

A BRIEF REPORT
DST-STUTI SPONSORED SEVEN DAYS TRAINING PROGRAMME ON
DEVELOPING SKILLS AND KNOWLEDGE FOR “NANOTECHNOLOGY IN DRUG
DELIVERY” HELD FROM 23 to 29 DEC, 2022

The Department of Science & Technology under the aegis of Synergistic Training Programme Utilizing the Scientific & Technological Infrastructure (DST-STUTI), sponsored one week Hands on training programme on **Developing Skills and Knowledge for Nanotechnology in Drug Delivery**, which was organized from **23 to 29 December-2022**, by the **Department of Pharmaceutics (DST-FIST) and DSPRU-DSIR-CRTDH Centre for Advanced Formulation Technology, DPSRU, New Delhi** in collaboration with **Jamia Hamdard, New Delhi as a project management unit (PMU)**. The DST-STUTI Scheme is intended to provide training to human resource and its capacity building through open access to science and technology infrastructure across the country in departments funded under various DST schemes like DST-FIST, PURSE, SATHI. This event is aimed at providing hands-on training and sensitization of the state-of-the-art equipment and ensuring transparent access of science and technology facilities. Moreover, it will enable the budding researchers and professionals to develop better understanding and familiarization with the available resources/scientific equipment supported by the Govt. of India. The workshop was attended by post-graduates, research scholars and faculty members.

Honourable Prof. Ramesh K. Goyal, Vice Chancellor of DPSRU was the Chief Patron, Dr. O.P. Shukla, Registrar, Prof. P.K. Sahoo, Director DIPSAR, Prof. Harvinder Popli, Director SPS, Prof. Rajiv Tonk, Dean Student Welfare and Prof. Geeta Aggarwal, Dean Academics were the Chairpersons of this workshop. The Organizing Secretary of the workshop was Dr. Gaurav Kumar Jain, Associate Professor of Pharmaceutics and Prof. Geeta Aggarwal and Prof. Deepti Pandita were the Joint Organizing Secretaries. The Co-Patrons were Prof. Suhel Parvez, Coordinator DST-STUTI, PMU Jamia Hamdard, New Delhi. The primary objective of workshop was to:

- To imbibe skills for development and evaluation of nano drug delivery systems.
- Hands on training on nanoformulation processing equipments such as high pressure homogenizer, probe sonication, extrusion, spray drying etc.
- Hands on training on sophisticated analytical equipments such as HPLC, HPTLC, AAS and GC-MS.
- Hands on training on formulation optimization software and analytical software

Organized By:



In Association With:



DST-STUTI Training Program on
Developing Skills And Knowledge For

NANOTECHNOLOGY IN DRUG DELIVERY

23rd – 29th Dec 2022 | DPSRU, New Delhi

Chief Patron



Prof. Ramesh K Goyal
Vice Chancellor, DPSRU

Under Scheme of
Synergistic Training
Program Utilizing the
Scientific and
Technological
Infrastructure (STUTI)

An Initiative By
Department of Science
and Technology,
Government
of India

Chief Guest



Prof. M. Afshar Alam
Vice Chancellor, Jamia Hamdard

Eligibility

PG/ Ph.D. Scholars,
Post-Docs, RA fellows,
Early Career Faculty

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Invited Speakers



Prof. Sukhinder Cheema
Memorial University of
Newfoundland, Canada



Prof. B.S. Bhoop
UIPS, Panjab University,
Chandigarh, India



Prof. Farhan J. Ahmad
Jamia Hamdard,
New Delhi, India



Dr. Saurabh Arora
Arbro Pharmaceuticals
Auriga Research



Dr. Rishi Gupta
Application Specialist,
Anton Paar

Max 30 Participants will be selected based on screening of applicants whose area of research matches with the theme of this program. The confirmation will be communicated on or before 5/12/2022. Local Hospitality (Accommodation & Meal) will be provided.

