
जिज्ञासा
केन्द्रीय विद्यालय छात्रों के लिये
ग्रीष्मकालीन अनुसंधान शिविर
JIGYASA
A summer research program for "Kendriya Vidyalaya Students
केन्द्रीय विद्यालय संगठन
सी.एस.आई.आर- ारतीय रासायनिक जीवविज्ञान संस्थान
CSIR- Indian Institute of Chemical Biology

‘JIGYASA’ 2018

CSIR-IICB, Jadavpur Campus

CSIR-IICB, Saltlake Campus

सीएसआईआर-
ाारतीय रासायनिक जीवविज्ञान संस्थान, कोलकाता
द्वारा आयोजित

'जिज्ञासा' 2018 :
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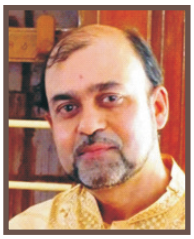
"Kendriya Vidyalaya Students"

Organized by
CSIR-Indian Institute of Chemical Biology, Kolkata

सी.एस.आई.आर- ाारतीय रासायनिक जीवविज्ञान संस्थान
CSIR- Indian Institute of Chemical Biology
4, Raja S.C. Mullick Road, Kolkata- 700 032

Message from the Director, CSIR-IICB



It's a pleasure for us to hold the second 'JIGYASA Programme' at CSIR-IICB, Kolkata, which will be held during April 24-26, 2018. This is a special and novel mode of outreach programme for the school children, which was inspired by the President, CSIR and Hon'ble Prime Minister of India and inaugurated by Dr. Harsh Vardhan, Hon'ble Minister of Science & Technology, Earth Sciences, Environment, Forests and climate change and Shri Prakash Javadekar, Minister of Human Resource Development in 2017. This student-scientist connect programme has been planned in such a way that thousands of students from Kendriya Vidyalaya will get, well planned research laboratory based training. The objective of the unique programme is to promote Scientific and Social Responsibility (SSR) of scientific community and institutions.

I am hopeful that, like the previous year, this year's JIGYASA program will be very successful, where the students will be able to gain general knowledge in Science as well as hands on experience on different scientific aspects. I wish all the very best to all the participants who will join this very important programme.

Dr. Samit Chattopadhyay

Message from the Chairman
JIGYASA Program, CSIR-IICB

It is our pleasure and privilege to organize the second JIGYASA programme during April 24-26, 2018 at two campuses of CSIR-Indian Institute of Chemical Biology, Kolkata. This is a novel initiative of CSIR across India, where the students of KendriyaVidyalaya get a chance to interact Scientists and Scientific staffs of different CSIR laboratories across India to enrich their knowledge and fulfil their inquisitiveness in different aspects of science. We, at IICB, organized the 1st JIGYASA program in 2017 and we had a very nice experience. The students were very enthusiastic while attending scientific lectures and demonstrations.

This year also we have organized demonstration of several experiments that will be demonstrated by the faculties of Biology, Bioinformatics and Chemistry departments, which has been organized in both IICB-Salt Lake and IICB-Jadavpur campuses. The students will also get a chance to experience the usage of high-end instruments. Apart from that, three scientists will present popular lecture and a science quiz has also been arranged. I am sure that the students will enjoy this three-day long programme. On behalf of 'Team-JIGYASA' at CSIR-IICB I wish all the success of this JIGYASA programme.

Dr. Sib Sankar Roy

CSIR-IICB Organizes 'JIGYASA': An Interactive Training Camp for KV Students

CSIR in collaboration with Kendriya Vidyalaya Sanghatahan (KVS) has initiated a wide-ranging Scientist-Students Connect program in full stream named as JIGYASA through its laboratories nationwide. The programme is designed to connect 1151 Kendriya Vldyalayas with 38 National Laboratories of CSIR across the country targeting 100,000 students and nearly 1000 teachers annually. The objective of this programme is to connect school students to scientists for extending students' classroom knowledge with that of a very well planned research laboratory based hands on learning.

As a part of the above initiative of CSIR, a group of 30 students of class XII and 5 teachers from Kendriya Vidyalaya, Ballygunge, Kolkata took part in the first training camp, JIGYASA 2017, organized by CSIR-Indian Institute of Chemical Biology (CSIR-IICB), Kolkata in both Jadavpur and Saltlake campus during July 3-7, 2017. Dr. S. Bose, Assistant Commissioner, Kendriya Vidyalaya Sangathan, Kolkata was present as Guest of Honour and Dr. K. Muraleedharan, Director, CSIR-CGCRI was present as Chief Guest in the inaugural programme on 3rd July, 2017. Dr. G. Suresh Kumar, Chairman, Organizing Committee, JIGYASA-2017 in his welcome address said that CSIR-IICB is glad to arrange this student outreach programme to provide school students with first-hand research experience. He also told "We strongly believe that such a program will instigate scientific motivation to the students, ignite young minds about scientific research, and inculcate the spirit of scientific thoughts in them". Dr. Samit Chattopadhyay, director, CSIR-IICB said that the idea of this interactive programme is to encourage the students in asking (JIGYASA), to exercise their curiosity in nature, life and science. He expressed that this kind of programme will be able to attract fresh minds in

scientific research which will facilitate them to choose a career in research and development. In the inaugural address, Dr. S. Bose described the background and structure of KVS and expressed his hope that continuing the programme will certainly lead to immense improvement in our education system and it will empower the students in building a scientific career. Dr. K. Muraleedharan in his brief address described the students' role as most important in achieving benefits of knowledge from the teachers. The inquisitive minds of students keep the teachers active and updated in scientific information and thus the teacher-student interactions are beneficial to both ends, he added.

The weeklong programme consisted of basic lab experiments, popular science lectures, science quiz, demonstrations, laboratory visits and one to one interaction with scientists and PhD scholars. The students were enlightened with bio-safety and chemical safety, trained on some useful softwares like Microsoft PowerPoint, Microsoft Excel, Adobe Photoshop, Dream Weaver etc. During this programme different topics on conceptual understanding of scientific perceptions along with their practical demonstrations were covered. The students visited laboratories where exciting areas of research in biology, chemistry and chemical biology were going on. They got first-hand experience on the modern aspects of R&D including instrumental techniques used to facilitate high end research.

In the concluding day popular talks were given by the scientists on biology, natural products to cope with gastric disorders, a common health problem and societal impacts of green chemistry. Students also participated in a science quiz with great enthusiasm. Dr. Suman Lata, Principal, KV Ballygunge was present in the concluding session. The vote of thanks was delivered by Dr. Neeta Vatsala Massey Khalkho, convener of JIGYASA-2017. Certificates of participation were awarded to the students and the teachers. The programme ended with a great success as the feedbacks received from the students, teachers, principal and scholars were highly appreciating and encouraging.

Students of Kendriya Vidyalaya Ballygunge Participated in
'JIGYASA' a Summer Research Program held at
CSIR-Indian Institute of Chemical Biology, Kolkata
during July 3-7, 2017

सीएसआईआर-आईआईसीबी 'जिज्ञासा' का अयोजन करता है: केवी छात्रों के लिए एक इंटरैक्टिव ट्रेनिंग कैंप

केन्द्रीय विद्यालय संगठन (केवीएस) के सहयोग से सीएसआईआर ने देश ार में अपनी प्रयोगशालाओं के माध्यम से जिज्ञासा नामक एक पूरी तरह से वैज्ञानिक-छात्र कनेक्ट कार्यक्रम को देश ार में सीएसआईआर के 38 राष्ट्रीय प्रयोगशालाओं के साथ 1151 केन्द्रीय विद्यालयों को जोड़ने के लिए बनाया गया है, जिसमें सालाना 100,000 छात्र और लग ाग 1000 शिक्षकों का लक्ष्य रखा गया। इस कार्यक्रम का उद्देश्य छात्रों को वैज्ञानिकों जोड़ने का है।

सीएसआईआर की उपर्युक्त पहल के एक ाग के रूप में, सीएसआईआर - ारतीय रासायन विज्ञान संस्थान (सीएसआईआर- ारतीय रासायनिक जीवविज्ञान संस्थान) द्वारा आयोजजित, पहला विद्यालय शिविर, जिग्यासा- 2017 के केन्द्रीय विद्यलय, बालीगंज, कोलकाता के बारहवीं कक्षा के 30 छात्रों के एक समूह ने हिस्सा लिया इस कार्यक्रम में सीएसआईआर-आईआईसीबी, कोलकाता में जादवपुर और साल्टलेक परिसर में जुलाई 3-7 से, 2017 को सम्पन्न हुआ। डॉ. एस बोस, सहायक आयुक्त, केन्द्रीय विद्यालय संगठन, कोलकाता सम्मानित अतिथि के रूप में उपस्थित थे और सीएसआईआर - सीजीसीआरआई के निदेशक डॉ. के. मुरलीधरन 3 जुलाई, 2017 को उद्घाटन कार्यक्रम में मुख्य अतिथि के रूप में उपस्थित थे। डॉ. जी. सुरेश कुमार, आयोजन समिति के अध्यक्ष जिग्यासा -2017 ने अपने स्वागत ाषण में कहा कि सीएसआईआर-आईआईसीब इस छात्र आउटरीच कार्यक्रम की वयवस्था करने में प्रसन्न है। उन्होंने कहा कि, "हम दृढ़ता से मानते हैं कि ऐसा कार्यक्रम विद्यार्थियों को वैज्ञानिक प्रेरणा, वैज्ञानिक अनुसंधान को युवा दिमाग में प्रज्वलित करेगा, और उन में वैज्ञानिक विचारों की ावना पैदा करेगा"। सीएसआईआर-आईआईसीबी के निदेशक डॉ. समित चट्टोपाध्याय ने कहा कि इस इंटरैक्टिव प्रोग्राम का विचार विद्यार्थियों को जिग्सासा पूछने, प्रोत्साहन करने, प्रकृति, जीवन और विज्ञान में अपनी जिज्ञासा का इस्तेमाल करने के लिए प्रोत्साहित करना है।

