TITLE

Antifungal activity of functionalized carbon nanotubes with amphotericin B against Candida biofilms

ABSTRACT

Invasive *Candida* infections are associated with considerable attributable morbidity, mortality rates and high health-care costs. An important factor in its pathogenesis is the ability of *Candida* strains to form biofilms and adhere to host tissues and biomaterial surfaces (more frequently vascular catheters). *Candida albicans* is the most frequent of all fungal biofilm formers exhibiting increased resistance to conventional drugs compared to their planktonic cells. Amphotericin B (AmB) has been widely used against *C. albicans* biofilms, however in some cases its medical application is limited by its toxicity, poor solubility and its inability to eradicate the biofilm as antifungal monotherapy. Therefore a strong medical but also economical motivation for the development of novel anti-fungal biofilm strategies is requested. Nanomaterials and in particular, carbon nanotubes (CNTs), display unique and well-defined physical and chemical properties, including a very high surface area to volume ratio and are emerging as novel nanomaterials for various biomedical applications, since they can be used to deliver a variety of therapeutic agents, including antimicrobial agents, to selectively target disease sites. These applications are particularly enhanced by their ability to penetrate biological membranes with relatively low cytotoxicity after their biofunctionalization. The aim of the study is firstly to successfully conjugate AmB on multiwalled carbon natoubes and secondly to evaluate the antifungal activity of biofunctionalized nanotubes (MWNTs) against *Candida albicans* biofilms. Interestingly, conjugated nanotubes with AmB (AmB-PEG-MWNTs) presented a significantly enhanced anti-biofilm activity compared to AmB, especially in low concentrations.This study indicates that this novel nano-formulation of AmB might be a promising treatment for various fungal infections.