Last Date of Registration

25 Nov. 2022



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Inauguration Day 1

The training program began with an inauguration ceremony on 23 December 2022 at Board Room of DPSRU with **Prof. R.K Goyal, Hon'ble Vice Chancellor, DPSRU** as **Chief Patron** and **Prof. M. Afshar Alam, Hon'ble Vice Chancellor, Jamia Hamdard** as **Chief Guest** for the day. The **Guest of Honor** was **Dr. Pratishtha Pandey** presently working as "Head & Scientist F" in the Science & Technology Infrastructure Programme, Department of Science and Technology (DST), Govt. Of India. The other guests for the day were **Prof. Suhel Parvez** from **Jamia Hamdard** as **PMU Coordinator**; **Dr. Prashant Kesarwani** as **invited speaker** from **Jamia Hamdard** and **Dr. Harish Kumar** from **Department of Science & Technology, Govt. of India**. The event was managed by the organizing secretary, **Dr. Gaurav K. Jain**, joint organizing secretary, **Prof. Geeta Aggarwal** and **Prof. Deepti Pandita** along with DPSU faculty coordinators, **Dr. Devesh Tewari, Dr. Pooja Mongia Raj, Dr. Anshul** and **Mr. Gaurav**.

Around 30 participants from all across India have been shortlisted for the program and were present. The skill development program opened with lamp lighting and Ma Saraswati Vandana. It was followed by an introduction of the university by Prof. Geeta Aggarwal, Dean Academics & joint organizing secretary of DST-STUTI program; a brief description of the DST-STUTI program by Dr. Gaurav K. Jain, organizing secretary of the program; addresses by Hon'ble Vice Chancellor, DPSRU, guests and vote of thanks by Prof. Deepti Pandita, joint organizing secretary of the program.





Day 1 Pictures of inauguration program of DST-STUTI conducted at DPSRU

Different sessions from Day 1 to Day 7 of the workshop have been summed up in the following report:

Training Program: Day 1

The inaugural function was followed by the worthy presentations of invited speakers viz. **Dr. Harish Kumar** from Department of Science and Technology, Govt. of India and **Dr. Prashant Kesharwani**, Assistant Professor, SPER, Jamia Hamdard.

Dr. Harish elaborated the various schemes of DST where participants and faculty members can apply for funding. He also briefed participants about relevance of DST-STUTI program and its importance for researchers across various domains.

The second half of the session had a lecture on “**The Art of Writing a Manuscript**” by **Dr. Prashant Kesharwani, Jamia Hamdard**”. Considering the importance of manuscript during PhD his lecture was well received and praised by the participants.



Day 1: Interactive session by Dr. Harish and Dr. Prashant

The interactive session was followed by Practical hands-on-training of Quality by Design (QbD) in Nanotechnology by **Dr. Atul Jain, Dr. Neetika Sharma, and Dr. Lalit Kumar**; faculty of DPSRU. Firstly, the theoretical concepts of QbD were discussed with the participants. This was followed by application of QbD and design expert on nanoformulation development using software provided to the participants by the faculty members. The training session was followed by a questionnaire round where participants asked their respective concerns and gave an assessment. The workshop was very informative and helpful for the participants. The whole event ended well with a group photograph of all the dignitaries and delegates.



Day 1: Interactive session and Hands-on-training of QbD to participants

Training Program: Day 2

The Day 2 commenced with the visit of participants to the manufacturing, analytical and training facility of Arbro Pharmaceuticals Pvt. Ltd, Kirti Nagar, New Delhi assisted by faculty members of DPSRU including Dr. Gaurav K. Jain, Dr. Devesh Tewari, Dr. Pooja Mongia Raj, and Dr. Anshul.

Dr. Saurabh Arora, Executive Director, Arbro Pharmaceuticals and Dr. Neha S. Arora, Director and Co-founder, Lab-training.com welcomed all the participants and faculty members.



Day 2: Participants visit to manufacturing & analytical facility of Arbro Pharmaceuticals, Kirti Nagar.

