



## BIOLOGICAL PROPERTIES OF BIOCHANAIN: A SHORT REVIEW

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### ABSTRACT

Biochanin A is a naturally occurring dietary isoflavone. It is mainly found in red clover. Biochanin A has various putative advantageous properties. It has cardiovascular defense, anticancer activity, antioxidant property, antiinflammatory, and anticarcinogenic effects. Most useful health impacts connected to Biochanin A is accepted to be interceded by the estrogenic and antioxidative properties of this compound. It is already commercially available and is among the main ingredients in many types of supplements used to alleviate postmenopausal symptoms in women.

**Keywords:** Biochanin, Chemical compounds, plants, bioactivities

## INTRODUCTION

Phytoestrogens are compounds found in plants with a molecular structure and size resembling those of estrogens. Plant flavonoid isoflavones are the most popular among the many estrogenic compounds. In humans, the main dietary sources of isoflavones are soybean and soybean products. When these types of food are consumed, they have multiple effects (1). Epidemiological studies have indicated that populations with a high isoflavone intake through soy consumption have lower rates of several cancers, such as breast, prostate, bladder, gastric, and colon cancer (2, 3). Isoflavones are considered chemoprotective and can be used as an alternative therapy for a wide range of hormonal disorders (4). Biochanin A (BCA), is a naturally occurring isoflavone present in legumes of many clover species, most notably red clover, and in many herbal dietary supplements. In zigzag clover (*Trifolium medium*) it occurs in high concentration, and in red clover. It is also present in other plants such as soy, alfalfa, peanuts, and chickpea (5). This isoflavone is also reported in *Cassia fistula*, *Dalbergia odorifera* (6). BCA has been evaluated in many studies related to cancer treatment. The first study was performed in 1988 in hamster embryo cell cultures and found that BCA inhibited carcinogen activation (7). It has various purported biological activities, including its antioxidant, anti-inflammatory, anti-infective, and anticarcinogenic effects, and BCA has been used for several purposes, such as to treat estrogen deficiency and pain and reduce the severity of nerve damage (8, 9). This review examines the literature associated with the most significant biological effects of Biochanin A.

### **Biological Activities:**

#### **Antidiabetic activity:**

Biochanin A has significant antidiabetic activity against streptozocin-induced diabetic rats. Biochanin A can modulate glucose metabolism effectively. In diabetic rats Biochanin A was lowered HBA1c level on continuous dosing. Moreover, it also normalized the liver enzymes and the body weight upon long-term administration. The mechanism of BioA's observed activity was related to the improvement in visfatin expression (10).

#### **Antiparasitic activity:**

Biochanin A was tested on antiparasitic activity in protozoans. It was found that Biochanin A showed an antiparasitic activity against, *T. cruzi* trypanosomes, *L. chagasi* promastigotes, *L. chagasi* amastigotes (11).

#### **Anti-microbial activity:**

Biochanin A is a potent inhibitor of the intracellular gram-negative bacteria and *Chlamydia pneumoniae* and *C. trachomatis*. It was also established that Biochanin A has good buccal mucosal penetration without any stability or metabolism issues during the buccal permeation (12).

#### **Osteoarthritis:**

A recent study indicated that biochanin A exerted antiproliferative and anti-inflammatory effects through the inhibition of iNOS expression, p38-MAPK and ATF-2 phosphorylation, and blocking of NF- $\kappa$ B nuclear translocation (13).

### **Chemo preventive properties:**

Biochanin A, an isoflavone, is known to exert an anticancer effect on various cancer types.: as breast cancer: selectively targets HER-2+ SK-BR-3 breast cancer cells and inhibits multiple deregulated mechanisms associated with malignant transformation. It drastically reduced cell invasion, inhibited multiple signaling pathways and lowered the cell viability in a dose dependent manner (14). It has anticancer effect against brain tumor: Biochanin A inhibited endothelial cell functions observed in gliomas such as migration, invasion and cell viability. The activation of several proangiogenic proteins such as ERK, AKT, and mTOR was significantly inhibited. Overall, Biochanin A appears to provide dual targeted agent that inhibits two processes, invasion and angiogenesis (15). Biochanin A effectively reduced pancreatic cancer cell survival(MTT and annexin V staining), proliferation (colony formation and mitogenic signaling), and progression (inhibition of migration and invasion). Mechanistically, it was confirmed that Biochanin A inhibited the activation of AKT and MAPK pathways in pancreatic cancer (16).

### **Neuroprotective Effects:**

BCA has been shown to protect dopaminergic neurons against LPS-induced damage by inhibiting the activation of microglia; the generation of proinflammatory factors, such as TNF- $\alpha$ , IL-1 $\beta$ , NO, and superoxide; and MAPK signaling pathways in microglia (17). BCA inhibits nicotinamide adenine dinucleotide phosphate oxidase (NADPH oxidase) activation and malondialdehyde (MDA) production, thereby increasing SOD and glutathione peroxidase (GPx) activity in the brain (17).

## **CONCLUSION**

BCA has shown many potential benefits in numerous in vitro and in vivo studies. This review showed the importance of BCA.

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