उन्होंने व्यक्त किया कि इस तरह का कार्यक्रम वैज्ञानिक अनुसंधान में नया दिमाग को आकर्षित करने में सक्षम होगा, जो उन्हें अनुसंधान और विकास में कैरियर का चयन करने में मदद करेगा। उद्घाटन संबोधन में, डॉ. एस. एस. बोस ने केवीएस की पृष्ठ ाूमि और संरचना का वर्णन किया और अपनी आशा व्यक्त की कि इस कार्यक्रम को जारी रखने से हमारी शिक्षा प्रणाली में बहुत सुधार होगा और यह छात्रों को एक वैज्ञानिक कैरियर बनाने में सशक्त करेगा। डॉ. के. मुरलीधरन ने अपने संक्षिप्त सम्बोधन में शिक्षकों से ज्ञान के ला ाों को प्राप्त करने में छात्रों की ाूमिका को सबसे महत्वपूर्ण बताया। उन्होंने कहा कि , छात्रों के जिज्ञासु दिमागों को वैज्ञानिक जानकारी में सक्रिय और अद्यतित किया जाता है और इस प्रकार शिक्षक-छात्र की बातचीत उन दोनों के लिए फायदेमंद होती है।

साप्ताहिक कार्यक्रम में मूल प्रयोगशाला प्रयोग, लोकप्रिय विज्ञान व्याख्यान, विज्ञान प्रश्नोत्तर, प्रदर्शन, प्रयोगशाला का दौरा और वैज्ञानिकों और पीएचडी विद्वानों के साथ एक से एक बातचीत शामिल था। छात्रों को बायो-सुरक्षा और रासायनिक सुरक्षा, माइक्रोसॉफ्ट पावरपॉइंट, माइक्रोसाफ्ट एक्सेल, एडोब फोटोशॉप, ड्रीम वीवर इत्यादि जैसे कुछ उपयोगी सॉफ्टवेयरों पर प्रशिक्षित किया गया। इस कार्यक्रम के दौरान अपने व्यावहारिक प्रदर्शनों के साथ-साथ वैज्ञानिक धारणाओं की वैचारिक समझ पर वि िान्न विषयों को शामिल किया गया था। छात्रों ने प्रयोगशालाओं का दौरा किया जाहां जीव विज्ञान, रसायन विज्ञान और रासायनिक जीव विज्ञान में अनुसंधान के रोमांचक क्षेत्र चल रहे थे। उच्च अनुसंधान की सुविधा के लिए उपयोग की जाने वाली सहायक तकनीक सहित और एंड डी के आधुनिक पहलुओं पर उन्हें पहला हाथ मिला।

समापन के दिनों में वैज्ञानिकों ने जीव विज्ञान, प्राकृतिक उत्पादों पर गैस्ट्रिक विकारों से निपटने, एक सामान्य स्वास्थस समस्या और हरे रंग की रसायन विज्ञान के सामाजिक प्र ाावों पर वैज्ञानिकों द्वारा दिए गए। छात्रों ने ाी उत्साह के साथ विज्ञान प्रश्नोत्तरी में ाग लिया डॉ. सुमन लता, प्रधानाचार्य, के. वी. बालिगंज समापन सत्र में उपस्थित थे। डॉ. नीता वत्सल मैस्सी ख़लखो,

2017 के संयोजक द्वारा धन्यवाद ज्ञापन दिया गया था। छात्रों और शिक्षकों को ागीदारी का प्रमाण पत्र दिया गया। छात्रों, शिक्षकों और प्राचार्यों से मिली प्रतिक्रियाओं के रूप में एक बहुत बड़ी सफलता के साथ कार्यक्रम समाप्त हो गया, बहुत सराहना करते हुए, खुश और उत्साहजनक रहे।

Imparting Training to Kendriya Vidyalaya Students for National Level Science Exhibition

Two class-XI students, Mr. Adhiraj Mukherjee and Mr C. H. Rithic, of Kendriya Vidyalaya, Ballygunge, Kolkata, did a two month long project after they participated in 'JIGYASA-2017' programme at CSIR-IICB in the month of July 2017. They worked with a research fellow, Ms Shreya Bandyopadhyay under the guidance of Dr. Sib Sankar Roy at CSIR-IICB during September-October, 2017. They worked on preparation of health drink by mixing several edible plant extracts with high nutrient and medicinal value having anti-oxidant property that have long shelf life. Later on they participated and presented their work in an exhibition.

Ms. Shreya Bandyopadhyay
Research Fellow, CSIR-IICB

Dr. Sib Sankar Roy
Scientist, CSIR-IICB

Contents

JIGYASA program at CSIR-IICB
TRUE Salt Lake Campus
24th April, 2018 (Day I)

Session I: 10 am- 1 pm (Four batches A-D , 12 students each will do same experiments in four different labs.)

Scientist: Dr. Arun Bandyopadhyay **Batch A**
Student Volunteer: Sayanan Sengupta

Scientist: Dr. Mrinal K Ghosh **Batch B**
Student Volunteer: Satadeepa Kal

Scientist: Dr. Amitava Sengupta **Batch C**
Student Volunteer: Mayuk Biswas

Scientist: Dr. Dipyaman Ganguly **Batch D**
Student Volunteer : Purbita Bandyopadhyay

Scientist: Dr. Saikat Charaborty
Student Volunteer : Subhranshu Das

9.30 a.m. 10.00 am	:	Address by **Dr. Arun Badyapadhyay** Scientist In charge TRUE Campus
10.00 a.m. 10.35 a.m.	:	Demonstration of sub-culture of cells and showing cells Under simple microscope
10.35 a.m. 11.15 a.m.	:	Cell harvesting using centrifuge
11.15 a.m. 11.45 a.m.	:	Staining the cells with DNA-specific fluorescent dye (DAPI)
11.45 a.m. 12.15 p.m.	:	Preparation of slides with stained cell
12.15 a.m. 1.00 p.m.	:	Demonstration of stained cells under florescent microscope to show nucleus
1.30 pm- 2.30 pm	:	Lunch in the canteen (JIGYASA Participants)

Post Lunch session: Dr. Saikat Chakraborty

2.30 p.m. 4.00 p.m.	:	Importance of computational biology in human health
4.30 p.m.	:	Tea in the canteen

JIGYASA program at CSIR-IICB
Jadavpur Campus
25th April, 2018 (Day II)

Session I : 10 am - 1 pm

Scientist: Dr. P. Jaisankar
Student Volunteer : Anushree Achari, Pooja Chaudhary & Chirasmita Meda
Demonstration of Steam Distillation of Essential oils from Fruits

Scientist: Dr. Biswadip Banerji
Student Volunteer: K. Chandrashekhar & Satadru Chatterjee
Demonstration of a simple etherification reaction

Scientist: Dr. Arindam Talukdar
Student Volunteer: Barnali Paul & Swarnali Roy
Lecture and Demonstration of various separation techniques

Scientist: Dr. Umesh P. Singh
Student Volunteer: Pinaki Bhattacharyya & Kamraz
Demonstration of Soap Preparation

Four batches (A-D) of 13 students will visit four Instrument demonstration

	Dr. P. Jaisankar Room117	Dr. Biswadip Banerji Room17/12	Dr. Arindam Talukdar Room117	Dr. Umesh P. Singh Room 21
10 am - 11.30 am	A	B	C	D
11.30 am -1 pm	B	C	D	A

1.30pm- 2 pm Lunch In the Canteen (JIGYASA Participants)

Session II: 2 pm 5 pm

	Dr. P. Jaisankar Room117	Dr. Biswadip Banerji Room17/12	Dr. Arindam Talukdar Room117	Dr. Umesh P. Singh Room 21
2 pm - 3.30 pm	C	D	A	B
3.30 am -5 pm	D	A	B	C

JIGYASA program at CSIR-IICB
Jadavpur Campus
26th April, 2018 (Day III)

Four batches (A-D) of 13 students will visit four Instrument Demonstration

	NMR Dr. E . Padmanabhan	AFM Mr. Murganandan	CONFOCAL Mr. Binayak Pal & Mrs.Banshree Das	MALDI Mr. Sandip Chakraborty
10 am -10.30 am	A	B	C	D
10.30 am -11 am	B	C	D	A
11 am- 11.30 am	C	D	A	B
11.30am -12 noon	D	A	B	C

12.00 noon 12.20 p.m. Popular Talk by **Dr. Jayati Sengupta**
12.20 p.m. 12.40 p.m. Popular Talk by **Dr. V.S. Pragadheesh**
12.40 p.m. 1.00 p.m. Popular Talk by **Dr. Subhajit Biswas**
1.30 p.m. 2.00pm **Lunch In the Canteen (JIGYASA Participantants)**

