Fungi are the fourth most common cause of bloodstream infections in hospitalized patients. In the last years, a significant increase in the number of patients with fungal infections has been reported. This is partially due to fungal resistance to some antibiotics, and the increased number of individuals with reduced immune responses caused by AIDS or the effects of chemotherapy. The design of materials or surfaces that mitigate or prevent fungal colonization or infection with subsequent biofilm formation would be beneficial in medicine, especially because no surfaces/materials with specific and efficient antifungal properties currently exist.

Several antifungal agents have been proposed in the last years. Unfortunately, most of the agents are not currently approved by Food Drug Administration (FDA), and their antifungal spectrum and cytotoxicity profile in contact with human cells is practically unknown. Amphotericin B (AmB) is a potent antifungal agent approved by FDA, widely used in clinical practice, effective against a large spectrum of fungi and few resistant strains of fungi have been reported so far. Experimental data indicates that AmB associates with the ergosterol in the fungal membrane, forming pores and consequently disrupting the ionic gradient.

Here we present antifungal nanoparticles with AmB immobilized to their surface. We hypothesize that such particles can be used to modify surfaces of medical devices. Antifungal nanoparticles can produce longer lasting antifungal effectiveness, and can ensure that fungi encountering the antifungal agent are exposed to only high surface concentrations as opposed to low systemic ones created by slow release devices.

The nanoparticles were tested against five species of Candida with highly positive results. Our formulation is more effective in our experimental frame than silver nanoparticles, one of the most used antimicrobials in the market. We confirmed that our nanoparticles require contact with the fungal cells in order to have antifungal activity. Additionally, the experimental results show that the nanoparticles can be reused several times and, when attached to a solid surface, they maintain their antifungal properties.

References