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POSTER

Taraxacum officinale (dandelion) extract efficiently inhibited the breast cancer stem cell proliferation

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Abstract

Introduction:
Breast cancer stem cells (BCSCs) play an important role in breast cancer initiation, metastasis, recurrence, and drug resistance. Therefore, targeting BCSCs is an essential strategy to suppress cancer growth. This study aimed to evaluate the effects of dandelion Taraxacum officinale extracts on BCSC proliferation in vitro in 2D and 3D cell culture platforms.

Methods:
The BCSCs were maintained understandard conditions, verified for expression of CD44 and CD24 surface markers, and transfected with GFP before use in experiments. In the 2D model, the BCSCs were cultured as adherent cells in standard culture plates; in the 3D model, the BCSCs were cultured on low-adherent plates to form spheroids. The effect of Dandelion extracts on proliferation of BCSC was assessed by evaluating induction of cell death, expression of genes of death receptor signaling pathways, and production of reactive oxygen species (ROS) by BCSCs.

Results:
BCSCs formed spheroids as microtumors in vitro and exhibited some in vivo characteristics of tumors, such as increased expression of N-cadherin and Slug, decreased expression of E-cadherin, capacity to invade into the extracellular matrix (ECM), and presence of a hypoxic environment at the core of tumor spheroids. The dandelion extracts significantly inhibited BCSC proliferation in both two-dimensional (2D) and three-dimensional (3D) models of BCSCs. However, the IC50 value of dandelion extracts in BCSCs in the 3D model was much higher than that in the 2D model. The results also demonstrated that BCSCs treated with Dandelion extracts showed increased expression of tumor necrosis factor-related apoptosis-inducing ligand (TRAIL) and TRAIL receptor 2 (TRAILR2; i.e. death receptor 5;DR5). Moreover, treatment induced expression of DR4. Treatment with methanol dandelion extract enhanced production of ROS in BCSCs.

Conclusion:
Dandelion extracts are promising extracts for the treatment of breast tumors. The effect of methanol dandelion extract was better than that for ethanol extract. Importantly, BCSCs in 3D exhibited stronger drug resistance than those in 2D. In summary, our results indicate the strong potential of dandelion extracts as anti-cancer agents and rational use for drug development.

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