Session II: 2 pm- 4.30 pm

2.00 p.m. 3.00 p.m.: Quiz by **Dr. K. Chattopadhyay**
Volunteers:Arnab Bandyopadhyay & Dwipanjan Sanyal

3.00 p.m.3.10 p.m.: Address by **Dr .Rupak K Bhadra**
Acting Director

3.10 p.m.3.15 p.m.: Address by the Guest of Honor
Sri T. Brahmanandam
Assistant Commissioner, Kendriya Vidyalaya Sangathan,RO, Kolkata

3.15 p.m.3.20p.m.: Address by **Dr. Sibsankar Roy**
Chairman CSIR- IICB JIGYASA 2018,

3.20 p.m.3.30 p.m.: Address by **Sri Sudhanya Karan**
Principal Salt Lake K V No-1, &
Sri Ashutosh Kumar Jha
Principal Salt Lake K V No-2,

3.30 p.m. 3.45 p.m.: Felicitation of the Dignitary & Certificate Distribution

3.45 p.m. 3.50 p.m.: Valedictory session
Mr. Suprakash Halder, Administrative Officer

3.50 pm 4.00 p.m.: Vote of Thanks **Dr. Neeta V. M. Khalkho**, Nodal Officer, JIGYASA

4.00 pm 4.30 p.m: Tea in the Canteen

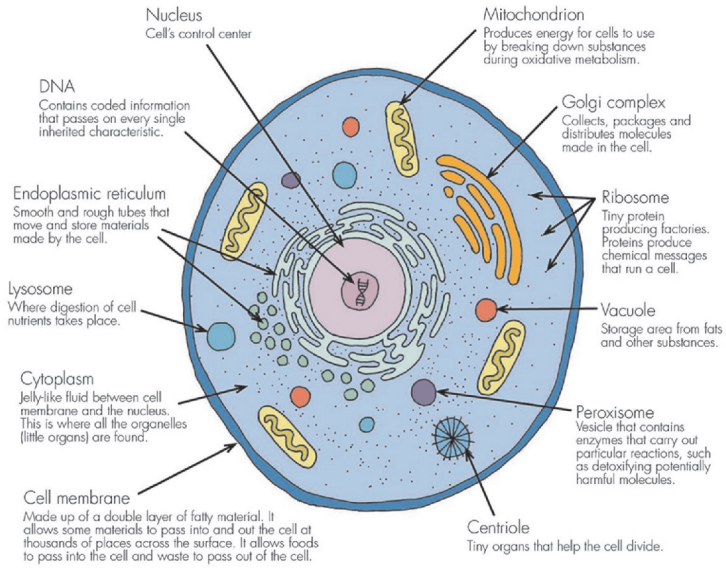
Subculture of Cells and visualization of Nucleus under Microscope @CSIR IICB TRUE

Dr. Arun Bandyopadhyay
Senior Principal Scientist & Head
Cell Biology and Physiology Division

Dr. Mrinal K Ghosh
Principal Scientist
Cancer Biology &
Inflammatory Disorder Division

Dr. Amitava Sengupta
Senior Scientist
Cancer Biology &
Inflammatory Disorder Division

Dr. Dipyaman Ganguly
Senior Scientist
Cancer Biology &
Inflammatory Disorder Division



A **cell** is the smallest structural and functional building block of an organism. Basically cells are of two types, eukaryotic (with nucleus) and prokaryotic (without nucleus). Prokaryotes are generally single-celled organisms, while eukaryotes can be either single-celled or multicellular. Cells are mainly enveloped by a membrane. Cell organelles such as nucleus, mitochondria, Golgi body etc. are embedded in cytoplasm which carries out various functions.

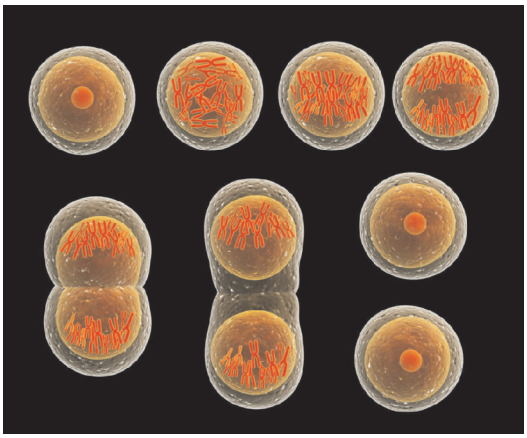


Figure 2:Schematic representation of Cell Division

Cell division is the process by which a parent cell divides into two or more daughter cells. In eukaryotes, there are two types of cell division, a somatic division, whereby each daughter cell is genetically identical to the

parent cell (mitosis) and the other one is reproductive cell division, whereby the number of chromosomes in the daughter cells is reduced by half to produce haploid gametes (meiosis).

What is cell culture and why it is important?

Cell culture is the process of growing cells under a controlled environment outside the body. Cell culture is one of the major tools used in cellular and molecular biology, for studying the normal physiology and biochemistry of cells (e.g., metabolic studies, aging), the effects of drugs and toxic compounds on the cells, and mutagenesis and carcinogenesis. Cells are harvested in suitable cell culture flasks, petri dishes or various multiwall plates according to the required experiment.

Subculture of cells

Cell lines growing in monolayers are attached at the bottom of tissue culture flask need to be subcultured at regular intervals to maintain them in exponential growth. When the cells are near the end of exponential growth (roughly 70% to 90% confluent), they are ready to be subcultured. Sub cultivation of monolayers involves the breakage of both intercellular and intracellular cell-to-surface bonds.

Cells, particularly those derived from hematopoietic or certain tumour tissues, are anchorage independent and grow in suspension.

Adherent cell sub culture

Bring the trypsin-EDTA solution, PBS or incomplete media and complete growth medium to the appropriate temperature (37°C) for cell lines.

Remove and discard the cell culture medium from the flask

Rinse the cell monolayer with Dulbecco's PBS without calcium or magnesium/ Incomplete medium and remove

Add 1 mL to 2 mL of the trypsin-EDTA solution and incubate at 37°C for dissociation of cells (5min)

Add equal amount of complete growth medium to the flask, aspirate the total medium

Pellet the cells by centrifugation (800rpm for 5 minutes)

Resuspend the cells in 2-4ml of fresh medium

Divide them according to a routine split ratio and dispense them into the medium of the newly prepared flask

Place the flask back into the incubator. Examine the culture the following day to ensure the cells have reattached and are actively growing

Suspension cell culture

Bring the PBS or incomplete media and complete growth medium to the appropriate temperature (37°C) for cell lines

Aspirate the cells and pellet by centrifugation (800rpm for 5 minutes)

Resuspend the cells in 2-4ml of fresh medium

Divide them according to a routine split ratio and dispense them into the medium of the newly prepared flask

Place the flask back into the incubator. Examine the culture the following day to ensure the cells have reattached and are actively growing

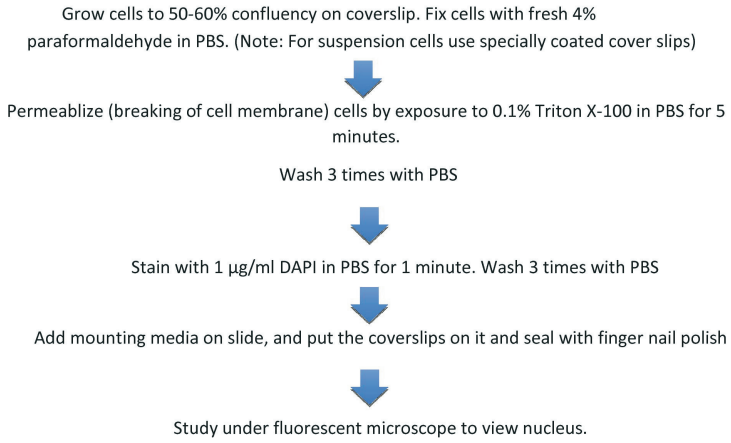
Cell Staining

Cell staining is a technique that can be used to better visualize cells and cell components under a microscope. By using different stains, one can preferentially stain certain cell components, such as a nucleus or a cell wall, or the entire cell. Nucleus is usually stained by 4'-6-Diamidino-2-phenylindole (DAPI).

How Does DAPI Work?

DAPI forms fluorescent complexes with natural double-stranded DNA, showing a fluorescence specificity for AT, AU and IC clusters. Because of this property DAPI is a useful tool in various cytochemical investigations. When DAPI binds to DNA, its fluorescence is strongly enhanced. It also binds to the minor groove of DNA, stabilized by hydrogen bonds between DAPI and acceptor groups of AT, AU and IC base pairs.

