

## Betaendorphin: Immune-Stimulatory Activity

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### Abstract

Endorphins are endogenous morphine, produced in pituitary gland response to stress. There are three types of endorphins beta endorphin, enkephalin, and dynorphin binds to mu, kappa, and delta receptors situated on nervous system and immune cells. Beta-endorphin is an abundant endorphin, has immune stimulatory activity by activation of immune cells and inhibition of chronic psychological stress induced NF-KB key transcription factor involved in immune modulation by release of pro-inflammatory cytokines. This article highlights about the basic research findings of betaendorphin and its immune-stimulatory activity.

**Keywords:** HPA-axis; