



Report on Instrumental Training Sessions

Date: 9th - 11th September 2024

Venue: Shree Naranjibhai Lalbhai Patel College of Pharmacy, Umrakh

Coordinator: Mr. Yash D. Dudhwala (Assistant Professor), Mr. Lalit Chaudhari (Assistant Professor)

Convener: Dr. Ketan Shah (Principal)

1. Introduction

As part of our continuous efforts to enhance the practical skills of our students and better equip them for the pharmaceutical industry, a comprehensive Instrumental Training Program was organized at **Shree Naranjibhai Lalbhai Patel College of Pharmacy, Umrakh**. This training was specifically arranged for the B. Pharm last year students and took place over three days, from **9th to 11th September 2024**. A student participated in the event, with the primary aim of giving them hands-on experience in operating and understanding the critical instruments they will encounter in pharmaceutical research, quality assurance, and pharmacology laboratories.

In the evolving field of pharmacy, it is vital for students to not only possess theoretical knowledge but also to have a practical understanding of how pharmaceutical instruments work. Therefore, this training was designed to offer students direct exposure to the instruments available in our college and to enhance their technical competence.

2. Objective

The key objectives of the training program were:

- **Hands-on Exposure:** Providing students with practical experience in operating pharmaceutical instruments commonly used in the industry.
- **Skill Enhancement:** Building technical competence and confidence in the use of laboratory instruments to improve their employability.
- **Theory to Practice:** Bridging the gap between theoretical knowledge and its practical application in a laboratory setting, fostering a deeper understanding of the subject matter.

- **Research Insight:** Introducing students to the advanced instruments they may encounter in pharmaceutical research and quality control laboratories.

3. Participants

The training program was designed for the **7th-semester B. Pharm students**, with **95 students** divided into three batches for better management and focused learning.

- **Batch A:** 32 students
- **Batch B:** 32 students
- **Batch C:** 31 students

The division of students into batches ensured that each student received personalized attention, and the trainers could effectively guide them through the intricacies of the instruments.

4. Departments and Instruments Covered

The training sessions were organized across all key departments Pharmaceutics, Quality Assurance (QA), Pharmacognosy, Microbiology and Pharmacology each of which provided training on specific instruments relevant to their domain. The details of the instruments covered in each department are as follows:

4.1. Pharmaceutics Department

- **Tablet Compression Machine:** A critical instrument used in the formulation and development of tablets. Students learned the process of compressing powder into tablets and the various factors affecting the quality of tablets.
- **Lyophilizer (Freeze Dryer):** Students were trained on the principle of lyophilization, a key technique used for the preservation of sensitive pharmaceuticals. They observed the sublimation process and how it aids in drying pharmaceutical products without compromising their quality.
- **Dissolution Apparatus:** This apparatus is used to test the rate at which a drug dissolves in a medium. Students were given practical experience in understanding the importance of dissolution in drug formulation and how it relates to bioavailability.
- **Probe Sonicator:** A probe sonicator is commonly used in research for breaking up particles, dispersing samples, and facilitating the emulsification of solutions. It works by generating ultrasonic waves through a metal probe, which creates cavitation in liquids, resulting in mechanical shear forces. This is particularly useful for nanoparticle preparation, cell disruption, and homogenization of suspensions. The high-intensity energy delivered by the probe enables efficient mixing and size reduction, important in pharmaceutical formulations and drug delivery research.

- **Other miscellaneous equipment:** Other equipment like **Magnetic Stirrer**, **Rotary Evaporator**, and **Capsule Filling Apparatus** are essential tools in pharmaceutical labs. A **Magnetic Stirrer** is used to mix solutions uniformly by rotating a magnetic bar placed inside a container, ideal for dissolving solids or preparing homogenous mixtures. **The Rotary Evaporator** is crucial for solvent evaporation under reduced pressure, which allows for the efficient concentration and purification of liquid samples, often used in drug formulation. **The Capsule Filling Apparatus** facilitates the accurate and efficient filling of powders or granules into capsules, critical for dosage form development. These instruments contribute significantly to enhancing the precision and efficiency of pharmaceutical research and development.

