

# Eradicating deadly tuberculosis with better tests and treatments

June 13 2023, by Anthony King

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Tuberculosis is caused by a bacterium that usually attacks the lungs but can target any part of the body. Credit: CDC on Unsplash

European researchers are tackling the world's most lethal infectious disease as part of efforts to end it by 2035. Dr. Cristina Vilaplana is a medical doctor passionate about helping patients with tuberculosis (TB). Her research could make a difference to a lot of people.

Each year globally, around 10 million adults and children fall ill with TB and 1.6 million people die. This makes it the world's leading infectious-disease killer.

While countries with [high TB rates](#) include China, India, Indonesia, Pakistan and the Philippines, [Europe](#) also still faces the disease.

"You might think TB is eradicated in Europe, but this is not the case," said Vilaplana, who works at the Germans Trias i Pujol Research Institute, or IGTP, in Barcelona, Spain.

She points to a persistence of high numbers of TB in small pockets—mostly socially deprived communities—across the continent.

Although the disease was temporarily knocked off the top spot by COVID-19, lockdowns and disruptions during the pandemic meant that fewer people were diagnosed and treated for TB than usual, storing up trouble.

In March this year, the World Health Organization (WHO) [warned](#) that TB deaths in the European region increased in 2021 compared with 2020. This is the first time in 20 years TB cases have been on the rise, prompting concerns about the feasibility of a goal to end the disease by 2035.

## **Lasting damage**

Like COVID-19, TB is spread through the air from one person to another. People infected with the tuberculosis bacteria can remain symptom-free.

Once the disease takes hold, however, the patient suffers both from the damage caused by the bacteria itself and from the inflammation that results as the body fights back.

Currently, about half of all tuberculosis patients are left with permanent damage. This means that, even when cured of the bacterial infection, they may still have a lasting effect that leaves them struggling to breathe when carrying out daily activities such as walking.

"Patients are cured but don't feel better," Vilaplana said. "I want them to feel better."

The insight led her to test some existing, common anti-inflammatory medications in mice with TB. When the mice were given ibuprofen or aspirin, their lungs suffered less damage.

As a result, the EU-funded [SMA-TB](#) project led by Vilaplana is [investigating](#) whether these widely available and relatively safe drugs could potentially also help patients with TB recover more fully from the disease.

The project, which began in January 2020, runs through June 2024.

It will feed data from the TB patients into a medical algorithm with the aim of predicting the course of the disease and identifying those people who will respond best to [anti-inflammatory drugs](#). This will help doctors come up with more personalized options for patients to recover better.

## Urine, breath tests

Across Europe, researchers are exploring new ways to tackle the disease.

"TB is far from eradicated," said Dr. Jose Dominguez, a tuberculosis researcher who is also based at the IGTP and leads another EU-funded project called [INNOVA4TB](#).

Combining expertise from 16 research institutions in six countries, the initiative is seeking simpler ways of diagnosing TB and groundbreaking treatments for it. The project started in January 2019 and runs through June 2024.

One strand being investigated is finding new biomarkers—a biological

indicator of the body's internal condition such as [blood pressure](#) or cholesterol levels—to make diagnosis quicker, cheaper and more accessible.

For example, the researchers have discovered tell-tale molecules in urine that are not only able to diagnose the illness but can potentially flag when a person is moving from a sleeping, or "latent," infection to an active one.

This is important because, while people in the transition stage to active TB may not yet have symptoms, they can still be contagious and spread the disease to family and friends.

"If you can identify patients who will suffer from tuberculosis, you could treat them with drugs and avoid progression," said Dominguez.

Work is also underway on ways to diagnose TB simply by testing a person's breath.

These two diagnostic approaches have several advantages over the existing sputum test, which requires patients to cough up mucus from the lungs. For one, they will be less unpleasant for people, especially children, who struggle with the sputum test.

The new tests will also be easy to conduct outside a hospital setting and the results will be available quickly—elements that could be useful in poorer countries and rural regions.

## **Resistant strains**

A worrying development has been the emergence of drug-resistant TB, especially in countries like Moldova and Ukraine.

First-line antibiotics don't work in such cases and the drugs given to patients instead can have serious side effects.

Moreover, it can take 18 months fully to treat drug-resistant forms of the disease.

"Imagine taking pills for one and a half years," said Dominguez. "It is not easy for patients to follow this treatment."

A team of INNOVA4TB researchers is developing and evaluating a [test](#) that can tell whether a person is infected with drug-resistant TB within three hours, allowing doctors to start treatment immediately.

Evaluations of the test in different locations are due to start soon in both Europe and India.

Another team is using DNA sequencing to identify and monitor drug-resistant TB strains in Ukraine and Moldova. This will help ensure that treatments offered are the most effective available.

## **New drugs, deliveries**

On the treatment front, the researchers have honed in on the [marine environment](#) as a rich source of potential new antimicrobial agents and are working to isolate new strains of Actinobacteria from the Black Sea with a view to developing new treatment options.

The project is also exploring new ways of delivering drugs deeper into the lungs. Traditionally this goal has been challenging because the lungs' natural defense mechanisms work to remove or inactivate anything that appears foreign.

Nanoparticles are emerging as a good vehicle for drug delivery and this

area has interesting potential, according to Dominguez.

He said such future treatments could perhaps be delivered via a spray directly to the lungs.

"The project is trying to help both European citizens and worldwide TB patients," said Dominguez.

**More information:**

- [SMA-TB](#)
- [INNOVA4TB](#)

Provided by Horizon: The EU Research & Innovation Magazine

Citation: Eradicating deadly tuberculosis with better tests and treatments (2023, June 13)  
retrieved 9 May 2024 from

<https://medicalxpress.com/news/2023-06-eradicating-deadly-tuberculosis-treatments.html>

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