Protocol

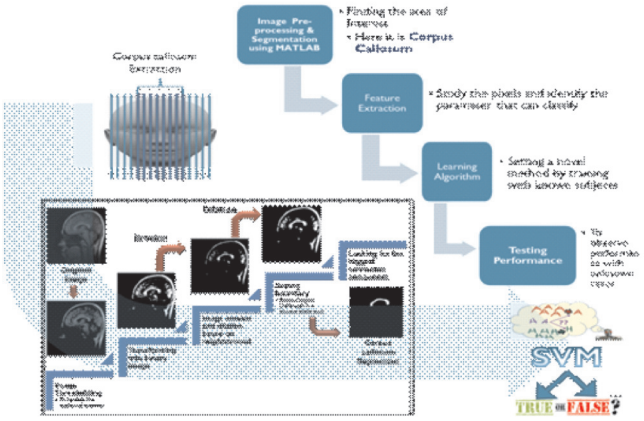


Importance of Computational Biology in Human Health

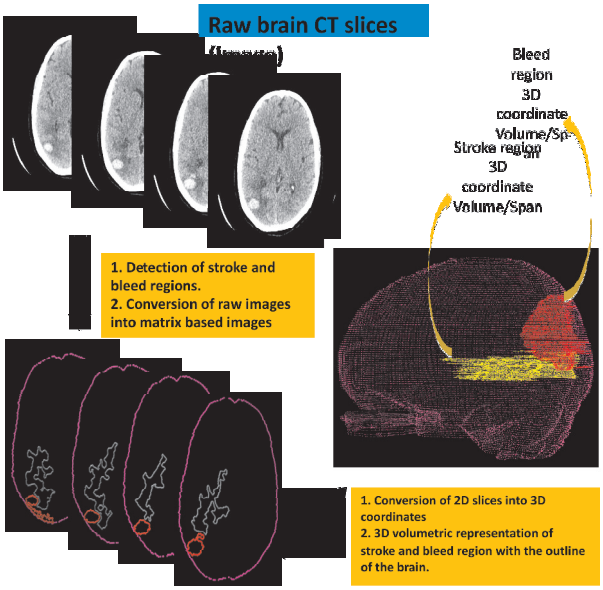
Dr. Saikat Chakraborty, Principal Scientist
Structural Biology and Bioinformatics Division

A. Create better diagnostic tools for detection of dementia

In the project of building MRI based diagnostic tool for Alzheimer's disease, initially I started working with two online available data sources namely Open Access Series of Imaging Studies (OASIS) and Alzheimer's Disease Neuroimaging Initiative (ADNI). OASIS data contains 58 demented and 228 non-demented cases whereas the ADNI data contains 65 demented and 32 non-demented sagittal MR slices.Firstly we extract only those slices of sagittal view where the callosum is visible.Then every slice image is to be preprocessed for segmentation of our region of interest i.e. Corpus Callosum. Now from that segmented region I extract various properties and features which can be used to classify between demented and non-demented. While comparing these features between demented and non-demented male and female, some basic and composite features seemed to be good classifier as they came with p value less than 0.01. Then I go for the classification using LIBSVM.Training set is created using 80% of whole data whereas accuracy of the classifier has been testified using the rest 20% test data. A Radial basis kernel function has been used via 5 fold cross validation of the training set to obtain the optimized gamma and C



parameter. Obtained average accuracy is approximately 84%. This is only using the two dimensional features. Addition of volumetric features will certainly increase the accuracy.



B. Analysis and introspection of the damage caused by stroke

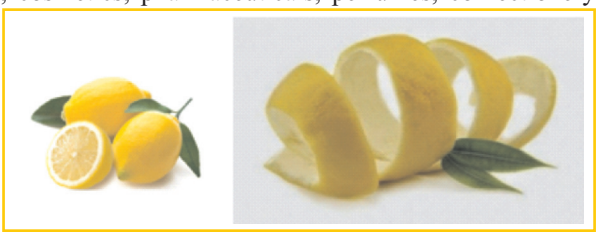
In this project of quantifying stroke and internal bleeding and estimating its severity, I started working with 3D CT scan data of 4 patients, collected from AMRI hospitals, Mukundapur. Initially all the 3D data are converted into a series of axial continuous 2D slices, each of which later went through some morphological operations to segment the damage region or blood, if any, of the brain. These chronological segmented surface areas of stroke or bleeding produce the volume on integration.

Extraction of essential oil from lemon by water and steam distillation

Dr. P. Jaisankar, Chief Scientist & Head
Organic and Medicinal Chemistry Division

Introduction:

Essential oils are used in a wide variety of consumer goods such as detergents, soaps, toilet products, cosmetics, pharmaceuticals, perfumes, confectionery food products, soft drinks, distilled alcoholic beverages (hard drinks) and insecticides. The world production and consumption of essential oils and perfumes are increasing very fast. Production technology is an essential element to improve the overall yield and quality of essential oil. The traditional technologies pertaining to essential oil processing are of great significance and are still being used in many parts of the globe. Water distillation, water and steam distillation, steam distillation, cohobation, maceration and effleurage are the most traditional and commonly used methods. Distillation methods are good for powdered almonds, rose petals and rose blossoms, whereas solvent extraction is suitable for expensive, delicate and thermally unstable materials like jasmine, tuberose, and hyacinth. Water distillation is the most favored method of production of citronella oil from plant material.



Source of Natural essential oil: Bark of Lemon

Procedure:

500 mL water containing round bottom flask was place on a heating mantle. The RB flask was connected to a 250 mL adapter flask which contains lemon bark (cut in to tiny pieces) which was then connected to a condenser followed by a

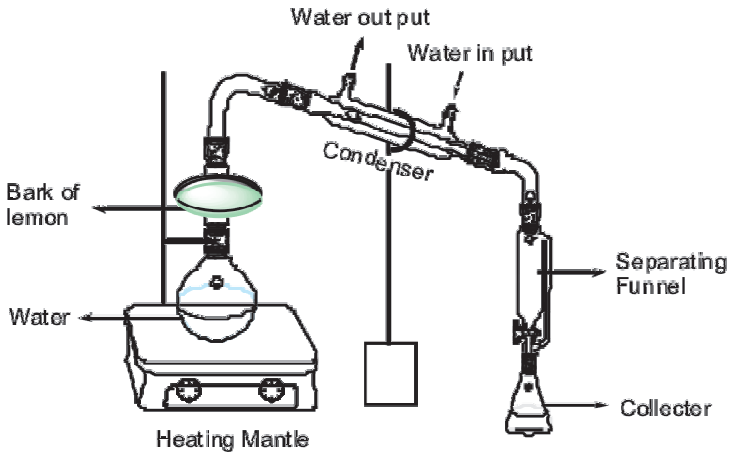


Fig. 1 Water and steam distillation of essential oil from Lemon Bark

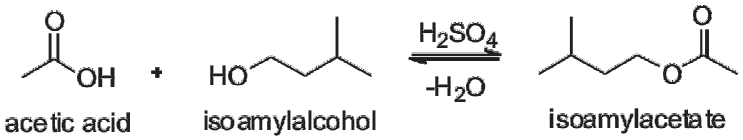
separating funnel and a 100 mL glass container (collector, Fig 1).

The steam generated by boiled water could extract the essential oil from plant material and vaporize. The vapor then get condensed while passing through condenser. The condensed essential oil will be collected along with distilled water, which will be separated out in a separating funnel to get pure essential oil from lemon bark.

Preparation of isoamylacetate (Ester)

Dr. Biswadip Banerji, Principal Scientist
Organic and Medicinal Chemistry Division

Reaction:



Experimental Procedure

To a 100 mL round bottom flask add 25 mL (0.420 mol) glacial acetic acid followed by 20 mL (0.185 mL) isopentyl alcohol (3-methyl-1-butanol). Swirl the flask to mix the layers. To the solution add 5 mL concentrated sulfuric acid. Swirl the flask while sulfuric acid is added. Add several boiling chips to the flask then place a reflux condenser with lightly greased joints on the flask. Bring the solution to boil in an oil bath for 1 hr. After reflux is completed, allow the solution to cool to room temperature. Transfer the entire solution to a separatory funnel and add 50 mL distilled water. Swirl the solution, allow the layers to separate and remove the lower aqueous layer. Add another 25 mL portion of distilled water, shake the flask, and separate and remove the lower aqueous layer. Extract the organic layer with three 25 mL portions of 5% aqueous sodium bicarbonate solution to remove excess acetic acid. Test the last extract and if the aqueous phase is not basic (pH paper), extract the organic layer with two more 25 mL portions of sodium bicarbonate solution ($NaHCO_3$). Then collect the organic layer and dry over granular anhydrous sodium sulfate (Na_2SO_4) or magnesium sulfate ($MgSO_4$). After drying, a clear colourless product was obtained with an intense odor of bananas

Principles of Column Chromatography

Dr. Arindam Talukdar, Senior Scientist
Organic and Medicinal Chemistry Division

Introduction

'Chromatography' is an analytical technique commonly used for separating a mixture of chemical substances into its individual components. There are many types of chromatography e.g., liquid chromatography, gas chromatography, ion-exchange chromatography, column chromatography. They employ the same basic principles.The methods of separation in chromatography are based on the distribution of the components in a mixture between a stationary and a moving (mobile) phase (fig 1). The stationary phase can be a column of adsorbent, a paper, a thin layer of adsorbent on a glass plate, etc., through which themobile phase moves on. The mobile phase may be a liquid or a gas. When a solid stationary phase is taken as a column, it is known as column chromatography.

