In vivo efficacy of bevacizumab-loaded albumin nanoparticles in the treatment of colorectal cancer

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Abstract

Bevacizumab (as other monoclonal antibodies) has now become a mainstay in the treatment of several cancers in spite of some limitations, including poor tumour penetration and the development of resistance mechanisms. Its nanoencapsulation may be an adequate strategy to minimize these problems. The aim of this work was to evaluate the efficacy of bevacizumab-loaded nanoparticles (B-NP-PEG) on a xenograft model of human colorectal cancer. For this purpose, human serum albumin nanoparticles were prepared by coacervation, then coated with poly(ethylene glycol) and freeze-dried. B-NP-PEG displayed a mean size of about 300 nm and a bevacizumab loading of approximately 145 μg/mg. An in vivo study was conducted in the HT-29 xenograft model of colorectal cancer. Both, free and nanoencapsulated bevacizumab, induced a similar reduction in the tumour growth rate of about 50%, when compared to controls. By microPET imaging analysis, B-NP-PEG was found to be a more effective treatment in decreasing the glycolysis and metabolic tumour volume than free bevacizumab, suggesting higher efficacy. These results correlated well with the capability of B-NP-PEG to increase about fourfold the levels of intratumour bevacizumab, compared with the conventional formulation. In parallel, B-NP-PEG displayed six-times lower amounts of bevacizumab in blood than the aqueous formulation of the antibody, suggesting a lower incidence of potential undesirable side effects. In summary, albumin-based nanoparticles may be adequate carriers to promote the delivery of monoclonal antibodies (i.e. bevacizumab) to tumour tissues.