

Endorphins – a natural healer

Abbreviations: PNS, peripheral nervous system; CNS, central nervous system; ACTH, adrenocorticotropic hormone; HPA, axis, hypothalamic pituitary adrenal axis; STAT 3, signal transducer and activator of transcription protein 3; NF-kB, nuclear factor kappa-light-chain enhancer of activated B cells; CRH, corticotropin releasing hormone; COX-2, cyclooxygenase 2; TNF- α , tumor necrosis factor- α ; IFN- γ , interferon gamma

Introduction

Endorphins are endogenous morphine, neuropeptides produced in the pituitary gland in response to stress and pain. There are three

types of endorphins such as Beta-endorphins, enkephalins & dynorphins binds to mu, kappa & delta receptors located on nervous system and immune cells. Beta-endorphins are abundant endorphins, synthesized & stored in the anterior pituitary gland, more potent than morphine; it is a precursor of pomc (Proopiomelanocortin).

Most of all immune cells produced endorphins .in inflammatory state recruitment of immune cells to the site of inflammation by chemokine's produce endorphins involved in suppression of inflammation by affecting recruitment of leukocytes, affecting immune cells attachment to endothelium by affecting cell adhesion molecules expression. In inflammatory state, binding of endorphins to the receptors on peripheral nerves results in inhibition of substance p, a neurotransmitter of pain and inflammation and also by production of anti-inflammatory cytokines such as IL-10, IL-18, and IFN- γ .

Chronic psychological stress induced release of CRH from hypothalamus activates HPA-axis through ANS release neuropeptides such as cortisol, nor-adrenalin, and ACTH activates IL-1 β , TNF- α , IL-6 & COX-2 inflammatory mediators, which activates NF-KB, STAT-3, a key transcription factors involved in chronic inflammation, autoimmune disease, and cancer.

In the PNS, binding of endorphins to the receptors on peripheral nerves results in inhibition of substance p, a neurotransmitter of pain and inflammation. In the CNS, binding of endorphins to the receptors on CNS results in inhibition of GABA inhibitory neurotransmitter, activation of dopamine excitatory neurotransmitter involved in analgesic activity, stress buster activity, euphoria, tranquility of mind, cognitive development, and addiction.

Binding of endorphins to the receptors on immune cells such as neutrophils, macrophages, T cells, B cells, mast cells, NK cells, Dc's results in activation and release of IFN-gamma, opsonin, granzyme-B, and antibodies, involved in anti-inflammatory, immune stimulatory, antiviral activity, and antitumor activity.

Endorphins inhibits chronic psychological stress mediated sympathetic nervous system activity and activation of parasympathetic nervous system activity of ANS through which it inhibits HPA-axis mediated release of neuropeptides such as nor adrenaline, cortisol, and ACTH, activates inflammatory mediators such as IL-1 β , TNF- α , IL-6, and COX-2, activates NF-KB, STAT-3 key transcriptional factors involved in chronic inflammation, tumor progression, and

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autoimmunity.

Endorphins inhibits NF-Kb a key transcriptional factor, which antagonize P53 tumor suppressor gene, a guardian of genome, mutated in more than 50% of all cancers. Endorphins involved in epithelial expression E-Cadherin helps in epithelial attachment, loss of E-cadherin involved in epithelial mesenchymal transition (EMT) induced tumor invasion.

Endorphins inhibits NF-KB mediated conversion of Th1 to Th2 lymphocytic type, Th17 cells involved in chronic inflammation and tissue damage, altered Tregs (regulatory T cells) involved in immune modulation, which otherwise leads to self tolerance and immune homeostasis, growth factors such as (EGF, FGF, VEGF) involved in cell proliferation and angiogenesis, all these changes leads to auto-immune diseases.¹⁻⁵

Endorphins involved in delay aging by lengthening telomeres, which otherwise shorten with aging. Other mechanism by inhibiting free radicals such as ROS (Reactive oxygen species) and RNS (Reactive nitrogen species) release during oxidative burst from inflammatory cells such as neutrophils, macrophages, and dendritic cells through NADPH oxidase pathway. Free radicals involved in aging, gene mutation, and cell death. Endorphins produced during intense physical exercise, meditation, yoga, pranayama, love, tender, care, sex, sympathy, empathy, music therapy, acupuncture.

Endorphins involved in holistic preventive, therapeutic, promotive, and palliative treatment of various diseases such as auto-immune diseases, cancer, and infectious diseases without adverse effects and inexpensive. Thorough understanding of endorphins, activities that produce endorphins, activities that produce endorphins, mechanism of action, duration of action, prognosis related to disease for future therapeutic purpose in various diseases.

Patient faith or believe in doctor cure disease by production of endorphins known as placebo effect. Sympathy and empathy in caring the patient by doctor or care takers heal disease by production of endorphins.

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Conflict of interest

Author declares that there is no conflict of interest.

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