



Breakthrough science

Tuberculosis: could a new vaccine soon be on hand?

With an estimated 28 million people at risk of death from TB by 2030, there is a drive to develop shorter treatment courses and new options that tackle drug resistance

by [Sue George](#)

Main image: A GSK scientist works on TB research in the lab

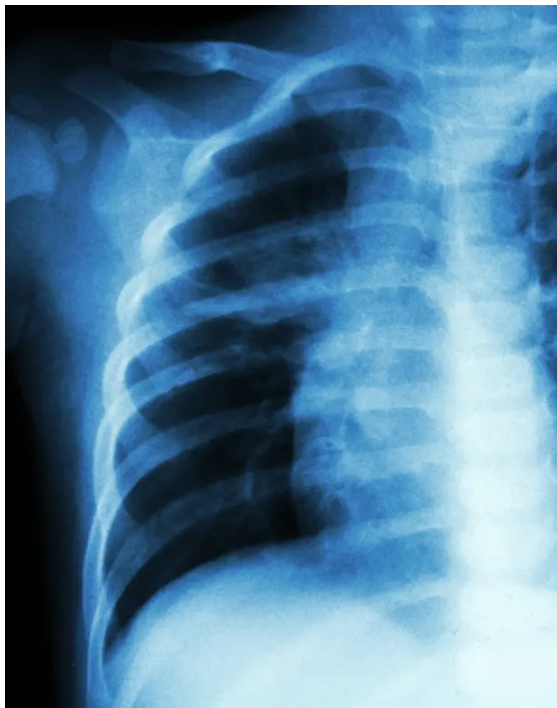


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160

Many people believe that tuberculosis (TB) is a disease confined to the past. Yet, in reality, it is the world's leading infectious cause of death - according to the [World Health Organization](#) (WHO), 10 million people became ill with TB in 2017 and 1.6 million people died from the disease. TB is also the leading killer among people living with HIV.



10 million
people contracted
TB in 2017

1.6 million
people died from
TB in 2017





X-ray of pulmonary TB; tuberculosis bacteria

Without immediate concrete action, an estimated [28 million people will die from TB by 2030](#), at a global economic cost of US\$1tn.

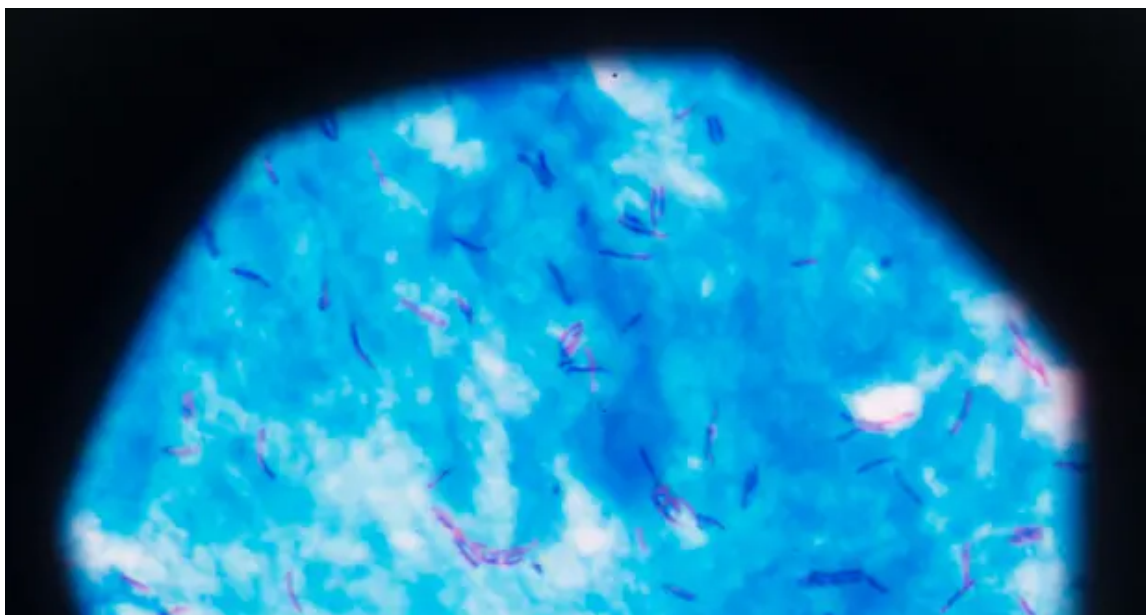
So what needs to be done in order to reduce these numbers?

