



HeroRATS for Tuberculosis Elimination

[Source: TH](#)

Why in News?

A Tanzanian non-profit organization conducts research to **train African giant pouched rats, or HeroRATS**, to detect [Tuberculosis \(TB\)](#).

- These rats show high accuracy, especially in resource-limited areas. This research could help speed up **TB detection in countries like India**.

What are the Key Findings of the Research on HeroRATS?

- **HeroRATS:** These rats have an exceptional sense of smell due to their sensitive **olfactory receptors**, allowing them to detect diseases like TB.
 - HeroRATS undergoes a **training** program, learning to detect TB in sputum samples (thick mucus from lungs). They can screen **100 samples in just 20 minutes**, compared to **3-4 days** for traditional methods.
 - Detected samples are then confirmed using **Ziehl-Neelsen and fluorescent microscopy**.
- **Increased Detection Rates:** HeroRATS **doubled TB detection rates** in children compared to conventional testing.
 - The rats were **six times more effective** at detecting TB in patients with a low bacillary load compared to those with a higher concentration of bacteria.
 - They outperformed traditional microscopy, which often fails in such cases.

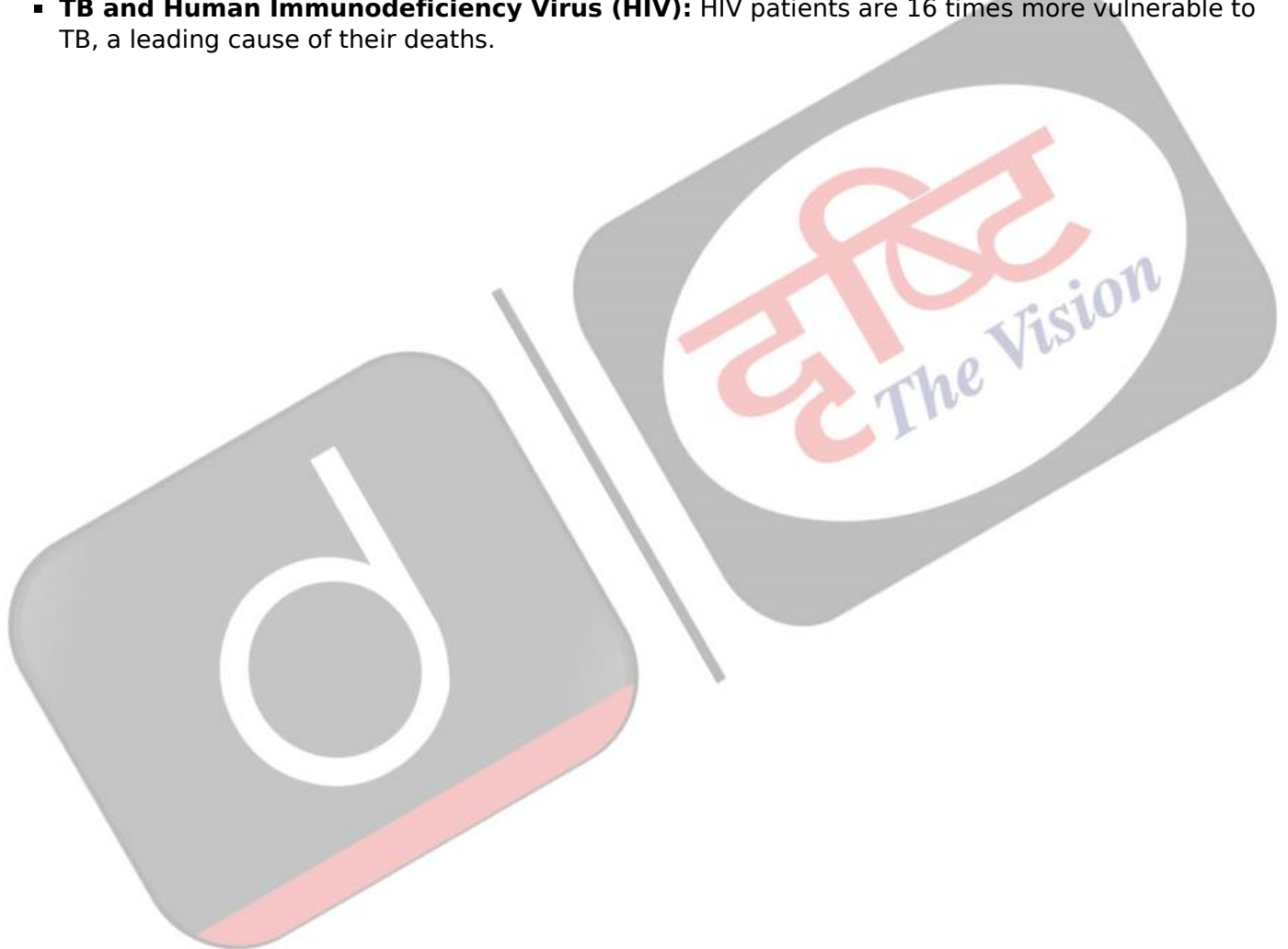
Note: Earlier, Magawa, a Tanzanian-born African giant pouched rat, was trained to detect landmines and alert handlers for their safe removal.

