

## **Nano-formulation of ethambutol with multifunctional graphene oxide and magnetic nanoparticles retains its anti-tubercular activity with prospects of improving chemotherapeutic efficacy**

### **ABSTRACT**

Tuberculosis (TB) is a dreadful bacterial disease, infecting millions of human and cattle every year worldwide. More than 50 years after its discovery, ethambutol continues to be an effective part of the World Health Organization's recommended frontline chemotherapy against TB. However, the lengthy treatment regimens consisting of a cocktail of antibiotics affect patient compliance. There is an urgent need to improve the current therapy so as to reduce treatment duration and dosing frequency. In this study, we have designed a novel anti-TB multifunctional formulation by fabricating graphene oxide with iron oxide magnetite nanoparticles serving as a nano-carrier on to which ethambutol was successfully loaded. The designed nanoformulation was characterised using various analytical techniques. The release of ethambutol from anti-TB multifunctional nanoparticles formulation was found to be sustained over a significantly longer period of time in phosphate buffer saline solution at two physiological pH (7.4 and 4.8). Furthermore, the nano-formulation showed potent anti-tubercular activity while remaining non-toxic to the eukaryotic cells tested. The results of this in vitro evaluation of the newly designed nano-formulation endorse its further development in vivo.

**Keyword:** Multifunctional nanocarrier; Nanoformulation; Ambutol; Graphene oxide; Iron oxide magnetite; Tuberculosis