Drug-resistant TB (DR-TB) is a preventable, treatable, and curable infectious killer after COVID-19, yet it is an preventable, treatable, and curable infectious killer after COVID-19, yet it is an global health threat. TB is the second leading infectious killer worldwide, with an estimated 10 million new cases and 1.5 million deaths annually. The World Health Organization (WHO) estimates that 1 out of 20 people will develop TB in their lifetime.

### DRUG SUSCEPTIBILITY TESTING (DST)

Drug susceptibility testing (DST) is the standard method for determining the susceptibility of TB to antituberculosis drugs. It involves culturing TB organisms on selective media and incubating them in a culture chamber. After several weeks, the results are interpreted based on the growth of the bacteria.

### TARGETED METHOD TO DETECT DRUG RESISTANCE GENES

Whole genome sequencing (WGS) is a targeted method to detect drug resistance genes. WGS provides comprehensive information on the genome of the TB organism, allowing for the identification of drug resistance genes and their resistance mechanism.

### CURRENT DRUG RESISTANCE AND DRUG SUSCEPTIBILITY TESTING (DST)

**Treatment Success Rates**

- **Drug-susceptible TB (2020):** 80%
- **Drug-resistant TB:**
  - Extensively drug-resistant (XDR): 40%
  - Pre-extensively drug-resistant (pre-XDR): 47%
  - Multidrug-resistant (MDR): 82%

**Drug Resistance Surveillance and Drug Susceptibility Testing (DST)**

- Drug resistance surveillance is critical to combat the global TB epidemic and informs TB treatment guidelines.
- DST is performed in laboratories around the world to monitor TB drug resistance.
- DST results are used to guide treatment regimens, ensuring that patients receive the most effective therapy.

**Drug-resistant TB (DR-TB)**

- **MDR-TB:** Drug resistance to two or more first-line drugs, including isoniazid and rifampicin.
- **XDR-TB:** Drug resistance to all first-line drugs and at least one second-line drug.
- **Pre-XDR-TB:** Drug resistance to at least one first-line drug and three or more second-line drugs.

**Treatment**

- **TB MDR-TB XDR-TB**
  - Duration of treatment is typically longer than for drug-susceptible TB.
  - Combination of multiple drugs is required.

**Outcome**

- **Drug-susceptible TB:** Generally treated with 6-12 months of directly observed therapy.
- **Drug-resistant TB:** Treatment can last up to 24 months or longer, depending on drug resistance.

### NGS WORKFLOW

**Simple:**

1. **Sample Preparation:** DNA extraction from sputum or other body fluids.
2. **Library Preparation:** Amplification of the target region using PCR.
3. **Sequencing:** Run the library on a sequencing platform.
4. **Analysis:** Interpret the sequencing data to identify drug resistance genes.

**Easy:**

1. **Sample Preparation:** DNA extraction from sputum or other body fluids.
2. **Library Preparation:** Amplification of the target region using PCR.
3. **Sequencing:** Run the library on a sequencing platform.
4. **Analysis:** Interpret the sequencing data to identify drug resistance genes.

**Accurate:**

1. **Sample Preparation:** DNA extraction from sputum or other body fluids.
2. **Library Preparation:** Amplification of the target region using PCR.
3. **Sequencing:** Run the library on a sequencing platform.
4. **Analysis:** Interpret the sequencing data to identify drug resistance genes.

### OUTLOOK

- **3.4 million people with TB and drug-resistant TB (DR-TB):**
  - 2.4 million tested for drug resistance.
  - 74% of patients started treatment for MDR/RR-TB in 2021.

- **801,000** deaths estimated.

- **$420,000-$67,000** treatment cost.

- **4-13 days from positive culture.**

- **Patient reported: $20-26 and household financial impact, resulting in lost 3% subpopulations.**

- **Drug-resistant TB (DR-TB):** significantly worsens outcome and increases mortality.

- **Drug-susceptible TB (DS-TB):** treatment success rates are lower for drug-resistant cases.

- **Pre-intervention rates:**
  - TB: 14.1%
  - MDR-TB: 4.9%
  - XDR-TB: <1%

- **Post-intervention rates:**
  - TB: 10.8%
  - MDR-TB: 2.4%
  - XDR-TB: <1%

- **Drug-resistant TB (DR-TB):**
  - TB: 5-15%
  - MDR-TB: 5-15%
  - XDR-TB: 3-15%