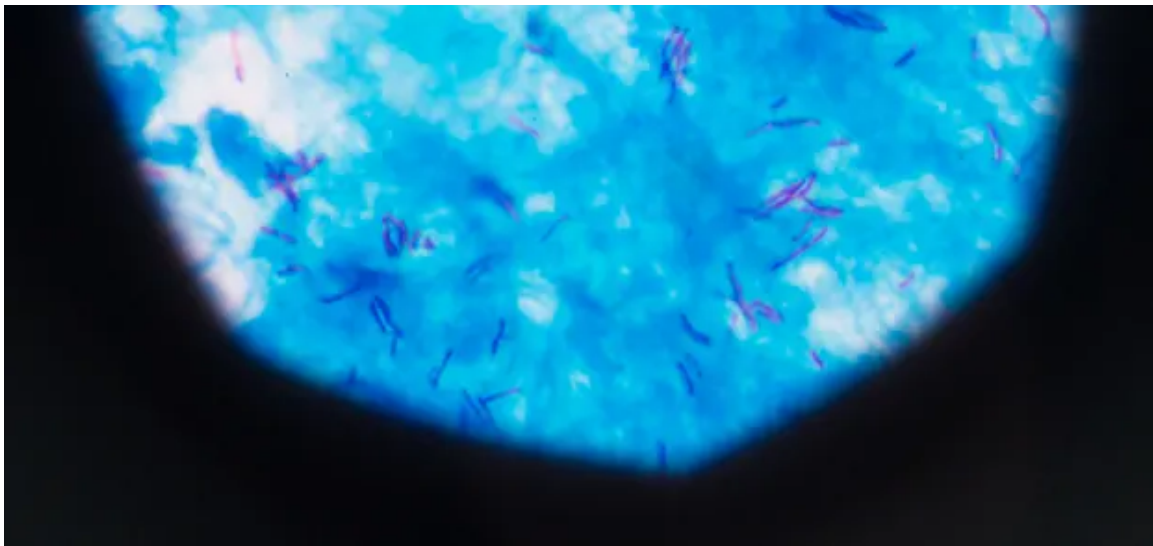
The first step is to prevent people from contracting TB in the first place. At present, the only vaccine that can be used against TB is the BCG vaccine, first developed nearly 100 years ago. To prevent pulmonary TB in [children](#), the BCG is given to babies and those under 16, but not to anyone over the age of 35.

Olivier Van Der Meeren leads clinical research for the TB vaccine at GSK. "[BCG] has been the most broadly used vaccine in the world. It has done a tremendous job and TB is decreasing. But vaccine efficacy wanes and [BCG] is not working in adults. We need new options to finish the job."

Research on the next generation of vaccines to prevent TB started several decades ago. But it became apparent that finding a [new vaccine](#) would be difficult. The pathogen that causes TB can remain latent in the body, evading the human immune system. According to [WHO](#), a quarter of the world's population have latent TB, where they have been infected by *Mycobacterium tuberculosis*, the bacterial pathogen causing TB.

Work by GSK and its partners means that there is now a candidate vaccine against TB in adults, having demonstrated efficacy in preventing adults with latent TB from developing active pulmonary TB. This candidate vaccine has completed a [phase II clinical trial](#) in Kenya, South Africa and Zambia, in which 3,575 people took part – half of whom received a placebo. The preliminary report indicates there were 22 cases of active pulmonary TB in people who received the placebo, but only 10 cases in those who received the vaccine. Final study results will be available later this year.





3,575
the number of
people who took
part in the trial

22
cases of TB
among placebo
group

10
cases of TB
among trial group

Mycobacterium tuberculosis cells on a blue background.

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"Being able to reduce a deadly disease by more than 50% in trial – that is a scientific breakthrough," says Van Der Meeren.

