Mr. Uday Dandekar, Officer in Charge, Common Instrument Room, CRI, ACTREC udandekar@actrec.gov.in

ACTREC maintains centralized Common Instrument Rooms (CIR) to ensure optimal utilization of major scientific instruments, and make them available round the clock to the staff and students of the centre. The equipments are
housed in rooms located on different floors and wings of the Centre, and include sonicator, high speed refrigerated ultracentrifuges, spectrophotometers, microplate absorbance reader, nanodrop, high pressure liquid chromatograph, radioactivity counter, thermal cycler, gel documentation system, etc. Most of these are vital basic equipment required for sample preparation, analysis or measurement. During Open Day 2014, the following equipment will be demonstrated to the visiting students: (1) Centrifuge/ Ultracentrifuge, (2) Thermal cycler, and (3) Gel documentation system. Centrifuges and ultracentrifuges are vital tools required for the differential or density gradient separation of components of biological material. The thermal cycler or PCR machine is used for the large scale amplification of target DNA, and the gel documentation system is used to visualize and digitally store the gel images.

Flow Cytometry
Dr. SV Chiplunkar, Officer-in-charge, Flow Cytometry Facility, CRI, ACTREC schiplunkar@actrec.gov.in

The Flow Cytometry (FCM) Facility is a centralized facility used by scientists and clinicians from ACTREC and other institutes. ACTREC has two Becton Dickinson flow cytometers, FACSAria and FACSCalibur. FACSAria is equipped with 3 lasers (633 nm, 488 nm and 405 nm) and can perform 11 color analysis and sorting (2 and 4 way). FACSCalibur is equipped with one laser (488 nm) and can perform 3 color analysis. The software used are FACSDiva, CellQuest Pro, FlowJo, FCAP Array and Modfit. The research applications include live cell sorting, Immunophenotyping, multicolor analysis, intracellular cytokine detection, stem cell analysis, side cell population (SP), DNA content and cell cycle analysis, Ploidy determination, apoptosis studies, cell proliferation by CFSE, measurement of Calcium Flux, intracellular antigen measurement, mitochondrial membrane potential, drug resistance, reactive oxygen species, cytometric bead array (CBA) for cytokine analysis. During Open Day 2014, the visiting groups will be shown demonstrations of a few applications of flow cytometry.

Biorepository
Dr. Kishore Amin, Biorepository, CRI, ACTREC kamin@actrec.gov.in

The Biorepository at ACTREC is designed to promote the safe handling, receipt, processing, storage, inventory control and distribution of biological specimens - surplus tumour, adjoining normal tissues and blood from cancer patients, and provide cryopreserved tissue samples to on request to Principal Investigators for their Institutional Review Board (IRB)-approved research projects. Patient consent is procured initially. Tumour samples are collected from operation theatres and snap frozen in liquid nitrogen for processing further downstream. The facility houses ultra-low temperature mechanical freezers, vapor-phase liquid nitrogen freezers and other modern equipment. Majority of the samples accrued in the Biorepository are head and neck (H&N) and breast tumours, followed by neurological, gastrointestinal, genitourinary, gynecological tumours, etc. Attempts are being made to generate cell lines from tumour tissues from different cancer sites. The ACTREC Biorepository facilitates cancer researchers to address a variety of intricate research challenges using tumour tissues. The data procured has the potential to open avenues for discovering novel therapies, treatment and diagnosis for cancer. Visiting student groups will be shown around the Biorepository during Open Day 2014.

Gel Electrophoresis and Western Blotting
Dr. Rajiv Kalraiya, Principal Investigator, Kalraiya Lab, CRI, ACTREC rkalraiya@actrec.gov.in

The research focus of this lab is glycobiology and metastasis. The spread of cancer cells to different organs, which are not in contact with the organ bearing the primary tumor, is referred to as metastasis. It is the major cause of cancer related deaths. Tumor cells show several cell surface modifications especially in the type of glycosylated structures on the surface glycoproteins. This lab explores the role of such altered carbohydrate structures and the glycoproteins bearing them in invasion and organ specific metastasis of cancer cells. During Open Day 2014, gel electrophoresis and
Western blotting will be demonstrated. These techniques are used routinely to analyse glycoproteins and the sugar structures that they carry. Analysis on SDS-PAGE helps in determining the subunit composition and the molecular size of each subunit. Western blotting helps in identification of proteins using specific antibodies, and lectins are used to identify specific carbohydrate structures on Western blotted glycoproteins.

