Beta-endorphin: Potential Anti-Tumor Activity

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Received: July 26, 2019; Published: October 22, 2019

Abstract
Beta-endorphin is an abundant endorphin, more potent than morphine, synthesized and stored in the anterior pituitary gland. It has got analgesic, anti-inflammatory activity, immune stimulatory activity, and stress buster activity, which is helpful for its potential anti-tumor activity. This article highlights about the potential anti-tumor activity of beta-endorphin.

Keywords: NF-KB; STAT-3; P53; IL-1; TNF-α; IL-6

Introduction
Beta-endorphin is an abundant endorphin, more potent than morphine, synthesized and stored in the anterior pituitary gland in response to stress and pain; it is a precursor of POMC (Proopiomelanocortin).

Endorphin receptors are situated on the nervous system and immune cells. There are three types of endorphins betaendorphin, enkephalin, dynorphin binds with mu, kappa, and delta receptors situated on the nervous system and immune cells. Endorphin receptors are increased during stress such as inflammation abruptly binds with endorphins. Most immune cells produce endorphins, in an inflammatory state recruitment of immune cells to the site of inflammation by chemokines produce endorphins. Binding of endorphins to the receptors on the peripheral nerves results in inhibition of substance p a neurotransmitter of pain and inflammation, produce anti-inflammatory cytokines such as IL-10 and IFN-γ to reduce inflammation, where chronic inflammation is considered as a seventh hallmark of cancer.

Cancer is a major threat to mankind, majority of cancers, more than 90% of all cancers are due to external environmental factors such as tobacco, alcohol, infectious agents (HPV, EBV), chronic psychological stress, chemical agents such as silica, arsenic, lead [1-4].

Mechanisms of actions of betaendorphins
Endorphin receptors are situated on the most immune cells. Binding of betaendorphin to the mu receptors situated on the innate and adaptive immune cells such as neutrophils, macrophages, dendritic cells, NK cells, mast cells, T cells, B cells results in inhibition of inflammatory mediators such as IL-1, TNF-α,IL-6 and activation of innate and adaptive immune cells (immune stimulatory activity) results in release of opsonin, granzyme-B, IFN-γ, and antibodies involved in anti-tumor activity, antiviral activity, apoptotic activity, and anti-inflammatory activity.

Betaendorphin binds with µ receptors situated on the central nervous system results in inhibition of GABA inhibitory neurotransmitter and produce dopamine neurotransmitter involved in analgesic activity, euphoria, stress buster activity (Tranquility of mind) [2-4,8].

Citation: Shrihari TG. “Beta-endorphin: Potential Anti-Tumor Activity”. EC Pharmacology and Toxicology 7.11 (2019): 81-82.
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Beta-endorphin inhibit chronic psychological stress induced sympathetic nervous system activity and activation of parasympathetic nervous system activity of ANS through inhibition of HPA-axis mediated release of stress releasing hormones such as cortisol, ACTH, and noradrenaline mediated activation of inflammatory mediators such as IL-1β, TNF-α, and IL-6, which further activates NF-KB, STAT-3 transcription factors activate inflammatory mediators involved in tumor progression by cell proliferation (Cyclin D, cyclin E), cell survival (BCL-XL, BCL-2), angiogenesis (IL-8, COX-2, VEGF), genomic instability (ROS, RNS, AID, iNOS), immune modulation (IL-4, IL-5, IL-13, TGF-β), invasion and metastasis (UPA, MMP’s 2,9).

Advanced cancer treatment modalities such as radiotherapy, chemotherapy, surgery failed to improve the prognosis of cancer with increasing morbidity, adverse drug reactions, and decreased survival rate.

Beta-endorphin inhibit inflammatory mediators such as IL-1, TNF-α, IL-6 induced activation of NF-KB a key transcription factor, which antagonize P53 tumor suppressor gene, a guardian of the genome mutated in more than 50% of all cancers by inflammatory mediators such as NO,ROS,RNS free radicals, AID (Activation induced cytidine deaminase) enzyme expressed any NF-KB a key transcription factor.

Betaendorphin express epithelial E- cadherin helps in cell adhesion, loss of epithelial E- cadherin mediated epithelial to mesenchymal transition leads to tumor invasion [4-8].

Conclusion

Betaendorphin can be used in holistic preventive, therapeutic, health promotion, and palliative management of cancer without adverse effects and economical. Thorough understanding of betaendorphin mechanisms of actions, dose dependent duration of actions, and clinical trials of exogenous betaendorphin helpful for future management of cancer.

Funding Agencies

None.

Conflict of Interest

None.

Bibliography


Volume 7 Issue 11 November 2019
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Citation: Shrihari TG. “Beta-endorphin: Potential Anti-Tumor Activity”. EC Pharmacology and Toxicology 7.11 (2019): 81-82.