



Report

UOM, JSS AHER & DST-STUTI Training Program

Topic: Advanced Equipment Handling and Applications in Molecular Biology

Organized during
25th April to 01st May, 2022

Sponsored By
Department of Science & Technology – Synergistic Training program
Utilizing the Scientific and Technological Infrastructure (DST-STUTI) Scheme

Organized by
JSS Academy of Higher Education & Research, Mysuru - 570015

Venue
Vijnana Bhavan, University of Mysore, Mysuru - 570006



Committee Members

University of Mysore

JSS Academy of Higher Education & Research

Patrons

- **Prof. G. Hemantha Kumar**
Vice Chancellor
- **Prof. K.S. Rangappa**
Former Vice Chancellor
- **Dr. Surinder Singh**
Vice Chancellor
- **Dr. B. Suresh**
Pro chancellor

Organising Team

- **Dr. S. Chandra Nayak**
Professor & Coordinator
Vijnana Bhavan
- **Dr. Prashant Vishwanath**
Professor & Director (Research)
DST-STUTI Coordinator
- **Prof. K.A. Raveesha**
Head, School of Life Sciences

Conveners

- **Dr. K. Kemparaju**
Professor
DOS in Biochemistry
- **Dr. K. Mantelingu**
Associate Professor
DOS in Chemistry
- **Dr. C. D. Mohan**
Assistant Professor
DOS in Molecular Biology
- **Dr. Kiran Kumar M N**
Assistant Professor
Department of Biotechnology &
Bioinformatics
- **Dr. H. Yogish Kumar**
Lecturer
JSS College of Pharmacy
- **Dr. Jamuna Bai A**
Assistant Professor
Dept. of Microbiology
- **Dr. Shiva S**
Assistant Professor, Division of
Biochemistry, School of Life Science

JSS Academy of Higher Education and Research, Mysuru

UOM, JSS AHER & DST-STUTI Training Program

Advanced Equipment Handling & Applications in Molecular Biology

Vijnana Bhavan, University of Mysore and JSS Academy of Higher Education & Research, Mysuru, jointly organized the training program on “Advanced Equipment Handling and Applications in Molecular Biology”. The training program was funded by Department of Science and Technology under the STUTI scheme. The training program was held from 25th April to 1st May 2022 at Vijnana Bhavan, University of Mysore. Totally, 30 applicants from all over the India including M.Sc., M.Pharm., MBBS, MD and PhD students and young faculty from various disciplines of Chemical and Biological Sciences were selected based on their area of research interest. The participants from reputed institutes such as IIT BHU, Central University of Punjab, Delhi Pharmaceutical Science and Research University, CSIR CFTRI Mysuru, ICAR NBAIR Bengaluru, Davangere University, Karnataka University Dharwad, Kuvempu University Shivamogga, AIMS Mandya, Govt. Ayurvedic Medical College Mysuru, and Manipal Academy of Higher Education attended this prestigious training program.

The main aim of the training program was to provide hands-on sessions on applications of nuclear magnetic resonance (NMR), next-generation sequencing (NGS) and confocal laser scanning microscopy (CLSM). Further, this training was designed to impart knowledge pertaining to application of: i) NMR for structural elucidation of synthetic drugs, small molecules and proteins/ nucleic acids; ii) confocal laser scanning microscopy for live cell imaging; and iii) Next-generation sequencing for high through-put DNA sequencing and data processing. The scientific and hands-on sessions were handled by resource persons from companies such as Bruker, Thermo Fisher Scientific and Carl Zeiss. Academic experts were also involved to provide knowledge in the domain areas.

The training program was inaugurated in the presence of the Chief Guest, Prof. G. Hemantha Kumar, Hon’ble Vice Chancellor, University of Mysore. The event was presided by Dr. Manjunatha B, Registrar, JSS AHER, Mysuru. Prof. S. Chandra Nayak, Co-ordinator, Vijnana Bhavan, University of Mysore welcomed the distinguished guests, resource persons and the esteemed participants. Prof. KA Raveesha, Head, School of Life Sciences, JSS AHER briefed the participants about the training program. Prof. Prashant Vishwanath, Director Research and DST-STUTI Coordinator, JSS AHER informed the participants about DST STUTI scheme and its role in building human resource and its knowledge capacity by organizing hands-on training

program and sensitization of the state-of-the-art equipment for students and researchers actively involved in research across various institutions in the country. Prof. Prashant Vishwanath proposed the vote of thanks and acknowledged the support extended by DST, University of Mysore, JSS AHER and the industry partners in organizing the training programme.



