



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
OIL TECHNOLOGICAL AND PHARMACEUTICAL RESEARCH INSTITUTE

(Accredited by NAAC with "A" Grade)

ANANTHAPURAMU-515 001

Report on Pharmaceutical Research: Opportunities & Challenges in Drug Discovery

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Target audience: B.Pharm I Year and Pharm.D III, & IV year

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1. Challenges for Academicians in Research

- Difficulties in obtaining patents and research publications.
- Limited extramural research funding and PhD mentorship opportunities.
- Lack of collaboration with central laboratories and international universities.
- Limited research facilities and inadequate industry-academia partnerships.
- Low motivation and funding from institutes, with only 10% engagement in research.

2. Global Challenges in Pharmaceutical Research

- Increasing economic and intellectual property challenges.
- Shift from manufacturing to innovative drug discovery.
- Need for novel molecules to combat drug-resistant infectious diseases (MRSA, VRSA, MDR-TB).
- Addressing polypharmacy issues, adverse drug reactions, and toxicity.

3. Plant-Based Research & Genomics

- Importance of genome sequencing for medicinal plants to discover new bioactive molecules.
- Examples:
 - *Ocimum sanctum* (anti-cancer, anti-fertility, cardioprotective) shares 80% genomic similarity with *Salvia miltiorrhiza*.
 - *Momordica charantia* (bitter melon) genome reveals potential for natural diabetes treatment through plant-based insulin.

4. Drug Design & Development Strategies

- **Molecular Hybridization:** Combining pharmacophoric elements for enhanced drug efficacy.
- **Multi-Target Directed Drugs:** Developing drugs for multiple therapeutic targets.

- **Drug Repurposing:** Example - Metformin's effectiveness in cancer, tuberculosis, and memory loss.
- **Repositioning Strategy:** Example - Thalidomide repurposed for leprosy.

5. Urgent & Emerging Health Threats

- **Urgent Threats:** Drug-resistant *Clostridium difficile*, *Carbapenem-resistant Enterobacteriaceae* (CRE), *Neisseria gonorrhoeae*.
- **Serious Threats:** MDR-TB, drug-resistant *Acinetobacter*, *Salmonella*, *Shigella*, *MRSA*.
- **Concerning Threats:** *Vancomycin-resistant Staphylococcus aureus* (VRSA), erythromycin-resistant *Group A Streptococcus*.

6. Challenges in Antibiotic Discovery

- Lack of new antibiotics and integrative approaches in chemistry and biology.
- Need for research on drug stereochemistry and microorganism adaptation.
- Lack of knowledge on cell biology and genomic networks affecting antibiotic resistance.

7. Future Research Directions in Diabetes

- Immunotherapy trials for type 1 diabetes remain unsuccessful due to disease complexity.
- Need for personalized medicine based on individual phenotypic and genotypic traits.
- Challenges in preclinical research due to lack of suitable animal models.
- **International Mouse Phenotyping Consortium (IMPC)** identified 7719 human diseases with potential mouse model correlations.





Conclusion

Pharmaceutical research faces critical challenges in academia, industry collaboration, drug development, and disease management. Addressing these barriers requires enhanced funding, international collaboration, innovative research methodologies, and a focus on genomic and personalized medicine to drive future breakthroughs in drug discovery.