Upregulating Effect of Wheat on Brain-Derived Neurotrophic Factor in Human Lung Adenocarcinoma A549 Cells

Abstract

The neurotrophic hypothesis of depression, that is, a deficiency in hippocampal brain-derived neurotrophic factor (BDNF) leads to depression, has gained widespread acceptance. BDNF is synthesized in various peripheral tissues such as the lung, kidney, liver, heart and testis, besides the brain. Peripheral BDNF can traverse the blood-brain barrier and reach the hippocampus; accordingly, substances that upregulate BDNF production in peripheral tissues may be useful in the treatment of depression. The Mediterranean diet, containing high amounts of whole grains including unrefined wheat, vegetables, fruits, nuts, and olive oil, reportedly reduces the risk of depression. The association between the high consumption of unrefined wheat in the Mediterranean diet and BDNF production in peripheral tissues is unclear. In this study, we investigated the BDNF production capacity of human lung adenocarcinoma cell line A549 and the effect of wheat on BDNF production in the cells. Methanol extracts of whole-wheat flour and wheat bran, which are forms of unrefined wheat, increased the BDNF level in the culture medium of A549 cells. However, methanol extract of wheat endosperm had no effect on the BDNF level in these cells. Our findings suggest that wheat bran contains ingredients that upregulate BDNF production in peripheral tissues, and unrefined wheat potentially contributes to the elevation in peripheral BDNF level.