How can HeroRATS Help India's TB Elimination Efforts?

- **Potential Benefits for India:** HeroRATS provide fast, cost-effective TB screening, **especially for children and smear-negative cases**, aiding early diagnosis and reducing transmission, thereby contributing to lowering the [TB burden in India](#).
 - Integrating rat-based TB detection into the [National Tuberculosis Elimination Programme \(NTEP\)](#) through a phased rollout, starting in high-TB burden states, can enhance case detection.
- **TB in India:** India has the **highest burden of TB** with **two deaths occurring every three minutes** from TB.
 - NTEP, implemented under the aegis of the [National Health Mission](#), aims to make India **TB-free by 2025**, ahead of the global 2030 target.
 - TB incidence declined by **17.7% (237 to 195 per 100,000)** from 2015 to 2023, while TB deaths fell by **21.4% (28 to 22 per lakh)**.

What are the Key Facts About Tuberculosis?

- **About:** TB is a bacterial infection (*Mycobacterium tuberculosis*) affecting the lungs, spreading through the air.
 - Preventable and curable with antibiotics. About 25% of the global population is infected, but only **5-10% develop symptoms**.
- **Risk Factors:** Weak immune system, diabetes, malnutrition, tobacco, and alcohol use.
- **Diagnosis:** WHO recommends rapid molecular tests (Xpert MTB/RIF Ultra). Traditional methods struggle with low bacterial loads, especially in children difficult due to their inability to produce sufficient sputum for testing.
- **Prevention:** The **Bacille Calmette-Guérin (BCG) vaccine** is given to infants to prevent TB.
- **Treatment:** Standard TB treatment lasts 4-6 months. Incomplete treatment leads to drug-resistant TB.
- **Multidrug-resistant TB (MDR-TB):** It is resistant to *isoniazid and rifampicin* (medicines used to treat TB), treatable with costlier alternatives.
- **Extensively Drug-Resistant TB:** It is more severe, with limited treatment options.
- **TB and Human Immunodeficiency Virus (HIV):** HIV patients are 16 times more vulnerable to TB, a leading cause of their deaths.



Tuberculosis

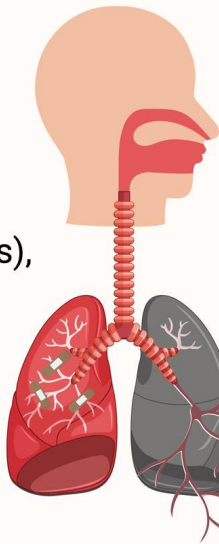


Drishti IAS

Tuberculosis (TB) is an infectious disease that affects the lungs.
Tuberculosis is preventable and curable.

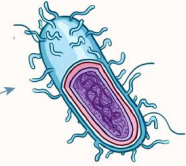
Prevention

- 📞 Seek medical intervention if symptoms persist
- 📞 If at a higher risk (HIV patients), get tested for TB.
- 📞 Practice good cough hygiene:
Wear a mask and avoid contact



Causes:

- *Mycobacterium tuberculosis*
- Coughing droplets
- Prolonged exposure from a patient



Symptoms of TB:

Chest pain
Weakness
Weight loss
Fever
Night sweats
Prolonged cough

Facts

- 1.6 million deaths in 2021 Worldwide
- 13th leading cause of death
- India aims to achieve the UN's TB-related SDGs by 2025, five years ahead of the global target to end the TB epidemic by 2030.

Ni-kshay Programme

- Nikshay Mitra are individuals or groups who adopt one TB patient for their treatment for a period of 6 months
- Provision of free drugs and diagnostics
- Ni-kshay Poshan Yojana for nutritional support to TB patients

#Tuberculosis

Macromatic Species Used for Disease Detection

- **Macromatic Species:** These species have a highly developed sense of smell, unlike microsmatic species with a reduced olfactory ability. Few macromatic species are:
 - **Dogs:** With 125-300 **million olfactory receptors** and a **special sensory organ called the Jacobson's organ**, they can detect diseases like **Parkinson's** and potentially lung cancer and diabetes.
 - **Ants:** A French study found **ants can detect cancer cells** within three days using chemical cues, offering a faster, cheaper alternative to traditional diagnostics.
 - **Honeybees:** Posses highly sensitive **olfactory antennal lobes**, can detect lung cancer, with 88% accuracy using synthetic biomarkers (artificial human breath that contains cancerous odours) in human breath.
- These highlight the growing field of **bio-detection**, where nature's instincts are harnessed for medical advancements.

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