The inauguration was held on 25th April 2022 in the presence of the Chief Guest, Prof. G. Hemantha Kumar, Hon'ble Vice Chancellor, University of Mysore, Dr. Manjunatha B, Registrar, JSS AHER, Mysuru, Prof. S. Chandra Nayak, Co-ordinator, Vijnana Bhavan, University of Mysore, Prof. Prashant Vishwanath, Director Research and DST-STUTI Coordinator JSS AHER, and Prof. KA Raveesha, Head, School of Life Sciences, JSS AHER.

21ನೇ ಶತಮಾನದ ಜೀವಶಾಸ್ತ್ರದ ಸವಾಲುಗಳು ಎದುರಿಸಲು ವಿಜ್ಞಾನಿಗಳಿಗೆ ಸಿದ್ಧತೆ ಅಗತ್ಯ: ಪ್ರೊ.ಜಿ.ಹೇಮಂತ್ ಕುಮಾರ್ .



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The inauguration event of the training program was covered and reported by a local daily.

Day 1 & 2 (25th & 26th April 2022): Nuclear Magnetic Resonance (NMR)

Resource Persons:

Dr. Anil Kumar P G, Senior Sales Manager, Bruker

Dr. Chandrashekar, Head of Bruker Academy & Lead, Applications

Dr. K. Mantelingu, Associate Professor, DOS in Chemistry, UOM, Mysore

Dr. H. Yogish Kumar, Faculty, Department of Pharmaceutical Chemistry, JSS College of Pharmacy, Mysore

The **objective** of the training was to upgrade the knowledge of participants on the fundamentals of NMR and its applications. The topic was chosen as the use of NMR has been increasingly applied in various research fields, particularly in the characterization of organic molecules in synthetic organic chemistry, medicinal chemistry, drug discovery in academia & pharmaceutical industry and also as a diagnostic tool.

The topics covered in the technical and hands-on training session were

- Fundamentals of NMR Spectroscopy (Multidimensional): Basic understanding of solution state to its applications
- NMR of synthetic drug molecules and their structure determination of small molecules
- Applications of NMR in determination of proteins and nucleic acids
- Hands-on session for usage of NMR instrument

The first technical session on 25th April 2022 morning was on “Introduction to Bruker NMR and 1D-NMR Spectroscopy” by Dr. Anil Kumar PG from Bruker. It was followed by the second technical session on “Applications of 1D & 2D-NMR Spectroscopy” by Dr. Chandrashekar, Head of Bruker Academy & Lead, Applications.

Post lunch break, all the 30 participants were divided into three group to facilitate easy demonstration & hands-on training of NMR Instrument. The participants were given demonstration & hands-on training in NMR by Dr. K. Mantelingu, University of Mysore.

On the next day 26th April 2022, Dr. H. Yogish Kumar, JSS AHER started the technical session with a talk on the topic ‘Applications of NMR in Drug Discovery’. Thereafter, the hands-on session of sample preparation and instrument operation was by Dr. Mantelingu. In the afternoon technical session, Dr. Chandrashekar trained the participants Hands on for using Bruker NMR Software – TopSpin. The technical sessions concluded with the participants working on Problem Solving and interpretation with Dr. Chandrashekar. After all the sessions, participants were evaluated/assessed with the MCQ test. Later, feedback was taken from all the participants about the two days session on NMR.



NMR facility at IOE, Vijnana Bhavan, University of Mysore



Hands-on training of NMR to participants by resource persons



Participants handling and operating the NMR



Technical sessions by resource persons on fundamentals and applications of NMR



Training session on interpretation of sample data analysis using NMR



Participants with the resource persons at the end of NMR training session

Day 3 & 4 (27th & 28th April 2022): Next Generation Sequencing (NGS)

Resource Persons:

Mr. Raju Yadav Perugu, Senior Product Specialist, Thermo Fisher Scientific

Dr. Manikantan K, Scientist, Field Application, Thermo Fisher Scientific

Dr. CD Mohan, Assistant Professor, DOS in Molecular Biology, UOM, Mysore

Dr. Shiva S, Assistant Professor, JSS AHER

Mr. Kiran Kumar, Technical Officer, UOM, Mysore

The **objective** of the training program was:

- To give insights into Sangers sequencing and next generation sequencing.
- To highlight the importance of NGS over traditional gene sequencing.
- To impart fundamental knowledge of DNA sequencing methods and its applications to their field of research.
- To give hands-on practical training for the participants.

