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Original Article

MgB_2 powders and bioevaluation of their interaction with planktonic microbes, biofilms, and tumor cells

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ABSTRACT

Commercial nanopowders of MgB_2 were characterized from the viewpoint of granulometric distribution, structure, microstructure, and pH behavior in water. The powders are very different: a higher amount of the MgB_2 phase with a lower tendency for agglomeration determines a higher rate of pH-increase. A higher rate of pH-increase usually produces a stronger antimicrobial activity against *Staphylococcus aureus*, *Enterococcus faecium*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Candida albicans*, and *Candida parapsilosis* reference strains. The variation of the pH-increase rate suggests the possibility of temporo-spatial control of MgB_2 bioactivity, although the contribution of other factors should not be neglected. Remarkably, the efficiency of the MgB_2 powders is higher against biofilms than on microbes in the planktonic state. Further, our experiments confirm the antimicrobial efficiency of MgB_2 in the *in vitro* tests against 29 methicillin resistant clinical *S. aureus* isolates and 33 vancomycin resistant *E. faecium/faecalis* strains, but in this case the biofilms are more resistant than planktonic cells. The MgB_2 treatment of infected mice led to a significant decrease of *E. coli* colonization in liver, spleen and peritoneal liquid and it also caused changes in the intestinal microbiota. The activity of powders on HeLa and HT-29 tumor cell lines was assessed by inverted microscopy, flow cytometry, and evaluation of the cellular cycle. MgB_2 inhibits tumor cell growth influencing DNA synthesis (S-phase). The obtained results indicate that the tested powders could provide promising solutions for the

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