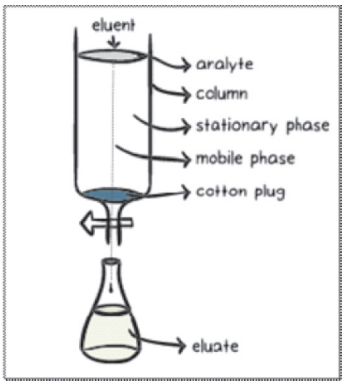
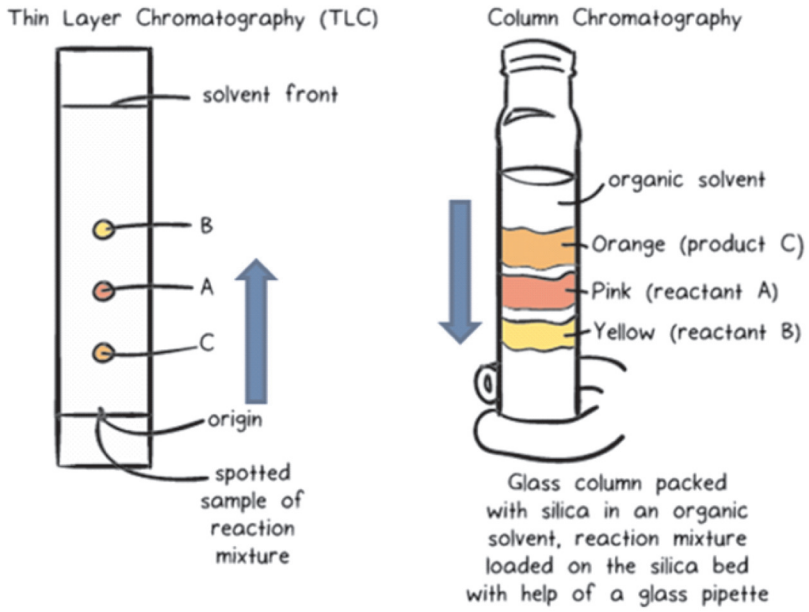


Figure: 1

Term	*Definition*
Mobile phase or carrier	solvent moving through the column
Stationary phase or adsorbent	substance that stays fixed inside the column
Eluent	fluid entering the column
Eluate	fluid exiting the column (that is collected in flasks)
Elution	the process of washing out a compound through a column using a suitable solvent
Analyte	mixture whose individual components have to be separated and analyzed



Compound separation in column chromatography is based on their affinity with the stationary phase (silica, alumina etc). The compound which is more*polar* has higher affinity with stationary phase. Elution of the compound will take place base on their affinity with stationary phase, less polar compound will elute earlier than more polar compound. Elution sequence of compound can be anticipated in correlation with TLC (thin layer chromatography) with column chromatography (fig 2).Since in TLC mobile phase is moving via capillary action (anti-gravity movement), TLC have *reverse correlation* with column chromatography where solvent is moving in direction of gravity.

Aim of the experiment

Inchemical reaction chemist mostly ended up with mixture of compounds where unreacted reactant and by product is present along with desire product as for example in nitration of phenol where product two product is obtain they are *ortho*-nitrophenol and *para*-nitrophenol. Separation of mixture of compound via column chromatography is the aim of experiment.

Steps of column chromatography

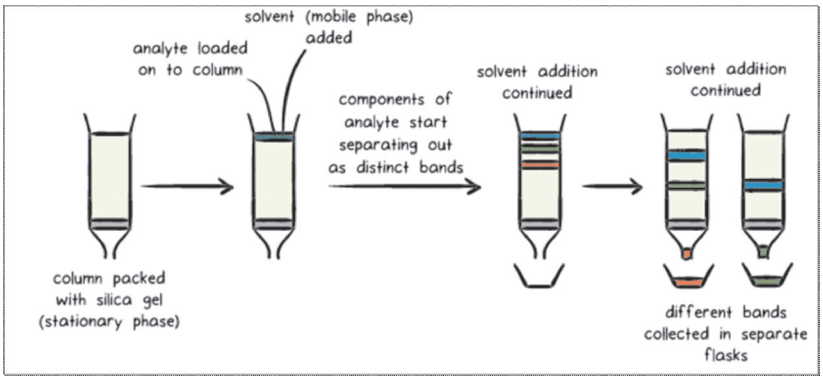
I) *Slurry preparation*: Mixture of compoundswas dissolve in volatile solvent.Considerable amount of silicawas added to the solution of

compound mixture. Amount of silica will be such that after evaporation of volatile solvent powdery slurry will be obtained.

II) *Column preparation*: First put cotton at the bottom of the glass column. Introduce silica inside the column. The amount of silica to be added to the column should be at least 10 times greater than the silica added for the preparation of slurry.

III) Pour the slurry above the silica band of column and put sand or cotton above it.

IV) Run the solvent from nonpolar to polar. We will observe the movement of band if the compounds having colour (**fig 3**) otherwisecompound elution need to monitor by TLC.



Application of chromatography

Chromatography uses phase equilibrium partitioning principles to separate proteins, nucleic acids, or small molecules in complex mixtures based on their differing interactions with a stationary phase and a mobile phase.

Soap Making at Home Using Coconut Oil

Dr. Umesh Prasad Singh, Principal Scientist
Central Instrumentation Division

Aim

To make soap using Coconut oil and Caustic Soda

Materials and Equipments

Coconut Oil: 250 gm

Caustic Soda (Lye): 44.9 gm

Distilled water (or Pure rain water): 112.26 gm (or 112.26 ml)

Beakers (or small buckets/Mug): One with mimimum 1L and one with about 1/2 L capacity, one 250 ml capacity, one 10 ml capacity

Mixer (or magnetic stirrer): 1 Mixer (electric) or 1 magnetic stirrer and a magnetic bead

Spoons: 1 table spoon, 1 tea spoon

Soap molds: Few soap molds are made up of silicon or small flexible plastic boxes of choice having total liquid holding capacity slightly more than the total volume of the Liquids.

Weighting machine: One

Essence: About 1-2 ml liquid essence of choice (rose/leamon grass essential oil/lavender essential oil/Vanilla or any other fragrance)

Permitted colours (food grade colours): 2-5 mg

Method

First make the NaOH solution by adding small amounts of Caustic soda (NaOH) powder (about 1 teas spoon at a time) to the distilled water. Stir the solution continuously to dissolve it. The solution would become too hot if large amount of caustic soda is added, hence care has to be taken. Once all the caustic soda has been added and dissolved, check the temp of the beaker (bucket/mug) by touching it from outside carefully. If it is too hot allow it to cool to some extent till the temperature from outside the vessel is tolerable to hand. Alternately one can measure the temperature of the NaOH solution which should be about 38-40 °C. Once the NaOH solution has cooled to desired value, then slow add it to the coconut oil. Keep stirring the solution either using a big spoon or magnetic stirrer or a mixer (electric). After about 45-60 min the solution starts thickening.

It would be thick to the consistency which we use to make basan batter or IDLI batter at home for making Pakodas (fry). This thick solution is called trace. At this stage add about 1/2 ml of essence to the solution to make the soap fragrant. Dissolve about 2-5 mg of colour completely in about 1-5 ml of distilled water. Add this colour to the trace which is already formed. Mix well till the colour and the essence distribute evenly. Now pour the trace to the casts (plastic boxes). Cover the lid of the plastic boxes and wrap the boxes in thick towels or blankets to keep it warm for about 24-48 hours. The trace slowly solidifies to give soaps. Gently remove the soaps from the boxes. Keep the soaps in a paper carton and store it for 4-6 weeks before using it. This time period is essential to cure the soap as some trace amount of NaOH may remain unreacted which may cause skin irritation in some cases. During the curing process the entire NaOH gets used up and soap dries to give good hard cakes which are easy to handle. This process produces glycerin containing soap which is mild on skins.

Note: The ratio of oil, Caustic soda and water would change if a different oil other than coconut oil is used. The ratios are given below for coconut oil soap and Olive Oil soaps which are very popular and are mild soaps.

Type of Soap	Oil (gm)	NaOH (gm)	Distilled water (gm or ml)
Coconut oil soap	250	44.9	112.26
Olive oil soap	250	31.5	75.0

Nuclear Magnetic Resonance (NMR)

Dr. E. Padmanaban, Senior Technical Officer
and Sandip Kundu, Technical Assistant
Central Instrumentation Division

Nuclear Magnetic Resonance spectroscopy, commonly referred to as NMR, has become the preeminent technique for determining the structure of organic compounds. Of all the spectroscopic methods, it is the only one for which a complete analysis and interpretation of the entire spectrum is normally expected.

The nuclei of many elemental isotopes have a characteristic spin (I). Some nuclei have integral spins (e.g. I = 1, 2, 3 ....), some have fractional spins (e.g. I =1/2,3/2,5/2 ....), and a few have no spin(I =0). Isotopes of particular interest and use to organic chemists are ^{1}H, ^{13}C, $^{19}F$and ^{31}P, all of which have spin I = . (Ref. Table 1).