Dr Saurabh Arora showcased the “Use of Software’s in Scientific writing”. He detailed about the use of referencing software’s such as Endnote and Zotero and thoroughly explained how to write scientific manuscripts and thesis using advanced tools in Microsoft word and power point and how their use ease the process of scientific writing. He provided several examples where these writing tools can be used appropriately making scientific writing convenient and easy.



Day 2: Technical session by Dr. Saurabh Arora, Executive Director, Arbro Pharmaceuticals

Later he discussed about the future professional plans of the participants and offer them training opportunities in his company.

Post-lunch the participants visited manufacturing and analytical facility of Arbro divided into group of 4. The participants witnessed GMP manufacturing of various pharmaceuticals including Tablets, Capsules and Syrups. They also learned various analytical equipments such as HPLC, LC-MS/MS, GS-MS/MS and others.



Day 2: Felicitation of by Dr. Saurabh Arora by Organizing Secretary

Training Program: Day 3

The speakers for the Day 3 were Dr. Atul Jain, Dr. Pooja Mongia Raj and Dr. Anshul, all working as an Assistant Professors in the Department of Pharmaceutics, DPSRU.

Dr. Atul Jain taught the participants regarding use of endnote for referencing in manuscript and/or thesis writing. He practically trained them to use the endnote for their scientific writing. Participants were highly delighted as use of endnote will make their task of collecting information and referencing easier.

Dr. Pooja Mongia Raj emphasized on “**Development and Application of liposomes as versatile nanocarriers**”. She stated the preparation methodology, evaluation criteria and applications of liposomes in delivery of drugs, cosmeceutics, nutraceuticals & phytopharmaceuticals.



Day 3: Interactive session by Dr. Pooja Mongia Raj

On the other hand **Dr. Anshul**, provided quick theoretical insight to “**Development and Application of metallic nanoparticles as versatile nanocarriers**”. She highlighted the preparation methodology of metallic nanoparticles, its evaluation and application in treatment of various disorders.



Day 3: Interactive session by Dr. Anshul

The lecture session was followed by hands-on-training, where the students were divided into 2 batches and trained for **'preparation of liposomes and gold nanoparticles'** in laboratory by Dr. Pooja, Dr. Anshul, Dr Dalapathi, Dr. Beauty Behra, Dr. Meenakshi K Chauhan. Thereafter, they characterized the developed systems for size and charge using particle sizer and UV spectroscopy.

In the last training session, they were taught for various **'nanoparticle processing techniques such as spray drying, lyophilization, vacuum drying and homogenization'** by research scholars Mr. Gaurav and Mr Rajkumar.



Day 3: Interactive session by Mr. Gaurav

Training Program: Day 4

The invited speakers for the Day 4 was **Dr. Gaurav Pandey, Assistant Professor, Department of Chemical Engineering, University of Petroleum & Energy Studies, Dehradun, India**. Dr. Pandey delivered talk on **“An Introduction to Nano-Rheology for Pharmaceutical Industry Applications”**. He explained the role of nano-rheology in design of various dosage forms particularly nanosystems.



Day 4: Interactive session by Dr. Gaurav pandey

After the technical session, the day was kept for leisure and participants visited EOD and India Gate assisted by faculty members of DPSRU.



Training Program: Day 5

The Day 5 started with the visit of participants to the **Nanoformulation Research Laboratory of Jamia Hamdard, New Delhi**. The visit was accompanied by Dr. Devesh Tewari, Dr. Pooja Mongia Raj and Dr. Anshul from DPSRU. **Dr. Farhan Jalees Ahmad, Professor, School of Pharmaceutical Education & Research (SPER), & Dean, School of Interdisciplinary Sciences & Technology, Jamia Hamdard** and his team highlighted the latest research being carried out in their lab alongside demonstration of high-end facilities for nanoformulation development. The participants were demonstrated the working of Supercritical fluid sizer (Malvern), high pressure homogenizer (Aventis), rheometer (Anton Paar), and zetasizer (Malvern) by Mr. Nazeer, Research Scholar. Mr Nazeer and his team also demonstrated the preparation of Nanogel to the delegates followed by its characterization.



