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Anticancer activity of grassy Hystric brachyura bezoar and its mechanisms of action: An in vitro and in vivo based study

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Abstract

Porcupine bezoar (PB) is a calcified undigested material generally found in porcupine's (Hystric brachyura) gastrointestinal tract. The bezoar is traditionally used in South East Asia and Europe for the treatment of cancer, poisoning, dengue, typhoid, etc. However, limited scientific studies have been performed to verify its anticancer potential to substantiate its traditional claims in the treatment of cancers. Hence, this study was aimed at investigating the in vitro and in vivo anticancer properties of two grassy PB aqueous extract (PB-A and PB-B) using A375 cancer cell line and zebrafish model, respectively. This paper presents the first report on in vitro A375 cell viability assay, apoptosis assay, cell cycle arrest assay, migration assay, invasion assay, qPCR experimental assay and in vivo anti-angiogenesis assay using the grassy PBs. Experimental findings revealed IC50 value are 26.59 +/- 1.37 mu g/mL and 30.12 +/- 3.25 mu g/mL for PB-A and PB-B respectively. PBs showed anti-proliferative activity with no significant cytotoxic effect on normal human dermal fibroblast (NHDF). PBs were also found to induce apoptosis via intrinsic pathway and arrest cell cycle at G2/M phase. Additionally, the findings indicated its ability to debilitate migration and invasion of A375 cells. Further evaluation using embryo zebrafish model revealed LC50 = 450.0 +/- 2.50 mu g/mL and 58.7 +/- 5.0 mu g/mL for PB-A and PB-B which also exerted anti-angiogenesis effect in zebrafish. Moreover, stearic acid, ursodeoxycholic acid and pregnenolone were identified as possible metabolites that might contribute to the anticancer effect of the both PBs. Overall, this study demonstrated that PB-A and PB-B possess potential in vitro and in vivo anticancer effects which are elicited through selective cytotoxic effect, induction of apoptosis, inhibition of migration and invasion and anti-angiogenesis. This study provides scientific evidence that the porcupine bezoar do possess anti-cancer efficacy and further justifies its traditional utility. However, more experiments with higher vertebrae models are still warranted to validate its traditional claims as an anticancer agent.

Keywords

Author Keywords: Porcupine bezoar; Apoptosis; Cell cycle arrest; Anti-angiogenesis; Anti-metastasis
KeyWords Plus: STEARIC-ACID; INDUCE APOPTOSIS; PALMITIC ACID; CELL-CYCLE; CANCER; MELANOMA; ANTIDOTE; TARGETS; STONES; ESTER

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