



## Enhancing BCG Vaccine Efficacy

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A recent study has found that **curcumin in nanoparticle form** has the potential to **enhance the efficacy of Bacille Calmette-Guérin (BCG) vaccine, used against Tuberculosis (TB).**

### Curcumin

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- Curcumin is the **active ingredient of the dietary spice turmeric (Curcuma longa)** and has been consumed for medicinal purposes for thousands of years.
- It has a **wide range of applications** such as antibacterial activity, anti-inflammatory, anti-oxidant, chemotherapeutic, anti-proliferative, wound healing, antiparasitic, anti-malarial, diabetes, obesity, neurologic, psychiatric disorders and cancer, as well as chronic illnesses affecting the eyes, lungs, etc.
- Although curcumin has shown therapeutic efficacy against many human ailments, one of the major problems with curcumin is its **poor bioavailability.**
- One of the promising approaches to increase the bioavailability of curcumin include the **use of nanoparticles.**

### Lacuna in BCG Vaccine

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- BCG vaccine is effective against disseminated and meningeal TB in young children.
- The vaccine induces two types of immune cells — **effector memory T cells and central memory T cells.**
- **The effector memory T cells** play a crucial role in mounting an immediate immune response against virulent TB bacteria and also kill them.
- **The central memory T cells** help in long-term protection in children. But, after persisting for some time, the central memory cells **ultimately diminish.** As a result, the **protection does not last beyond childhood** and adults become vulnerable to TB infection despite BCG vaccination.

### Curcumin in Nanoparticle Form & Enhanced Efficiency

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- One way of enhancing the efficacy of the BCG vaccine is **by increasing the number of central memory cells** so they last longer and confer protection for a longer duration.
- The researchers found that injecting curcumin nanoparticles, soon after vaccinating the mice with BCG, produced an appreciable enhancement of the central memory T cells.
- Curcumin also helps in the **activation of innate immune cells** known as macrophages and dendritic cells. TB bacteria reside and grow inside the macrophages. But once activated by curcumin nanoparticles, macrophages and dendritic cells clear the bacteria.
- It **enhances the level of TB-specific acquired immune cells (Th1 and Th17 cells)** and simultaneously **reduces the level of certain other cells (Th2 and Tregs)** thus improving the efficacy of the BCG vaccine.
  - After TB infection, the levels of Th2 and Tregs cells increase and they inhibit the host-protective effect of Th1 and Th17 responses.
- It, in a way **confers protection against adult pulmonary TB.**

**Source: TH**