Day 5: Participants visit to Nanoformulation Research Laboratory, Jamia Hamdard and interaction with Prof. Farhan J. Ahmad.

Thereafter, **Prof. Farhan Jalees Ahmad** delivered the talk on active research carried out on nanomedicines in his lab and applications for the same. He also discussed various products and technologies transferred from his lab.

Later the delegates visited the state-of-art **Cryo-Transmission Electron Microscopy (Cryo-TEM)** facility at SPER, Jamia Hamdard. They prepared their slide and visualized nanogel under TEM. The Organizing team thanked **Prof. Vidhu Aeri, Dean, SPER** for allowing the participants to visit the Cryo-TEM facility and laboratory.



Day 5: Cryo-TEM demonstration to Participants

Post lunch, **Prof. Sheikh Raisuddin, Professor of Toxicology at Jamia Hamdard, New Delhi** delivered a detailed lecture on **“Toxicology of Nanoparticles”**. He stated that though the nanomedicines are boon but their fate should be properly studied before consuming them as a drug delivery system.



Day 5: Interactive session by Prof. Sheikh Raisuddin & felicitation by Prof. Ramesh K Goyal, Vice Chancellor, DPSRU & Dr. O.P. Shukla, Registrar, DPSRU

Followed by this was a lecture by Dr. Devesh Tewari, Assistant Professor of Pharmacognosy at DPSRU. He discussed the importance of **“Metabolomics in Phytopharmaceutical Development”**. The presentation was followed by demonstration of Gas Chromatography Mass Spectrometry and its application in metabolomics of phytopharmaceuticals. This was led by Dr. Devesh and his research team.



Day 5: Interactive session by Dr. Devesh Tewari

Training Program: Day 6

The speakers for the Day 6 were **Dr. Amanpreet Kaur** and **Dr. Sumit Sharma**, both are presently working as **Assistant Professor** in the **Department of Pharmaceutics** at **DPSRU, New Delhi**.

Dr. Amanpreet delivered her talk on “**Role of Nanoemulsions in Drug Delivery**” whereas **Dr. Sumit** discussed the “**Applications of microemulsions and nanoemulsions in delivery of drug & vaccines**”.



Day 6: Interactive session by Dr Sumit and Dr Amanpreet

Following their lecture, the students were provided **hands-on-training** for **Development and evaluation of Microemulsions & Nanoemulsions** by **Dr. Amanpreet** and **Dr Sumit** assisted by **Mr. Gaurav, PhD scholar** in the DSIR-CRTDH funded Centre for Advanced Formulation Technology. In the hand-on-training session, all the delegates were trained for preparation of microemulsions. They prepared various emulsions using optimization of oil/surfactant/ cosurfactant ratios. The practical training helped the delegates to understand the difference between emulsions, microemulsions, nanoemulsions, reverse micelles etc through use of ternary phase diagram. Followed by preparation the faculty members helped the students for evaluation and characterization of the formed emulsions by using advanced technologies like size determination using Malvern particle size analyser and volume using Coulter counter apparatus. Apart for this the basic characterization such as determination of pH, particulate matter and turbidity was also conducted and demonstrated to the participants. The practical training was conducted into 2 batches and in second half the batches were exchanged.



Later in the day the participants were asked to briefly present their ongoing research work. The participants enjoyed the useful interaction among themselves and the presentations open door for future possible collaborations.



Day 6: Presentations delivered by participants

Training Program: Day 7

The 7th day of the workshop started with training session on Quality by Design (QbD) by **Prof. Bhupinder Singh Bhoop**, Hon. Professor, University Institute of Pharm Sciences (UIPS), PU and Emeritus Professor of Chitkara University Innovation & Network as the resource person for this training and technical session. He has also been the Coordinator of UGC Centre of Advanced Studies (CAS) in Pharm. Sciences (2011-18), and Founder-Coordinator of National UGC Centre for Excellence in Nano Biomedical Applications (2011- 2020). Following practical aspects of QbD, he delivered the lecture titled “**Quality by Design Paradigms for Efficient Pharma Development: Option, Coercion or Benediction?**”.