The topics covered in the technical session of the training were

- Introduction to Sanger's method of gene sequencing
- CE : 3500 series Workflow and its Applications
- Fundamentals of Next-generation sequencing (NGS) and its applications
- NGS workflow: Ion Torrent Sequencing Technology.
- Hands-on session for usage of NMR instrument

The use of NGS in modern science is very vast. In the training program 2 days were exclusively assigned to understand the workflow and applications of both Sangers sequencing as well as NGS for all the participants.

Sangers sequencing and NGS sessions were scheduled on 3rd and 4th day of the training program i.e., 27th & 28th April 2022. On the first day, 27th April 2022, Dr. Manikantan initially briefed about the fundamentals and applications of Sangers sequencing. Followed by this all-30 participants were divided into 2 batches to facilitate easy demonstration and hands-on training on Capillary DNA sequencing. Dr. Manikantan explained the work flow and applications of CE: 3500 for both the batches. Further, Dr. Manikantan trained the participants on handling the CE:3500 sequencer, sample preparation and running the sample. At the end, both the batches also had a small session on data analysis.

On the next day 28th April 2022, Mr. Raju Yadav Perugu started session with the talk on topic 'NGS workflow: Ion Torrent Sequencing Technology'. Thereafter, again, all-30 participants were divided into 2 batches and Mr. Raju Yadav Perugu on NGS carried out hands-on session for both the batches.

Mr. Kiran Kumar, Technical Officer, IOE, UOM also helped the participants in preparing samples for capillary DNA sequencing and NGS.

After all the sessions, participants were evaluated/assessed with the MCQ test. Later, feedback was taken from all the participants about the two days session on NGS.

Overall, the participants were exposed to fundamentals of Next-generation sequencing (NGS) including Principle, Instrumentation and Application. The participants were trained in prerequisites of NGS application such as sample preparation and run the sample as well as post NGS application including data collection, analysis and interpretation by the Hands-on session for usage of NGS instrument.



Resource persons explaining the participants about capillary DNA sequencing



Resource person giving demonstration on application of NGS



Participants with resource persons and organizing team at University of Mysore

Day 5 & 6 (29th & 30th April 2022): Laser Scanning Confocal Microscopy

Resource Persons:

Mr. Rishi Kant, Product Application & Sales Specialist, Carl Zeiss

Dr. K Kemparaju, Professor, DOS in Biochemistry, UOM, Mysore

Dr. Jamuna Bai A, Department of Microbiology, Assistant Professor, JSS AHER

Mr. Yogesh R, Technical Officer, UOM, Mysore

The **objective** of the training program was to familiarize the participants with fundamental of confocal microscopy, teach them the basic concepts in microscopy such as principles of optics in light, wide-field, confocal and super resolution microscopy. The participants were trained to design experiment, prepare samples and usage of appropriate controls. The participants were given hands-on session to work on advanced confocal techniques (involving FRET & FRAP).

The topics covered in the technical session of the training were

- Fundamentals of confocal microscopy
- Hands-on session on confocal microscopy
- Data processing and interpretation

In the first technical session, Mr. Rishi Kant from Carl Zeiss gave a talk on the fundamentals of confocal microscopy. Once the participants were familiar with the basic knowledge of fluorescence and confocal microscopy, the second technical session on biological applications of confocal microscopy was conducted. In the hands-on training session, the participants were trained to prepare samples, select right fluorophores for staining, capture images, and process raw images. Both the training and technical talks were comprehensive and helped the participants to differentiate between confocal and super resolution microscopes, select suitable confocal microscope for their research applications, understand the fluorescence spectral characteristics and learn the critical steps in sample preparations and work with advanced confocal techniques such as FRET, FRAP. The technical and hands on session in the first day covered topics on fluorescence excitation and emission and resolution limits, selection of filter set and lens, optics in confocal systems, specimen preparation and labeling, and image acquisition, processing and evaluation.

