Development of a highly biocompatible antituberculosis nanodelivery formulation based on para-aminosalicylic acid—zinc layered hydroxide nanocomposites

Abstract

Tuberculosis is a lethal epidemic, difficult to control disease, claiming thousands of lives every year. We have developed a nanodelivery formulation based on para-aminosalicylic acid (PAS) and zinc layered hydroxide using zinc nitrate salt as a precursor. The developed formulation has a fourfold higher efficacy of PAS against mycobacterium tuberculosis with a minimum inhibitory concentration (MIC) found to be at 1.40 μg/mL compared to the free drug PAS with a MIC of 5.0 μg/mL. The newly developed formulation was also found active against Gram-positive bacteria, Gram-negative bacteria, and Candida albicans. The formulation was also found to be biocompatible with human normal lung cells MRC-5 and mouse fibroblast cells-3T3. The in vitro release of PAS from the formulation was found to be sustained in a human body simulated phosphate buffer saline (PBS) solution at pH values of 7.4 and 4.8. Most importantly the nanocomposite prepared using zinc nitrate salt was advantageous in terms of yield and free from toxic zinc oxide contamination and had higher biocompatibility compared to one prepared using a zinc oxide precursor. In summary, these promising in vitro results are highly encouraging for the continued investigation of para-aminosalicylic acid and zinc layered hydroxide nanocomposites in vivo and eventual preclinical studies.

Keyword: Tuberculosis; Para-aminosalicylic acid; Zinc layered hydroxide; Biocompatible