

Immunomodulatory and Anti-cancer activities of Jordanian Barley Bran

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Abstract

Background: Barley bran is a common cereal grain grown globally in temperate climates. It was one of the earliest cultivated grains. It is a major ingredient as it is utilized in making popular foods worldwide. It has nutritional and beneficial effects in different pathological conditions. Many studies were achieved to assess the nutritious values of barley bran, but there is no research indicating immunomodulatory and anticancer activities of barley bran grown in Jordan. **Aims:** The present study aims to examine and assess the potential immunomodulatory and anti-tumor activities of ethanol, *n*-hexane, aqueous/methanol, and water extracts obtained from barley bran. **Methods:** Maceration method was utilized to prepare ethanol, *n*-hexane, aqueous/methanol, and water extracts. Various phytochemical groups were determined by using qualitative phytochemical tests. The antiproliferative activity of extracts was determined against (MCF-7: Human epithelial breast cancer cell line, HCT-116: Human colon cancer cell line, A549: Non-small lung cancer cell line, and EMT6/p: Mouse epithelial breast cancer cell line) by MTT assay. Folin-Ciocalteu reagent was used to detect the total phenolic content in extracts. Furthermore, immunomodulatory activity was assessed by determining the effect of extracts on splenocytes proliferation in the presence and absence of mitogens. Nitro blue tetrazolium assay and neutral red method were used to assess the effect of each extract on the phagocytic activity of macrophages and pinocytosis, respectively. For the *in vivo* part, three different concentrations (10%, 20%, and 30% w/v) of barley bran were used to test the prophylactic effect in four Balb/C 21 mice groups inoculated with EMT6/p cell-line subcutaneously. Also serum samples were collected to assess the effect on cytokines (IFN- γ , IL-2, IL-4, and IL-10). **Results:** Barley bran extracts inhibited cancer cell proliferation. According to immunoassays, *n*-hexane and aqueous/methanol extracts could significantly rise lymphocyte proliferation and pinocytosis activity of macrophages. The activity of phagocytosis was increased by *n*-hexane and ethanol extracts. For the *in vivo* part, the average tumor size and weight of mice given 30% barley bran group was significantly reduced ($P < 0.001$) compared with control group. During our study higher levels of TH1 cytokines (IFN- γ , IL-2) and lower levels of TH2 cytokine (IL-4) and T regulatory cytokine (IL-10) were obtained due to consumption of barley bran in food. **Conclusion:** Barley bran can be used as prophylactic agent because it has anti-cancer and immunomodulatory activities. Further testing is required to detect the biologically active constituents of barley bran.