Scolicidal and apoptotic activities of Albendazole sulfoxide and albendazole sulfoxide-loaded PLGA-PEG as a novel nanopolymeric particle against Echinococcus granulosus protoscoleces.

Abstract:

Treatment failures attributed to human cystic echinococcosis (CE) with Albendazole (ABZ) have been associated with its low solubility, poor drug absorption rate resulting in low drug level in plasma and hydatid cysts. Recently protoscolicidal effects of ABZ loaded liposome nanoparticles have broadly evaluated; however these particles have several challenges due to their low encapsulated load and poor solubility. This study was designed to evaluate and compare in vitro apoptotic activities of ABZ sulfoxide (ABZs) and ABZs loaded PLGA-PEG against protoscoleces (PSC). ABZs loaded PLGA-PEG was prepared by double emulsion method (W1/O/W2). Various concentrations (50, 100, 150 and 200 μg/ml) of ABZs and ABZs loaded PLGA-PEG at different exposure times (5, 10, 20, 30 and 60 min) were experimentally tested against protoscoleces of CE. ABZs loaded PLGA-PEG at concentrations 150 and 200 μg/ml showed 100% scolicidal rate in all times while concentration 200 μg/ml of ABZs after 20, 30 and 60 min of exposure times showed 94%, 100% and 100% mortality rates respectively. The expression of Caspase-3 mRNA was assessed by semi-quantitative RT-PCR after 15 h of exposure. Caspase-3 mRNA expression was higher in both PSCtreated ABZs and PSC-treated-ABZs loaded PLGA-PEG than control groups ($P<0.05$) however, no significant difference was observed between apoptotic intensity of PSCtreated ABZs and PSC-treated-ABZs loaded PLGA-PEG ($P>0.05$). DNA fragmentation assay and ultrastructural changes revealed that ABZs and ABZs loaded PLGA-PEG were associated with apoptosis of PSC. The higher permeability and scolicidal rate of ABZs loaded PLGA-PEG could be a potential alternative strategy to improve the treatment of human CE.

Keywords: Cystic echinococcosis . Albendazole sulfoxide . PLGA-PEG . Apoptosis . Caspase-3 . Protoscoleces.