**Immunohistochemistry in Identification of Cancer Biomarkers**
Dr. Milind Vaidya, Principal Investigator, Vaidya Lab  mvaidya@actrec.gov.in

The research focus of the laboratory is to understand the role of intermediate filament proteins - keratins, vimentin and their associated proteins in malignant transformation of human oral cancer. We are also involved in the development of biomarkers of human oral cancer prognosis. Immunohistochemistry (IHC) is a powerful technique that can identify antigens *in situ*, and is widely used in basic research to understand the distribution and localization of biomarkers and differentially expressed proteins in different parts of a biological tissue. Immunohistochemical staining is widely used in the diagnosis of abnormal cells such as those found in cancerous tumors. Specific molecular markers are characteristic of particular cellular events such as proliferation or cell death (apoptosis). The technique involves detecting antigens (e.g., proteins) in the cells of a tissue section by exploiting the specific binding of antigens and antibodies in biological tissues. Visualising an antibody-antigen interaction can be accomplished in a number of ways. In the most common instance, an antibody is conjugated to an enzyme, such as peroxidase, that can catalyse a colour-producing reaction. Our lab uses IHC extensively for detection of proteins of our interest in tumour tissues.

**Structure and Function of Proteasome**
Dr. Prasanna Venkatraman, Principal Investigator, Prasanna Lab, CRI, ACTREC  vprasanna@actrec.gov.in

The protein interactome lab for structural and functional biology primarily focuses on the structure and function of proteasomes, that are the major degradation machinery responsible for the bulk of protein degradation required for cellular homeostasis. They are much sought after targets in drug discovery for the treatment of diseases such as cancer. Nevertheless the structure of the proteasome and its protein interaction network is poorly understood. Our aim is to map the various interacting partners, towards which we use multidisciplinary approaches including structural bioinformatics, biochemistry, biophysics and cell biology techniques. We attempt to correlate domain motif interaction with function. The ultimate goal is to identify inhibitors of protein-protein interaction which may be engineered specifically towards cancer cells. During Open Day 2014, we would be demonstrating chromatography in our lab!

**Migration of Cancer Cells**
Dr. Shilpee Dutt, Principal Investigator, Shilpee Lab, CRI, ACTREC  sdutt@actrec.gov.in

Cell migration is a highly integrated, multi-step process that plays an important role in the progression of cancer. Data from our lab has revealed that radiation resistant glioblastoma cells acquire higher migration potential then the parent cells as analyzed by wound healing assay. For this assay, first the parent cells are subjected to lethal dose of radiation. The radiation resistant cells are allowed to grow and form a recurrent population. Cells from the parent and recurrent population are seeded in a 6-well plate and allowed to attach, spread, and form a confluent monolayer. Three parallel scratches are made in the middle of the well with a P200 pipette tip. The debris is washed away with PBS and new media is added to the wells. Time lapse images are taken for 24 hrs at regular 15 min intervals using a Zeiss A.1 inverted microscope. The percentage of wound repair is calculated from each image using Image J software. The Shilpee Lab demonstration during Open Day will be on Cancer Cell Migration.
Radiation in Cancer Treatment
Dr. Tejpal Gupta, Officer in charge, Department of Radiation Oncology, CRC, ACTREC  tgupta@actrec.gov.in

Radiation therapy uses high energy ionizing radiation for the treatment of cancerous tumor. Ionizing radiation works by damaging the DNA of exposed tissue. Radiation therapy can be given by teletherapy also called external beam radiotherapy or by brachytherapy in which radioactive sources are kept close to the tumour or inside the tumour tissue. The field of radiation therapy traces its roots 100 years back with the discovery of x-rays by Wilhelm Rontgen in 1895. However, its medical use began to grow in the early 1900’s after the ground breaking discovery of polonium and radium by Marie Curie. In the early 1950’s, cobalt units came into existence and replaced radium. In the late 1950’s, medical linear accelerators generating high energy x-rays were introduced to treat deep seated tumours inside the body. While cobalt machines still form the workhorse of a radiotherapy department, continuous innovations in field of imaging and delivery of radiation therapy have led to the development of 3D conformal therapy and intensity modulated radiotherapy (IMRT) with the help of image guidance (IGRT). These advances allow us to see and target tumours in a better way, resulting in better treatment outcomes and fewer side effects. The Department of Radiation Oncology at ACTREC is a tertiary care referral centre which exploits these technological innovations to deliver the most advanced radiation treatment (3DCRT, IMRT, IGRT, Stereotactic Radiotherapy (SRT), Stereotactic Radiosurgery (SRS), etc) to its cancer patients.

Vascular Bioengineering in Cancer
Dr. Amit Sengupta, Bioengineering Unit, CRC, ACTREC  asengupta@actrec.gov.in

Vascular biology is an important area of research that encompasses almost all the aspects of medical research such as cardiovascular physiology, cardiology, gynecology, obstetrics, developing various stents, cardiovascular physiology, cancer research, tissue engineering etc to name a few. Understanding the flow dynamics and the process of angiogenesis is necessary to unfold the mysteries of vascular supply or blood flow to the fetus, tumor, heart, and brain etc. In our laboratory, we are focusing on the study of physiological fluid dynamics and angiogenesis and various molecular markers that can be manipulated in order to understand the vascular basis of cancer, metastasis, and diagnostic and treatment modalities. We will demonstrate Microvascular laser Doppler imaging and bio-rheological studies in cancer. Biomedical sensor development and biophotonics experiments will also be shown and explained.