On the second day of the session, the theoretical aspects were integrated with hands-on experiments and practical experience in sample preparation using fluorophores, digital imaging, and live cell microscopy. The participants gained in depth knowledge on the working principles of confocal imaging, and troubleshooting issues concerned to optical aberrations,

bleaching, sample preparation and digitization. Overall, the participants were trained in the "state-of-the-art" imaging techniques using confocal microscopy for biological research.



Technical session on fundamentals and applications of CLSM



Resource person explaining optics, sample preparation and image capturing using CLSM



Hands-on training session for participants in sample preparation and imaging



Participants getting trained in image acquisition and processing



Resource person training participants on troubleshooting sample bleaching and imaging

Day 7 (1st May 2022): Invited Talks and Valedictory

Resource Persons:

Dr. KS Girish, Professor, DOSR in Biochemistry, Tumkur University

Dr. Sachin Chaudhary, Scientist, CSIR CFTRI

Dr. Vijaya Kumar MS, Assistant Professor, JSS STU, Mysore

Invited talks by three eminent researchers were organized on the last day of the training program. Prof. KS Girish delivered a talk on the topic “7 things to overcome during PhD”. He prepped the young researchers on the important skills required and to be developed while pursuing PhD. Dr. Sachin Chaudhary delivered a talk on “NMR, what is it good for?” and explained the myriad applications of NMR in biological research apart from its application in structural elucidation of compounds. Dr. Vijaya Kumar delivered a talk on “Basic science in Space and its Applications” and gave a glimpse of life in space station and discussed the various avenues of research that could be explored in Space Science and Space Biology.



Dr. KS Girish delivered a talk on “7 things to overcome during PhD”



Dr. Sachin Chaudhary delivering a talk on “NMR, what is it good for?”



Dr. Vijaya Kumar delivering a talk on “Basic science in Space and its Applications”

The valedictory of the 7 days training program was conducted on 1st May 2022 in the presence of distinguished Chief Guests Dr. Harish Prashanth K V, Principal Scientist from CSIR CFTRI and Dr. Mahadev Kumar S, Scientist from Kerala Forest Research Institute. Prof. Chandra Nayak welcomed the esteemed guests, invitees and the participants. The participants were asked to provide feedback about the training program and given certificate of participation. The valedictory ended with Prof. Prashant Vishwanath delivered the closing remarks.



Chief Guest, Dr. Harish Prashant, Scientist, CSIR CFTRI delivering valedictory speech.



Participants receiving participation certificate from the distinguished guests



Participants providing their feedback at the Valedictory



Prof. Prashant Vishwanath delivering the closing remark at the valedictory session



The participants and organizing team members for a photo-op during the closing ceremony of the training programme

List of participants for the training program from Institutes across India and their feedback

University/Institute Name with place	No. of participants
Indian Institute of Technology, BHU, Varanasi, Uttar Pradesh	2
Central University of Punjab, Punjab	1
Nirmala College Of Pharmacy, Andhra Pradesh	1
Vijaya Institute of pharmaceutical sciences for women, Andhra Pradesh	1
Delhi Pharmaceutical Science and Research University, Delhi	1
Karnatak University, Dharwad	2
Manipal college of Pharmaceutical Sciences, Manipal	2
Sahyadri Science College Shimoga, Shivamogga	1
Kuvempu University, Shivamogga	1
Davangere University , Davangere	3
Indian Academy Degree College-Autonomous, Bengaluru	1
ICAR-National Bureau of Agricultural Insect Resources, Bengaluru	2
Chandramma Dayananda Sagar Institute of Medical Education and Research, Bengaluru	1
CSIR-Central Food Technological Research Institute, Mysuru	1
Government Ayurveda Medical college, Mysuru	1
Adichunchanagiri University, Mandya	1
JSS College of Pharmacy, Mysuru	2
JSS Medical College, Mysuru	1
Life Sciences Departments & School of Life Sciences, JSS AHER, Mysuru	3
University of Mysore, Mysuru	5

Feedback form questions

1. Relevance of the course/ module content
2. Facilities provided by the Institute
3. Faculty members conducting the training
4. Training methodology
5. Relevance to their field of research
6. Usefulness of training in current role
7. Usefulness of training in future work/ job
8. Benefit on interaction with fellow participants of training
9. Relevance of course material supplied and related to training curriculum
10. Overall grading of the process of training
11. Recommendation to peers/ colleagues for the training programme

Overall feedback from participants in the UOM, JSS-AHER & DST-STUTI training program