Day 7: Interactive session by Prof. B.S. Bhoop

Following this **Dr. Gaurav K. Jain, Associate Professor at DPSRU and Organizing Secretary** trained students for various aspects of radiolabeling of drugs and thereof application of **gamma scintigraphy in Nano drug delivery** including drug delivery to pulmonary, dermal, ocular and oral route.



Day 7: Practical session by Dr. Gaurav K Jain

The practical session was followed by two invited lectures by guest speakers Prof. **Suhel Pervez, Professor, Jamia Hamdard, New Delhi** and Prof. **Sukhinder Cheema, Professor of Biochemistry at Memorial University of Newfoundland, Canada.**

The session started with the talk of Prof. Suhel Pervez on topic “**Maneuvering Nanotechnology in Drug Repurposing: Impact in Targeting Ischemic Stroke**”. Prof. **Suhel** gave a detailed account of ischemic stroke and how nanotechnology interventions are utilized for the treatment of ischemic stroke. In his talk, he discussed the impact of nanotechnology on drug delivery for targeting ischemic stroke. He enlightened the audience with the results of novel experiments of ongoing research in his laboratory.



Day 7: Interactive session by Prof. Suhel

Prof. **Sukhinder Cheema, Professor of Biochemistry at Memorial University of Newfoundland, Canada** delivered a talk on “**Bridging Basic, Translational and Clinical Research to improve Human Health**”. She shared her experience that how she inculcates her basic research into clinically driven products. During her talk, she motivated the delegates to perform their research to the set quality standards.



Day 7: Interactive session by Prof. Sukhinder Cheema

The workshop ended with the valedictory program.

Valedictory Program Day 7

The valedictory program started with the welcome address by **Prof. Geeta Aggarwal, Dean Academics and Joint Organizing Secretary** of the training program. She welcomed the invited guests and briefed about the curricular and extra-curricular activities and research and development of the University.

Following this **Dr. Gaurav Kumar Jain, Organizing Secretary** of the training program presented brief report of activities during the seven days of training. He thanked **Chief Guest, Prof. Sukhinder Cheema**, Prof. at Memorial University of Newfoundland, Canada. She is also an Adjunct Professor in the Department of Applied Human Nutrition, Mount Saint Vincent University, Canada. Dr. Gaurav also thanked **Guest of Honor, Prof. Suhel Parvez**, Professor at Jamia Hamdard, New Delhi and also coordinator for DST-STUTI Program. Dr. Jain thanked the guests for gracing the programme and concluded by wishing the participants good luck for their future endeavours.



Felicitation of guests by Honorable Vice Chancellor, DPSRU

Prof. Ramesh K Goyal, Vice Chancellor, DSPRU addresses the delegates and emphasised the importance of this workshop in the present scenario where training programs are very much required in capacity building and placement of students in reputed companies across the globe. He appreciated the workshop for making students familiar with the advanced nanotechnological techniques and for giving them a platform to raise their queries related to research. Prof. Sukhinder Cheema being Chief Guest congratulated DPSRU and the organising committee members for successful completion of the workshop. Prof. Suhel praised the DPSRU and congratulated the team for organising such a wonderful workshop.

Prof. Ramesh K Goyal, Prof. Sukhinder Cheema, Prof. Suhel Parvez and Dr. Gaurav K Jain distributed certificates of participation to the delegates. All the delegates gave their feedback and shared their experiences during seven days of the workshop. They all appreciated the presentations given by the invited speakers, training sessions by the experts, the hospitality and the management by the team.

The valedictory function concluded with a vote of thanks by the Joint organising secretary Prof. Deepti Pandita. She appreciated the efforts of participants for their presence and keen interest in the workshop and acknowledged the contribution of DST, Jamia Hamdard, and DSPRU fraternity who were instrumental in making the training program successful.



Day 7: Valedictory Session group image



Day 7: Presentation of certificates by dignitaries to the participants of DST-STUTI