4.2. Quality Assurance (QA) Department

- **UV-Visible Spectrophotometer:** The students were taught how to measure the absorbance and concentration of pharmaceutical substances using UV-Vis spectroscopy. The practical aspect included calibration, sample preparation, and data interpretation.
- **HPLC (High-Performance Liquid Chromatography):** One of the most vital instruments in pharmaceutical analysis, HPLC is used for the separation and quantification of compounds. The students gained practical insight into setting up the system, sample injection, and chromatogram interpretation.
- **IR (Infrared) Spectrophotometer:** Students were introduced to FTIR (Fourier Transform Infrared Spectroscopy), where they learned about functional group identification in pharmaceutical compounds. The practical session focused on sample preparation and spectrum analysis.
- **Other miscellaneous equipment:** Other than above various miscellaneous equipment play vital roles in analytical procedures. The **CAMAG TLC Chamber** is used for Thin Layer Chromatography, aiding in the separation and identification of compounds by creating a controlled environment for the development of chromatograms. The **Colorimeter** measures the absorbance of particular wavelengths of light by a solution, which helps in determining the concentration of a solute. The **Fluorimeter** is crucial for analyzing samples that exhibit fluorescence, making it useful for highly sensitive assays in pharmaceutical analysis. Lastly, the **pH Meter** provides precise measurements of the acidity or alkalinity of solutions, which is essential for ensuring the stability and efficacy of pharmaceutical products.

4.3. Pharmacology Department

- **Plethysmometer:** Used to measure the volume changes in limbs, this instrument is essential in pharmacological research for assessing inflammation. Students were trained in using it to evaluate the anti-inflammatory properties of drugs.
- **Rota-Rod Apparatus:** A behavioral pharmacology tool used to assess the motor coordination and balance of test animals. Students learned how to operate this instrument and understand its relevance in drug efficacy testing.
- **Analgesiometer:** This instrument is used for testing pain response in laboratory animals. Students gained insight into its application in assessing the analgesic effect of pharmaceutical compounds.
- **Other miscellaneous equipment:** Other than above various instruments were introduced to expand the students' understanding of behavioral and neurological testing in animals. The **Electroconvulsimeter** is used to induce and assess convulsions in rodents, aiding in anticonvulsant drug testing. The **Photoactometer** measures spontaneous locomotor activity, helping evaluate the effects of CNS drugs. **Cook's Pole Climbing Apparatus** tests an animal's motor coordination and learning response to auditory stimuli. **The Plus Maze** assesses anxiety behavior through open and closed arm exploration, while the **Light-Dark Box** and **Hole Board apparatuses** are used for anxiety and exploratory behavior testing, offering insights into the animal's mental state and drug effects.
- In addition to instrument training, students visited the Animal House to understand animal care and ethical considerations in research. They were also trained on various routes of drug administration and blood collection techniques, essential skills in pharmacology experiments. To enhance learning, videos of screening models were shown, along with demonstrations of pharmacological software, providing visual and technical insight into modern drug screening methods.

4.4 Microbiology Department:

Air Shower: An air shower is a self-contained unit used to minimize contamination in cleanroom environments. It uses high-velocity HEPA-filtered air jets to dislodge and remove dust and particulate matter from personnel and equipment before entering the aseptic lab. This step is crucial in maintaining a controlled microbial environment during sensitive microbiological experiments.

Aseptic Cabinet: An aseptic cabinet, also known as a biosafety cabinet, provides a sterile workspace for handling sensitive microbiological materials. It prevents contamination by

filtering the air and maintaining a laminar flow within the enclosure. This environment is essential for conducting microbial work, ensuring both sample integrity and user safety.

Autoclave: The autoclave is a critical instrument used for sterilization in the microbiology lab. By employing high-pressure saturated steam at temperatures typically reaching 121°C, it ensures the complete elimination of microbial life from instruments, glassware, and culture media. Autoclaving is an indispensable step in maintaining sterility in microbial experiments.

