IIT Indore: First in India to Develop a Powerful Weapon Against Tuberculosis

Researchers at the Indian Institute of Technology Indore, led by **Prof. Venkatesh Chelvam** from the Department of Chemistry and **Prof. Avinash Sonawane** from the Department of Biosciences and Biomedical Engineering, have developed new compounds that could help **combat drug-resistant tuberculosis (TB)**, a major health issue in India and globally.

As part of their drug discovery program, the team created over 150 new antibacterial compounds designed to treat TB. These compounds belong to the pyridine ring fused heterocyclic family, including pyrrollopyridines, indolopyridines, and others. The method used to develop these compounds was created in Prof. Chelvam's lab at IIT Indore and has been **granted patents in both India and the USA** for treating various diseases.

India, which accounts for nearly half of the world's TB cases, has never developed a TB drug. The technology developed at IIT Indore is a significant step forward in addressing the challenges of TB and drug resistance. The government spends thousands of crores every year to provide subsidized anti-TB drugs, and these new compounds could help **reduce long-term healthcare costs** while supporting indigenous drug development.

TB, caused by the bacteria Mycobacterium tuberculosis (Mtb), is one of the leading causes of death worldwide, claiming about 1.5 million lives annually. The situation is worsening due to the emergence of multidrug-resistant (MDR) and extremely drug-resistant (XDR) TB strains, which render most existing anti-TB drugs ineffective. According to the World Health Organization (WHO), there were around 480,000 new MDR-TB cases and an additional 100,000 cases of rifampicin-resistant TB (RR-TB) worldwide, with half of these occurring in China and India. Current TB treatments require six to nine months of antibiotics, but for MDR and XDR-TB, treatment can take several months to years with toxic drugs, often leading to high failure and mortality rates.

One major challenge in treating TB is that the bacteria can form a protective coating called "biofilms," which increases drug tolerance and makes the disease harder to treat. There's a critical need for new drugs that can effectively treat MDR-TB. The technology developed at IIT Indore addresses this need by targeting a key component in the bacteria's protective layer—mycolic acid (MA). MA is vital for the bacteria's cell wall integrity and survival. The IIT Indore team focused on an enzyme called polyketide synthetase 13 (Pks 13), which is involved in the final step of MA synthesis. The new compounds developed by the researchers prevent MA formation by binding to the Pks 13 protein, which leads to the death of the TB-causing bacteria.

The compounds have been tested in bacterial cultures and have shown promising results. They were effective in low concentrations without harming immune cells like macrophages. These compounds also killed TB bacteria isolated from patients, including strains resistant to standard drugs like isoniazid. The promising results bring hope in the long and expensive process of drug development.

Currently, the most potent of these anti-TB compounds are undergoing testing in small animals like mice, aiming to improve therapies for MDR and XDR-TB. The ultimate goal of this research is to provide new tools for treating TB and drug-resistant TB, which remains a significant challenge for both developing and developed countries.

Interested parties are encouraged to contact on the *eo-ctr@iiti.ac.in* for more information on technology transfer, commercialization and collaboration opportunities.