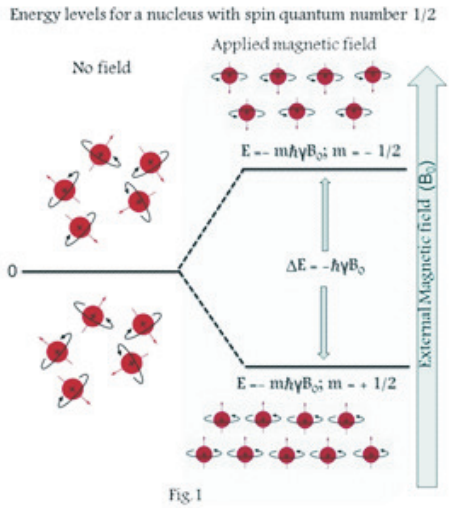


Fig.1

A spinning charge generates a magnetic field, ^{1}H and ^{13}C have nuclear spins of ½ and so they behave in a similar fashion to a simple, tiny bar magnet. In the absence of a magnetic field, these are randomly oriented but when a field is applied they line up parallel to the applied field, either spin aligned(+½) or spin opposed(-½). The lower energy level (+½) will contain slightly more nuclei than the higher

level(-½).Schematic representations of these arrangements are shown in Fig.1.

In order for the NMR experiment to work, a spin flip between the energy levels must occur. If an external magnetic field is applied, an energy transfer is possible between the lower energy to a higher energy level. The energy transfer takes place at a wavelength that corresponds to radio frequencies(in MHz). The populations of the higher and lower energy levels will become equal. If this occurs, then there will be no further absorption of radiation. The spin system is saturated. The possibility of saturation means that we must be aware of the relaxation processes which return nuclei to the lower energy state. While returning to the ground state, re-emission of the energy is

Table 1. General rules for determination of nuclear spin quantum numbers

Mass Number	No. of Protons	No. of Neutrons	Spin (I)	Example
Even	Even	Even	0	^{16}O, ^{12}C
	Odd	Odd	Integer (1,2,...)	^{2}H
Odd	Even	Odd	Half-Integer (1/2, 3/2,...)	^{13}C, ^{1}H
	Odd	Even	Half-Integer (1/2, 3/2,...)	^{15}N

Atomic Force Microscopy(AFM) Principles and Application in Biosciences

T. Muruganandan., Technical Officer
Central Instrumentation Division

In recent year, Atomic Force Microscope (AFM) has provided a range of now opportunities for viewing, manipulating and analysing biomolecules and will hopefully allow application to be developed in Medicine and biotechnology.

Introduction

The invention of in the mid-1980's, followed by continuous progress in instrumentation. It is a relatively new form of microscopy, in which a sharp tip is scanned over the surface of a sample, while sensing the interaction force between the tip and the sample. Because AFM does not rely on an incident beam, as in electron or light microscopy, the specimen can be directly observed at high Resolution in aqueous solution. The newly developed AFM is a valuable tool for studying physical and biological structures provides a unique window to the micro world of cells, subcellular structures, and biomolecules. The AFM can image the three-dimensional structure of biological specimens in a physiological environment.

This enables real-time biochemical and physiological processes to be monitored at a resolution similar to that obtained for the electron microscope. Sample preparation and recording conditions has revolutionized the way in which microscopists explore biological structures. This surface imaging technique involves scanning a sharp tip over the surface of a sample, while sensing the interaction force between the tip and the sample of biological specimens at sub-nanometre resolution under the physiological conditions.

In fact, an AFM is more than just a microscope as it can also measure minute forces within or between biological molecules a method known as Force spectroscopy which was not previously possible. The application of AFM in several field, especially in biological sciences have increased tremendously in last few years as evidenced by numerous published papers in highly reputed journals.

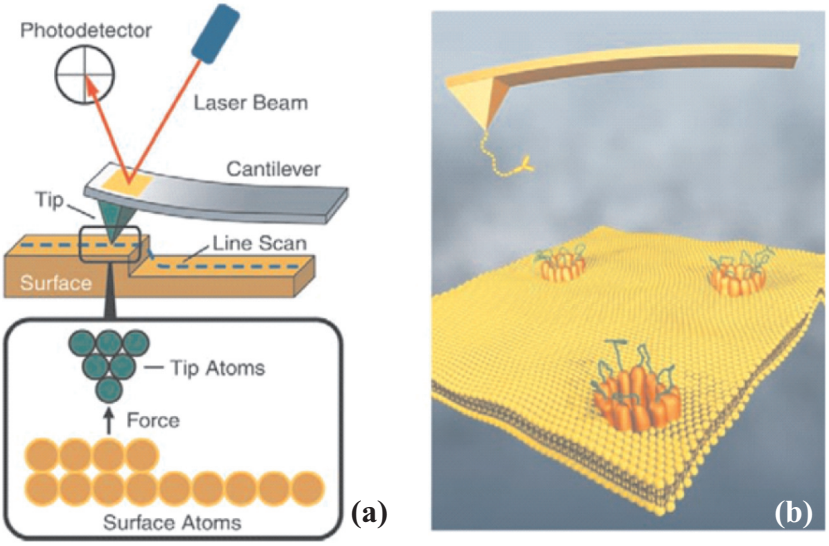


Fig. 1 *Principles of AFM. (a) A sample is probed by an ultra-sharp stylus mounted on a cantilever, which scans over the surface. A reflected laser beam reports deflections of the cantilever to a split photodiode. Photoelectric circuitry then converts the deflections into height information recorded as a digital image. (b) Sketch of a ligand tethered to an AFM tip and probing receptors embedded in a cell membrane*

The Principles of Atomic Force Microscopy

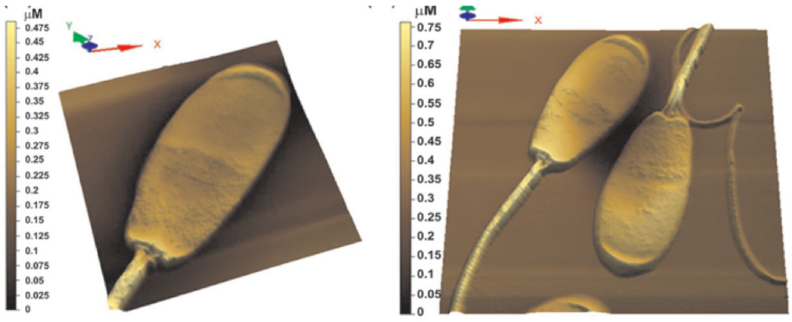
AFM is a member of a family of new microscopic techniques that are referred to as scanning-probe microscopes (SPMs). The principle of SPMs are the generation of images of surfaces by measuring the physical interaction between a sharp tip and the sample rather than by using an incident beam (light or electrons) as in classical microscopy. The main parts of AFM are the sample stage, the cantilever and the optical detection system, which comprises a laser diode and a photo detector. The sample is moved relative to the cantilever in three dimensions using PIEZOELECTRIC CERAMICS (Materials that expand or contract when subjected to a potential difference) .The force interacting between the tip and the sample is monitored with piconewton (10-12N) sensitivity, by attaching the tip to a soft cantilever, which acts as a spring, and measuring the bending (or deflection) of the cantilever (Fig-1). The cantilever deflection is usually detected by a laser beam focused on the free end of the cantilever and is reflected into a photodiode (2). AFM cantilevers and tips

are usually made of silicon or silicon nitride using micro fabrication techniques

Applications

- The AFM has been applied to problems in a wide range of disciplines of the natural sciences, including solid-state physics, semiconductor science and technology, molecular engineering, polymer chemistry and physics, surface chemistry, molecular biology, cell biology, and medicine.
- Applications in the field of solid state physics include (a) the identification of atoms at a surface, (b) the evaluation of interactions between a specific atom and its neighboring atoms, and (c) the study of changes in physical properties arising from changes in an atomic arrangement through atomic manipulation.
- In molecular biology, AFM can be used to study the structure and mechanical properties of protein complexes and assemblies. For example, AFM has been used to image microtubules and measure their stiffness.
- In cellular biology, AFM can be used to attempt to distinguish cancer cells and normal cells based on a hardness of cells, and to evaluate interactions between a specific cell and its neighboring cells in a competitive culture system. AFM can also be used to indent cells, to study how they regulate the stiffness or shape of the cell membrane or wall.

- The following images were captured from CSIR-IICB, Central Instrumentation AFM facility.



(Control; c1) and 2 µM QF treated (c2) cauda spermatozoa showing intact plasma membrane, acrosomal cap and mid piece in both images. In control image x and y axis are 10 µm each and z axis is 0.486 µm. In treated image x and y axis are 19 µm each and z axis is 0.762 µm
https://doi.org/10.1002/jcp.26275

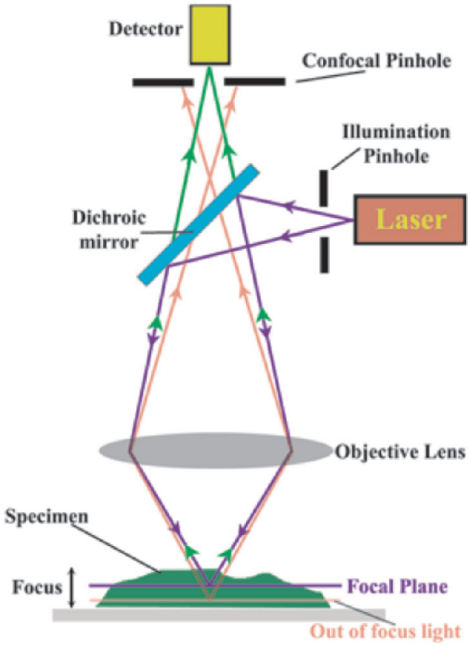
Confocal Imaging System

Mr. Binayak Pal, Principal Technical Officer
Mrs. Banasri Das, Senior Technical Officer
Central Instrumentation Division

Confocal microscopy is a highly specialized form of fluorescence microscopy which generates high-resolution images of material stained with fluorescent probes. It is useful for capturing multiple two-dimensional images at different depths in a sample. It is also possible to construct three-dimensional structures within an object.