Zone Reader: The zone reader is an instrument used to measure the diameter of inhibition zones in antimicrobial sensitivity testing. It ensures accurate assessment of microbial growth inhibition around antibiotic discs, making it an essential tool in studies involving antibiotic resistance or microbial susceptibility analysis.

Aseptic Lab: The aseptic lab is a specialized area designed for performing microbiological work in a contamination-free environment. It is equipped with controlled air systems, including laminar airflow, and stringent cleaning protocols to maintain sterility. This lab setup is essential for growing pure microbial cultures and conducting sensitive experiments without contamination risks.

Laminar Air Flow: The laminar airflow unit provides a continuous stream of filtered air to create a sterile working environment. It uses HEPA filters to remove airborne contaminants, making it ideal for microbial inoculation, sample preparation, and other tasks requiring aseptic conditions. This equipment ensures minimal contamination in microbiological operations.

Colony Counter: The colony counter is used to count colonies of bacteria or fungi grown on agar plates. It helps quantify microbial growth in samples by enabling precise counting, which is essential for determining microbial concentration, studying growth kinetics, and conducting microbial quality control tests.

Other Equipment

Binocular Microscope:

The Binocular Microscope is an essential tool in Pharmacognosy, allowing for the detailed examination of plant cells, tissues, and microscopic structures of natural substances used in medicinal products. This instrument, equipped with two eyepieces, provides enhanced depth perception and comfortable viewing during prolonged observation sessions. In this training session, students were taught the operational techniques of the microscope, focusing on the identification of key anatomical features of crude drugs and plant materials. Understanding these microscopic characteristics is critical in the authentication and quality control of herbal products.

5. Training Schedule

The training was conducted over three days, with a rotational system for the three batches, ensuring that all students received detailed, focused training on the instruments from each department.

	09/09/2024	10/09/2024	11/09/2024
Batch A	Pharmaceutics	QA	Pharmacology
Batch B	QA	Pharmacology	Pharmaceutics
Batch C	Pharmacology	Pharmaceutics	QA

This rotational schedule allowed the batches to receive individualized training in smaller groups, ensuring each student had ample time to understand and operate the instruments.

6. Training Methodology

The training sessions were designed to be highly interactive, combining theoretical knowledge with practical applications. Each session began with an introduction to the basic working principles of the instruments, followed by live demonstrations. Afterward, the students were encouraged to handle the instruments themselves, under the supervision of expert faculty members, allowing them to get first-hand experience with the equipment.

7. Student Engagement and Feedback

The students showed a great deal of enthusiasm and actively participated in the sessions. They asked insightful questions, showcasing their curiosity and eagerness to learn. The feedback from students was overwhelmingly positive, with many expressing that the training helped solidify their understanding of complex instruments and their applications in real-world pharmaceutical scenarios.

Students mentioned that this kind of practical exposure was invaluable in supplementing their theoretical studies and expressed interest in further such hands-on training programs.

8. Conclusion

The Instrumental Training Program held at Shree Naranjibhai Lalbhai Patel College of Pharmacy was a resounding success. The training not only achieved its primary objective of providing hands-on learning to students but also greatly enhanced their confidence and competence in using pharmaceutical instruments. The well-structured format allowed students to bridge the gap between theory and practice, giving them valuable insights into laboratory operations.

This event reflects our college's commitment to delivering quality education that meets the needs of the pharmaceutical industry and prepares our students for their future careers. We extend our

sincere thanks to the faculty members, technical staff, and the Principal, Dr. Ketan Shah, for their unwavering support in making this program a success.

9. Acknowledgments:

Special thanks to the faculty from the Pharmaceutics, QA, Pharmacognosy and Pharmacology departments for their expert guidance and assistance during the training sessions. Their contributions were instrumental in the smooth execution of the program.

Photos of Instrument Training Session







