# Immunomodulatory effects of bee pollen on doxorubicin-induced bone marrow/spleen immunosuppression in rat

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This study investigated the immunomodulatory effects of Bee Pollen (BP) on Doxorubicin (DOX)-induced bone marrow/spleen suppression in rats. 48 Wistar rats were divided into 6 groups (*n* = 8/group); control, DOX (5 mg/kg), BP (100 mg/kg), BP (200 mg/kg), BP (100 mg/kg) +DOX, and BP (200 mg/kg) +DOX groups. BP was administered orally for 42 days and 5 mg/kg of DOX was injected intravenously at days
7, 14, 21, 28, 35 and 42. Hematological parameters, antioxidant enzymes and inflammatory cytokines were measured. Apoptosis-related genes were investigated using Real-Time PCR and western blot. DOX significantly decreased blood cells count, cytokines, and antioxidant enzyme. It also increased the expression of apoptotic genes
in spleen and BM. The BP significantly improved hematopoietic function, antioxidant
parameters, and serum levels of hematopoietic simulating-cytokines. Also, BP significantly reduced the expression of apoptotic genes. These results confirm the immunomodulatory activity of BP in DOX-induced biochemical, molecular and histological immunosuppression.