



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
OIL TECHNOLOGICAL AND PHARMACEUTICAL RESEARCH INSTITUTE

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Report on the Dissemination of Antimicrobial Drug Resistance in Tuberculosis

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Target audience: All the pharmacy final year and IV year Pharm.D students

Organized by: JNTUA-OTPRI, Anantapur.

1. Introduction

The session focused on the growing concern of **antimicrobial drug resistance (AMR) in Tuberculosis (TB)**. Dr. V. N. Azger Dusthacker highlighted the challenges, historical perspectives, current research, and global efforts to combat TB drug resistance.

2. NIRT's Contribution to TB Management

The **National Institute for Research in Tuberculosis (NIRT)** has played a pivotal role in TB management by:

- Conducting **home-based treatment trials** instead of sanatorium-based care.
- Leading the **largest BCG vaccine trial (Chengleput trial)**.
- Running **over 50 randomized clinical trials** on TB, extra-pulmonary TB, and HIV-TB.
- Establishing **DOTS (Directly Observed Therapy Short Course)** as a global strategy.
- Providing **nationwide TB burden estimates** and technical support to **National Tuberculosis Elimination Program (NTEP)**.
- Testing and rolling out **new regimens like BPaLM for multidrug-resistant TB (MDR-TB)**.

3. Understanding Antimicrobial Resistance (AMR) in TB

- **Alexander Fleming (1945)** warned against the irrational use of antibiotics, which has led to **multidrug-resistant (MDR) TB** today.

- The emergence of **Methicillin-resistant Staphylococcus aureus (MRSA)** in the 1960s marked the rise of **drug-resistant bacteria**.
- Overuse, misuse, and inappropriate dosing of antibiotics have accelerated AMR, imposing a **huge economic and health burden**.
- **Antimicrobial Stewardship** is crucial for controlling AMR.

4. Tuberculosis: A Global Health Crisis

- TB is a **leading infectious cause of death worldwide**, killing **1.25 million people in 2023** (WHO report).
- **27.8 lakh cases** were reported in India last year.
- **1.8 billion people globally are infected with Mycobacterium tuberculosis (M.tb)**.
- TB disproportionately affects **vulnerable groups** such as women, children, and HIV/AIDS patients.
- **Drug-resistant TB is on the rise**, making treatment more difficult and expensive.

5. Urgency to Combat TB

- **3836 deaths occur daily due to TB**.
- **1.2 million children** fall sick with TB every year.
- TB therapy lasts from **6 months to over 2 years**.
- **62% of MDR-TB cases go untreated**.
- MDR-TB could cost the world **\$16.7 trillion by 2050**.

6. Evolution of Drug Resistance in TB

A. Key Milestones in TB Treatment

- **1944: Streptomycin** discovery (Schatz, Bugle & Waksman).
- **1950s-1960s:** Combination therapy introduced to **prevent resistance**.
- **1965: Rifampicin** discovery—shortened TB treatment duration from **18 months to 9 months**.
- **1990s:** WHO introduced **DOTS regimen**, now a global standard.

B. Causes of Drug Resistance in TB

- **Primary Factors:**
 - **Inadequate control measures and low-quality drugs**.
 - **Non-adherence to treatment** by patients.
 - **Interrupted drug supply** leading to inconsistent treatment.
 - **Poor pharmacodynamics** failing to generate sterilizing drug concentrations.

7. Mechanisms of AMR in *Mycobacterium tuberculosis*

- **Intrinsic Drug Resistance:**
 - The **thick, hydrophobic cell wall** prevents drug penetration.
 - Mycolic acids and arabinogalactan play a key role in resistance.
- **Acquired Drug Resistance:**
 - **Drug target alterations**—mutations in target sites prevent drug binding.
 - **Prodrug activation disruption**—mutations in genes like **katG (isoniazid resistance)** and **pncA (pyrazinamide resistance)**.
 - **Overexpression of drug targets**—leading to **low-level resistance**.
 - **Efflux pump-mediated resistance**—removing drugs from bacterial cells, reducing drug efficacy.

8. Geographic Distribution of MDR-TB

- **India (27%), China (14%), and Russia (8%)** together account for nearly **50% of MDR-TB cases worldwide**.
- **In 2019, there were 465,000 new MDR-TB cases, with 182,000 deaths.**

9. Strategies for TB Control and WHO's End TB Strategy

- **WHO aims to reduce TB incidence by 80% by 2030.**
- **90% reduction in TB deaths by 2030.**
- **No catastrophic costs for TB-affected households.**
- **Expanding all-oral regimens and second-line drug therapies.**
- **Strengthening global TB surveillance and research.**



10. Conclusion and Key Takeaways

- **AMR in TB is a global crisis** that demands immediate action.
- **Proper antibiotic stewardship and adherence to treatment regimens** are crucial.
- **Novel drug regimens and rapid diagnostics** are needed to combat MDR-TB.
- **Global collaboration** between health organizations, governments, and research institutions is key to controlling TB.