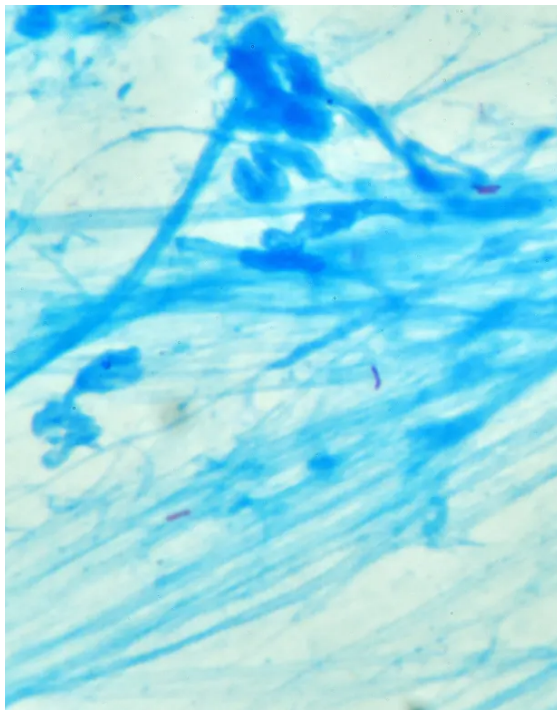
A significant factor in this success has been GSK's partnerships with a range of scientific and NGO partners, including the International Aids Vaccine Initiative [IAVI](#) (formerly not-for-profit biotech [Aeras](#)), the Bill and Melinda Gates Foundation, the UK's Department for International Development and others.

These collaborations are also key to GSK's work on TB treatment. The work of the [PreDiCT-TB](#) consortium, for instance, which ended in 2018, set out to find out how to predict the most effective combinations of drugs to treat TB. GSK is a member of the TB Drug Accelerator Programme, which aims to speed up new drug developments. In 2012, GSK's entire library of 2m compounds was opened up to researchers – including those from other pharmaceutical companies – just in case any of them were suitable for use against TB. Two hundred of these compounds were identified and opened up to researchers around the world.

David Barros Aguirre is head of the tuberculosis unit, based at the GSK laboratory at Tres Cantos in Spain. The lab has 50 staff working specifically on TB research and has worked in collaboration with researchers from other companies and countries to develop new drugs. After extensive tests in the Tres Cantos laboratory, the drugs become "clinical candidates" and are tested on humans.

"There is a whole machinery for drug discovery set up," he says. "The idea is to deliver enough candidates into trials over a time frame of the next 10 years."





90%
reduction in TB
deaths by 2030
called for by UN

At the moment, the only vaccine against TB is the BCG; acid-fast stains test for *Mycobacterium*

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One of the United Nations' sustainable development goals states that by 2030 there should be an 80% drop in new cases of TB and a 90% drop in people dying of the disease.



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"There are many challenges to ensure patients take their entire treatment course. Many patients do not finish [it], meaning that drug-resistant forms of TB can develop," explains Alison Webster, who is head of clinical, global health, at GSK.

"Optimising drug treatment regimens for TB comes from two angles," she says. First, the TB *Mycobacterium* is increasingly resistant to the drugs currently in use. Second, the drugs currently available to treat these multidrug-resistant strains can be quite toxic and lack the required effectiveness, resulting in long

treatments lasting up to two years. Even standard treatment lasts six months, using four different drugs.

As a result, there is a big drive to develop shorter courses of TB medication and also new drugs to tackle this drug resistance.

Two of GSK's potential medicines are about to go into clinical trials. [One](#) trial will assess a drug given to people [newly diagnosed](#) with TB to consider whether the quantity of bacteria in their sputum declines over two weeks. The other trial will use a new drug as part of a combination therapy, for a longer period, to see if it has the potential to cure patients in a much shorter time period than the current six months' treatment.

However, more research is necessary to develop a pipeline of novel drugs that can be tested in TB clinical trials, to ensure that these new potential medicines can be successfully combined in new regimens that deliver shorter, simpler and safer therapeutic options for TB patients worldwide.

"We are hoping to have better biomarkers that show how we should treat a patient, how the patient is responding to treatment and how to know when they are cured," says Barros Aguirre. "This is an area of confluence between vaccines and drugs which will help us be more efficacious and able to take important decisions rapidly."

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