Principle

To understand the principle of Confocal microscope you have to first know the physics of conventional fluorescence microscope. To visualize any object, we need to illuminate it with suitable light source. In fact, the entire specimen is flooded evenly in light from a light source in a conventional fluorescence microscope. All parts of the specimen in the optical path are excited at the same time and the resulting fluorescence is detected by the microscope's photo detector including a large unfocused background. Therefore, the image seen at the detector is produced from the light reflected from different planes of the specimen. Thus out of focus light emitted from the specimen interfere in the final



Ray diagram of laser scanning Confocal Microscope

image we see in traditional fluorescence microscope. In contrast, a confocal microscope uses point illumination mainly by lasers and a device to control out of focus light called pinhole in an optically conjugate plane in front of the detector. Pinhole helps to eliminate out-of-focus signal the name "confocal" meaning the “same plane” stems from this configuration. As only light produced by fluorescence very close to the focal plane can be detected, the image's optical resolution is much better than that of wide-field microscopes.

Advantages

- High resolution and less noise.
- Useful for 3D scanning of the specimen
- Useful for Z-axis scanning and depth perception in Z-sectioned images

Applications

Cell and tissue research

Matrix Assisted Laser Desorption Ionisation Time-of-Flight Mass Spectrometry (MALDI-TOF-MS)

Sandip Chakraborty, Technical Officer
Central Instrumentation Division

Matrix-assisted laser desorption/ionization (MALDI) is a soft ionization technique used in mass spectrometry (MS), allowing the analysis of biomoleciles (such as proteins, peptides and sugars) and large organic molecules (such as polymers and other macromolecules).

All mass spectrometers consist of three basic parts: an ion source, a mass analyzer, and a detector system (Fig.1). The stages within the mass spectrometer are:

1. Production of ions from the sample
2. Separation of ions with different masses
3. Detection of the number of ions of each mass produced
4. Collection of data to generate the mass spectrum

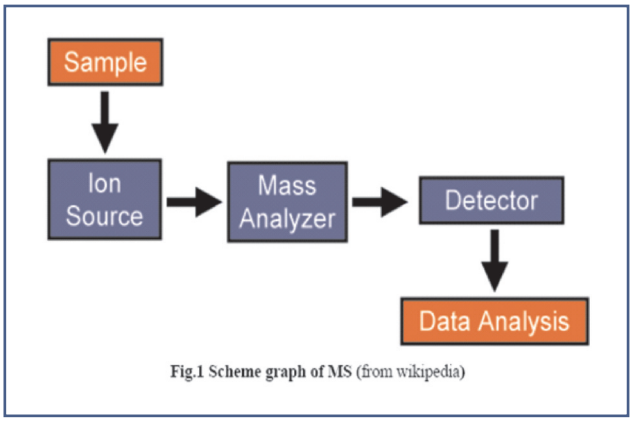


Fig.1 Scheme graph of MS (from wikipedia)

Different chemicals have different masses, and this fact is used in a mass spectrometer to determine what chemicals are present in a sample by measuring the mass-to-charge ratio of ions produced from the sample after induction of ionization. An ion is an atom or group of atoms that have lost or gained one or more electrons, making them negatively or positively charged, which means that the speed and direction may be changed with an electric or magnetic field.

An electric field acclearates the speed of ions . After this, they are directed into a magnetic field, which applies a force to each ion. This force deflects the ions (makes them curve instead of traveling in a straight line) to varying degrees depending on their mass-to-charge (m/z) ratio (The mass-to-charge ratio, is a physical quantity, for *e.g.* two particles with the same mass-to-charge ratio move in the same path in a vacuum when subjected to the same electric and magnetic fields.). Lighter ions get deflected more than the heavier ions. The detector measures the deflection of each resulting ion beam. From this measurement, the mass-to-charge ratios of all the ions produced in the source can be determined. The ions are generated at the ion source, then enter into a vacuum where they are accelerated by a strong electric field in a 'flight tube' and subsequently separated in time and finally hit the detector. An analyzer measures the time-of-flight (TOF) taken for particular ions to hit the detector. The flight time of an ion is related to its mass-to-charge ratio (m/z), thus, mass spectra can be generated from simple time measurements.

Mass spectrometry is an important method for the characterization of proteins. The two primary methods for ionization of whole proteins are electrospray ionization (ESI) and matrix-assisted laser desorption/ionization (MALDI). The MALDI-MS technique, in particular, allows for the mass determination of large biomolecules (bigger than 500 Da) and synthetic polymers of molar mass greater than 200,000 Daltons (Da) by ionization and vaporization without degradation.

Fig.2 Scheme graph of MALDI-TOF MS

In MALDI TOF-MS the ionization is triggered by a laser beam (normally a nitrogen laser), Fig.2. A solid matrix is used to protect the biomolecule from being destroyed by direct laser hitting by forming a crystal lattice surrounding the analyte and to facilitate vaporization and ionization. The matrix absorbs light at the wavelength that laser produces (generally Nitrogen UV 337 nm laser

is used). The sample is mixed with a matrix solution and allowed to co-crystallise on a target plate. When the laser is fired at the target the matrix absorbs the laser light energy which vaporizes it (it desorbs from the surface) and this carries some of the sample with it. At the time that the laser is pulsed a voltage is applied to the target plate to accelerate the ionised sample towards a time-of-flight mass analyser. There are two kinds of mass analyzer, one works in linear mode, and the other works in reflectron mode and can easily separate proteins up to 500 kDa. The precision is considered to be approx 10 ppm.

MALDI-TOF-MS is the workhorse for proteomics. For organisms whose genome sequence is known the identification of 'interesting' protein spots from a two dimensional gel (2-D gel) is a routine work. Protein spots are excised and digested with a specific protease (e.g., trypsin cleaves only on the carbonyl side of lysine and arginine) and the fragments are measured by MALDI-TOF. This peptide mass fingerprint can then be used to search databases to identify the protein.

Applications of MALDI TOF MS

To date, MALDI TOF mass spectrometry has been successfully used for the analysis of a wide range of different analyte molecules. Important examples are peptides and proteins including glyco- and membrane proteins and phosphopeptides, oligosaccharides etc.. MALDI TOF mass spectrometry is one of the most important tools for the analysis of the proteome, i.e. proteomics. In addition, it is the major tool for the analysis of the products of peptide synthesis. Therefore, MALDI TOF-MS has become a valuable tool in the modern biology research.

Understanding the Molecular Sociology Inside the Cell: Role of Structural Biology

Dr. Jayati Sengupta, Principal Scientist
Structural Biology and Bioinformatics Division

Living cells are extremely complex factories and they employ numerous 'molecular machines' to perform key cellular processes such as: transcription, translation, mRNA splicing, DNA repair, cellular signalling, transport etc. in order to perform specific functions. These molecular machines are either protein oligomeric complexes, or protein-nucleic acid assemblies. Particular striking features of these molecular assemblies are their high complexity and their ability to rapidly interconvert among multiple conformational states. The study of structure gives a great deal of insight. If it is complemented with studies on dynamics, further more understanding of functional mechanisms of the cellular macromolecules can be achieved.

Among all structural biology techniques, cryo-electron microscopy (cryo-EM) is in the limelight these days (following declaration of last year's Chemistry Nobel prize) for investigating macromolecular structure and dynamics. Cryo-EM of biological molecules in single-particle form is comparatively a newer approach in structural biology. However, this approach has furnished direct evidence for conformational changes of macromolecules as it proceeds through different states during their function. This technique made electron microscopic imaging of the entire molecule in a fully hydrated state (without causing deformations) possible.

A dedicated cryo-EM facility equipped with a state-of the-art 300kV Tecnai POLARA along with other necessary auxiliary equipments has been established at CSIR-IICB for studying structures and dynamics of biological macromolecules.

Floral Scent - Pollinator Attractant or Herbivore Deterrent?

Dr. V S Pragadheesh, Scientist
Organic and Medicinal Chemistry Division

When someone sayFLOWER, several things flashes in to our mind they are colour,smell,beautiful structures, nectar and so on. Do we ever think of what makes these flowers to produce colors and smell? And why the colorful butterflies, buzzing bees, hovering flies, moths, bats, humming birds visiting these flowers day and night?

Yes, plants attract these insects, using their floral scent and color, to transfer their pollen from one flower to another flower. The insects that we see in our garden are doing this job of transferring pollens (pollination) all the time.

Plants make a variety of low molecular weight floral scent compounds, which blends to give specific fragrance to the plants. Odor of flower provides potential information regarding the location of the flowers that makes insect and animal pollinators to identify and visit the flowers for pollination.

There are also several insects which feed on plants for their food, these are called herbivores. When plants send scent, these herbivores will also get attracted to the flowers and they feed on the flowers. How plants defend themselves from their herbivore enemies?

