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Beta-Endorphin - Novel Anti-Tumor Activity

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Article Info

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Abstract

Endorphins are endogenous morphine, neuropeptides produced in the pituitary gland. Beta-endorphin is an abundant endorphin, more potent than morphine, synthesized and stored in the anterior pituitary gland. Beta-endorphin, has got various mechanisms of actions such as analgesic activity, stress buster activity, anti-inflammatory activity, and immune stimulatory activity, because of these mechanisms of actions it can be useful in holistic preventive, therapeutic, health promotive and palliative management of cancer without adverse effects. This article highlights about the basic research findings of anti-tumor activity of beta-endorphin.

Keywords: NF-KB; STAT-3; Cortisol; ACTH; Noradrenaline; INF-γ; Opsonin; Granzyme-B.

Introduction

Holistic healing is a whole person healing. Human body works as a whole, if we consider human body as a whole rather than as parts in treating any disease with reductionist chemical drugs yeild better results without adverse effects. Most important causative factor for human diseases including cancer is human environment; most important part of human environment is human mind. Majority of cancers more than 90% of all cancers are due to external environmental factors such as tobacco, alcohol, infectious agents such as (HPV, EBV), inhalation of chemical agents such as silica, arsenic, benzene, lead leads to various types of cancers. These external environmental factors induced chronic inflammatory mediators such as cytokines, growth factors, proteolytic enzymes such as IL-1β,TNF-α, and COX-2 activate NF-KB a key transcription factors and IL-6, EGF, FGF, PDGF inflammatory mediators activate STAT-3 transcription factor, both transcription factors work together express inflammatory mediators involved in tumor progression by cell proliferation (Cyclin D, Cyclin E), cell survival (BCL-2, BCL-XL), angiogenesis (IL-8, VEGF, COX-2), genomic instability (ROS, RNS free radicals), invasion and metastasis (up A, MMP's 2,9).

Chronic psychological stress is one of the etiological factor for cancer. Chronic inflammation is considered as a seventh hall mark of cancer. Advanced cancer treatment modalities such as surgery, radiotherapy, chemotherapy failed to improve the prognosis of cancer with increasing morbidity, adverse drug reactions, and decreased survival rate. Endorphins are endogenous morphine, neuropeptides produced in the pituitary gland, response to stress and pain. There are three types of endorphins betaendorphin, enkephalin, and dynorphin binds to mu, kappa, and delta receptors situated on nervous system and immune cells. Betaendorphin is an abundant endorphin, more potent than morphine, synthesized and stored in the anterior pituitary gland, it is a precursor of POMC (Proopiomelanocortin) [1-7].

Endorphins are produced during pranayama, mindful meditation, pranic healing, intense physical exercise creates a psychological relaxed state known as "Runner's high", Love, sex, Tender, care, music therapy, acupuncture, Care, Sympathy and Empathy in caring

the patient involved in immune stimulatory activity, stress buster activity (Tranquility of mind), anti-inflammatory activity, and analgesic activity [1-3,8,9].

Betaendorphin anti-tumor activity

Endorphins receptors are increased during stress such as inflammation binds abruptly with endorphins. Most immune cells produce endorphins. In inflammatory state, recruitment of endorphins to the site of inflammation by chemokines produce endorphins, binding of endorphins to the receptors on peripheral nerves results in inhibition of substance P, a neurotransmitter of pain and inflammation, produce IL-10, IL-18, and IFN-γ anti-inflammatory cytokines.

In the PNS, binding of betaendorphin to the μ (MU) receptors present on the peripheral nerves results in inhibition of substance P, a neurotransmitter of pain and inflammation.

In the CNS, binding of betaendorphin to the mu receptors situated on central nervous system results in inhibition of GABA inhibitary neurotransmitter, produce dopamine neurotransmitter involved in analgesic activity, stress buster activity, euphoria, cognitive development, self reward, addiction, and tranquility of mind [6-9].

Endorphin receptors situated on most immune cells. Binding of betaendorphin to the μ receptors situated on most innate and adaptive immune cells such as a neutrophils, macrophages, mast cells, Natural killer cells, dendritic cells, T cells, and B cells results in inhibition of inflammatory mediators such as IL-1β,TNF-α, and IL-6 pro-inflammatory cytokines, activation of innate and adaptive immune cells (immune stimulatory activity) release opsonin, granzyme-b, IFN-Gamma, and antibodies involved in antiviral cativity, antibacterial activity, antitumor activity, and anti-inflammatory activity [6-8].

Betaendorphin inhibits chronic psychological stress induced activation of sympathetic nervous system and activation of parasympathetic nervous system of ANS (Autonomic nervous system) through inhibition of HPA-axis, mediated release of neuropeptides such as cortisol, noradrenaline and ACTH, inhibit inflammatory mediators such as IL-1β, IL-6, TNF-α, and COX-2, which inhibits NF-KB, STAT3 key transcruiption factors involved in chronic inflammation associated cancer [5-8,10-15].

Betaendorphin inhibits chronic inflammatory mediators induced activation of NF-KB a key transcription factor involved in tumor progression, 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 (Nitric oxide), ROS, RNS free radicals, AID (Activation induced cytidine deaminase) enzyme expressed by NF-KB key transcription factor. Betaendorphin express epithelial E cadherin helps in epithelial cell adhesion, loss of epithelial E-cadherin mediated epithelial to mesenchymal transition induced tumor invasion [6-8,16,17].

Betaendorphin involved in lengethening telomeres which otherwise shorten with aging. Other mechanism of dealy aging by inhibiting ROS,RNS free radicals from inflammatory cells such as neutrophils, macrophages, dendritic cells during oxidative stress via NADPH oxidase pathway involved in cell aging,tissue damage,DNA damage, gene mutation, and cell death [6-9].

Conclusion and future perspective

Betaendorphin is an abundant endorphins can be useful in natural holistic preventive, therapeutic, health promotive, and palliative treatment of cancer by its analgesic activity, immune stimulatory activity, stress buster activity, and anti-inflammatory activity without adverse effects and inexpensive. In future, basic human clinical trials to study the laboratory exogenous effect of beta-endorphin, mechanisms of actions, dose dependent duration of action in various types of cancers at different stages related to prognosis helpful for future management of cancer.

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