



Amygdalin; is it an anticancer and antitumor agent?

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Key point

In recent years, amygdalin has been manufactured and used to treat of many cancers in the worldwide. Some researchers showed amygdalin ameliorate the symptoms of patients in advanced stage of cancer.

Introduction

During 1950 a new vitamin that numbered B-17 called laetrile or amygdalin dedicated by Ernst Theodore Krebs. Amygdalin, is a cyanogenic complexes and relates to the aromatic cyanogenic glycoside group can be found in a variety of species in plants, particularly in the rosaceous plant seed, like apricot, cherry, plum and peach. It composes a diglucoside with cyanide radical (CN) which is highly bio-accessible (1). The highest concentration is detected in the seeds of the rosaceous fruits, like apricot kernels and other bitter nuts. Amygdalin is a non-toxic compound, but it can hydrolyze and produce mandelonitrile under the glucosidase action, like prunase and amygdalase which ultimately decomposed into benzaldehyde and hydrogen cyanide (HCN). HCN can decompose by some enzymes is poisonous substance therefore; some studies demonstrate amygdalin has antitussive and anti-asthmatic effects. Also, the pharmacological effects of amygdalin comprise anti-atherogenic, inhibition of kidney interstitial fibrosis, prevention of pulmonary fibrosis, immune suppression, resistance to hyperoxia induced lung damage, immune regulation, antitumor, anti-inflammatory and antiulcer (2). Recently, amygdalin has been administered for the treatment of asthma, bronchitis, emphysema, leprosy, colorectal cancer and vitiligo. However, the most effect of identification amygdaline is antitumor or anticancer function by decomposing carcinogenic substances in the body, blocking nutrient source of tumor cells, killing cancer cells, inhibiting of cancer cell growth, and could also decrease the incidence of colon cancer, prostate cancer, lung cancer, and rec-

tal cancer (3).

Therefore, this paper aims to provide further investigations of amygdaline advantages and signaling pathway of antitumor activities.

How is the action mechanism of amygdalin?

When amygdalin is in contact with the enzyme beta-glucosidase, it is broken down to form two molecules of glucose, one molecule of benzaldehyde and one molecule of HCN that HCN is a compound toxic. Hence, only the enzyme beta glucosidase is capable of manufacturing the HCN from amygdalin. While in the body, only the cancer cell contains that enzyme (3000 times as much glucosidase in the cancer cells as in normal cells). Also, amygdalin contains CN that it also is in vitamin B12, and in berries like blackberries, blueberries and strawberries too that CN radical is not a toxic compound (4).

The normal cells include an enzyme called rhodanese which in the presence of sulphur-bearing compounds, changes free cyanide to thiocyanate, a perfectly non-toxic composite then thiocyanate is excreted in the urine. In this way rhodanese neutralizes the amygdaline therefore; HCN do not produce in these cells and it only serves as glucose to healthy cells providing energy. In contrast, malignant cells do not contain rhodanese, therefore; production of HCN is storage in these cells.

The researches about the importance of amygdalin demonstrate diglucoside amygdalin treatment (D-mandelonitrile- β -gentiobioside) has been administered as a synergistic partner with established substances to treat prostatic cancer. It can alter cell cycle controlling proteins such as the expression



of cdk1 and its corresponding partner cyclin B thereby; it reduces the growth rate of prostatic cancer cell lines. Various studies show amygdalin has anti-proliferative and pro-apoptotic properties on promyelocytic leukemia, hepatoblastoma, colon cancer, cervical cancer, and bladder cancer cells. Investigations demonstrated amygdalin can drive all tumor cell lines into the G0/G1 phase of the cell cycle associated with a damage of cells in the S- and G2/M-phase. Therefore, it causes growth and proliferation blockade by slowing the cell cycle. Some studies show 2 weeks after amygdalin treatment of in all cell lines down-regulate of the cell cycle regulating proteins cdk1, cdk2 and cdk4 as well as cyclin A, cyclin B and cyclin D3.

On the other hand, apoptosis is also an essential factor in controlling cell number in various developmental and physiological conditions and it has been detected, disruption of apoptotic function contribute to many human tumors. Based on evidences, amygdalin can promote apoptosis in kidney fibroblasts and prostatic cancer cell lines. However, signaling pathway of apoptosis by amygdalin is not documented. One of the amygdalin functions is improving the immune function of organism. It can significantly increase polyhydroxyalkanoates (PHA) activity that PHA persuades proliferation of human peripheral blood T lymphocyte thereby; secretion of interleukin-2 (IL-2) and interferon gamma (IFN- γ) increase then inhibits the secretion of tumor growth factor- β 1 (TGF- β 1) (5).

Conclusion

Amygdalin plays a positive role in the treatment of atherosclerosis, diabetes, cancer signaling pathways.

Author's contribution

EA is the single author of the manuscript.

Conflicts of interest

The author declared no competing interests.

Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the author.

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References

1. Song S, Ma Q, Tang Q, Chen F, Xing X, Guo Y, et al. Stereoselective metabolism of amygdalin-based study of detoxification of Semen Armeniacae Amarum in the Herba Ephedrae–Semen Armeniacae Amarum herb pair. *J Ethnopharmacol.* 2016;179:356-66.
2. Bolarinwa IF, Orfila C, Morgan MRA. Amygdalin content of seeds, kernels and food products commercially-available in the UK. *Food Chem.* 2014;152:133-9.
3. Bolarinwa IF, Orfila C, Morgan MRA. Determination of amygdalin in apple seeds, fresh apples and processed apple juices. *Food Chem.* 2015;170:437-42.
4. Sánchez-Pérez R, Arrázola G, Martín ML, Grané N, Dicenta F. Influence of the pollinizer in the amygdalin content of almonds. *Scientia Horticulturae.* 2012;139:62-5.
5. Blaheta RA, Nelson K, Haferkamp A, Juengel E. Amygdalin, quackery or cure? *Phytomedicine.* 2016;23:367-76.