Plants use the floral scent to attract pollinators and repel herbivores. Remarkable variation of flower scents in plants is controlled mainly by three group of chemical compounds namely, terpenoids, phenylpropanoids and fatty acid derivatives. Phenylpropanoid compounds made along with the colored pigments of the plants functionin the attraction of pollinators to the flowers while terpenoids which present in the vegetative parts of the plants have a dual function as the attraction of pollinators and deterrent of herbivores. My presentation will explain how these natural occurring floral volatile compounds are produced in plants and modulate the emotions of not only insects but also to humans!

"Perfumes are the feelings of the flowers"- Heinrich Heine

Dengue Early Diagnosis and Search for Antivirals to Keep the Enemy at Bay

Dr. Subhajit Biswas , Senior Scientist
Infectious Diseases and Immunology Division

Introduction

In recent times, dengue virus (DENV) has become a major public health concern following the endemicity and the morbidity and mortality associated with the diseases caused by DENV. Dengue is caused by a positive sense single stranded RNA (ssRNA) virus which belongs to family Flaviviridae. These viruses are spread by the bite of the female mosquitoes of the Aedes species, principally A. aegypti and to a lesser extent A. albopictus. DENV causes dengue fever (DF), dengue hemorrhagic fever (DHF) and the more severe dengue shock syndrome (DSS).

Many parts of India are endemic for DENV infection and sharp increase in the number of dengue cases have been reported recently. No specific antiviral is available against dengue. The first ever dengue vaccine Dengvaxia (CYD-TDV) is only partly effective and doesn't provide full protection against DENV infections. These vector-borne diseases have become a major threat in South-East Asian countries like India due to ever-increasing urbanization, tropical climate and poor waste management.

DENV has four common serotypes namely DENV1-4 which form different phylogenetic groups based on their changed nucleotide sequences from each other. All the four serotypes have been reported in India and the serotype prevalence associated with dengue outbreaks shift from one serotype to another. Some recent studies have reported the presence of more than one serotype in dengue patients and one of these studies showed that majority of the DHF cases were associated with mixed DENV infection. Hence early molecular diagnosis with specific serotyping is of utmost necessity to manage the disease effectively.

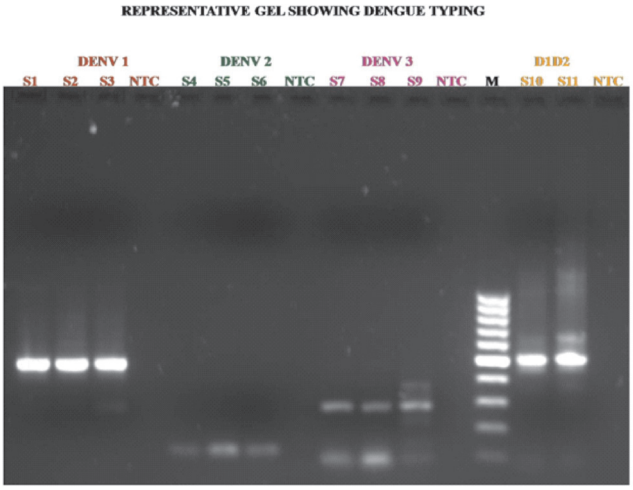
Methodology

Testing human sera samples for DENV NS1 by ELISA

ELISA is routinely performed in the pathological laboratories on patients' blood samples to detect DENV NS1/IgM/IgG in human sera. There are a number of

commercially available ELISA kits. The specificity and the sensitivity of these ELISAs are better than rapid strip-based tests.

Serotyping by reverse transcription-polymerase chain reaction (RT-PCR)
Total RNA from the patient's serum is extracted and the concentration and purity of the RNAs are checked using spectophotometry. cDNAs are prepared from the total RNA using Superscript III Reverse Transcriptase kit. Individual semi-nested PCRs are carried out using reverse primer, specific for individual serotypes.



Conclusion

Detection of DENV NS1 antigen by ELISA kit followed by molecular serotyping serves as the "gold standard" for pin-point diagnosis and management of DENV and the related diseases. The search for Dengue antivirals and vaccines remains a high research priority.

CSIR- Indian Institute of Chemical Biology

Sculpting and Creation of Indian Institute of Medical Research and Thereafter (Currently CSIR-INDIAN INSTITUTE OF CHEMICAL BIOLOGY)

When the British Empire was in power in our country, a group of bio-medical scientists propelled by the "Nationalistic feeling" dedicated themselves to the task of tackling problems of tropical diseases prevalent in our country in those days. This simple motivation illuminated the path towards the foundation of this institute in 1935.

IICB at 21st Century

What began as a small research unit at 64, Dharmatala Street in Central Kolkata is now transformed into an internationally renowned organization comprising of about 47 Scientists 94 technical personels and 400 students. The hard work, vision and foresightedness of our forefathers sustain and guide our institute to this day, as biologists and chemists work jointly to understand and prevent common human diseases.

Inception of CSIR-IICB Translational Research Unit of Excellence (TRUE) at Salt Lake, Kolkata.

In order to strengthen the basic research and to attain translational objectives, a second campus comprising of a four storey building was constructed at the Salt Lake, Kolkata. The unit, named CSIR-IICB Translational Research Unit of Excellence (TRUE), has the overall mandate to develop state-of-the-art fundamental innovations and translate the indigenous innovations into affordable technology for the Society.

Development of CSIR-IICB innovation

In order to tackle major diseases of today such as cancer, cardiovascular disease, immunological/metabolic/infectious disorders, specific cellular and molecular changes involved during the progression of the disorder needs to be clearly understood. CSIR-IICB TRUE campus is envisioned as an enabling platform for generation of quality knowledge and further transformation of that knowledge effectively into innovation and technology.

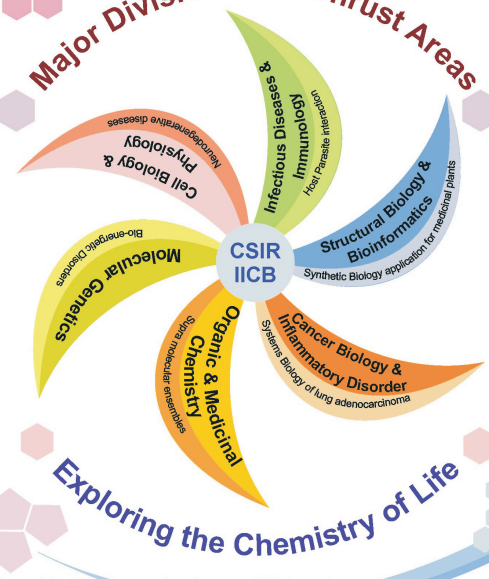
CSIR-Indian Institute of Chemical Biology

4, Raja S.C. Mullick Road, Kolkata- 700 032, Website : iicb.res.in

CSIR-INDIAN INSTITUTE OF CHEMICAL BIOLOGY

The Institute was established in 1935 as the Indian Institute of Medical Research and became a unit of CSIR in 1956. It owed its origin to the inspiration of prominent personalities like Gurudev Rabindranath Tagore, Acharya Prafulla Chandra Roy, Pandit Jawaharlal Nehru and many others. Today, by its mandate CSIR-IICB is engaged in research on diseases and certain biological problems of global interest.

Major Divisions and Thrust Areas



Exploring the Chemistry of Life

Generating Knowledge Globally
- ❖Publishing Papers/ Year > 240
- ❖Average Impact Factor > 3.5

Transforming Knowledge into Wealth (IP)
- ❖Filing Patents/Year > 4
- ❖Patents Granted/Year > 4

Potential Technologies Developed Recently
- ❖Biomarker for valvular heart disease
- ❖Microbicidal Contraceptive to Prevent HIV
- ❖Gene Therapy for Mitochondrial Diseases
- ❖Visceral Leishmaniasis Detection Kit
- ❖Anti-leishmanial Drug Candidates
- ❖Anti-asthmatic Drug Candidates
- ❖DNA Vaccine against Kala-Azar
- ❖Anti-cancer Drug Candidates
- ❖Anti-ulcer Drug Candidates

A symbiosis between chemistry and biology that translates to a commitment to higher standards of health for all.
Institute-Industry tie up recently rolled out PROSTALYN - a herbal composition for Prostate diseases.
Other products or processes accepted by industries for marketing: a herbal composition against chronic myeloid leukemia (CML), a potent DNA vaccine against Kala-azar, a diagnostic technology to detect a protein associated with pregnancy and embryo, a herbal extract & composition for peptic ulcer diseases.

Building People and Institution
Initiated and nurtured NIPER, Kolkata (National Institute of Pharmaceutical Education and Research); PhD Registration under AcSIR; Three schools adopted & provided laboratory aids; Providing training to class XII students of KV School under the programme "JIGYASA".

Infrastructures operational:
CSIR-IICB Translational Research Unit of Excellence (TRUE), Salt Lake, Kolkata

Major Facilities Available
- State of the art Instrumental facilities
- Modern Animal House
- Modern Library Computer Division

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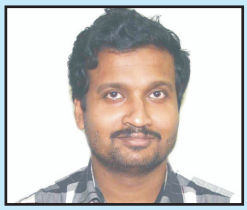

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GLIMPSES OF

'JIGYASA' 2017 : A Summer Research Program for "Kendriya Vidyalaya Students"
Organized by
CSIR-Indian Institute of Chemical Biology, Kolkata,
from July 3 to 7, 2017

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