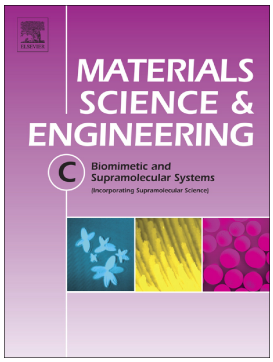

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EFFECTS OF HEXAGONAL BORON NITRIDE NANOPARTICLES ON ANTIMICROBIAL AND ANTIBIOFILM ACTIVITIES, CELL VIABILITY

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Abstract

The objective of this work was to investigate the antimicrobial and antibiofilm activities of hBN nanoparticles against *Streptococcus mutans* 3.3, *Staphylococcus pasteuri* M3, *Candida* sp M25 and *S. mutans* ATTC 25175. Minimum Inhibitory Concentration (MIC) of hBN nanoparticles were determined against *Streptococcus mutans* 3.3, *Staphylococcus pasteuri* M3, *Candida* sp M25 growth. In addition, we aimed to evaluate the cytotoxic effects of hBN nanoparticles on human normal skin fibroblast (CCD-1094Sk, ATCC® CRL 2120 ™) and Madin Darby Canine Kidney (MDCK) cells by using various toxicological endpoints. Cell viability was assessed by MTT, SRB and PicoGreen assays. After experimental analyses, it was revealed that hBN nanoparticles show better MIC results. The MIC values were higher for *Streptococcus mutans* ATTC 25175 and *Staphylococcus pasteuri* M3 and lower against *Streptococcus mutans* 3.3, *Candida* sp. M25. Surprisingly, hBN nanoparticles showed a high antibiofilm activity on preformed biofilm, which inhibited biofilm growth of *S. mutans* 3.3, *S. mutans* ATTC 25175 and *Candida* sp.M25. These results show that hBN nanoparticles may be an option to control oral biofilms.In cell viability tests, the cells were exposed to 0.025–0.4 mg/mL concentrations of hBN nano particle suspension. The exposure time to the hBN nanoparticle suspensions were 24 hours and 48 hours. The results indicate that there is no cytotoxic effect on CRL 2120 and MDCK cells at the concentration range of 0.025-0.1 mg/mL. However, on both first and second day, hBN caused mild cytotoxicity on CRL-2120 cells at high hBN concentration (0.2-0.4 mg/mL). Considering all the results of this study, in appropriate concentration (0.1 mg/mL) hBN nanoparticles can be considered a potential safe oral care product.

Keywords: Antimicrobial; antibiofilm; hexagonal boron nitride; cell viability

1. Introduction

The potential risks and health hazards with nanomaterials have motivated scientists to search for nanoparticles with good biocompatibility and no cytotoxicity[1]. Therefore biocompatibility and different bioapplications of nanomaterials have become hot topics in recent years [2-4]. Many nanomaterials, especially metal, metal oxide and organic nanomaterials have antimicrobial properties against numerous pathogen viral and bacterial species and they have been widely used in clinical and dentistry applications due to their antimicrobial properties [5,6]. Biofilms are agglomerates of microorganisms that adhere to a substrate. The first of all, the bacteria bind to the surface and then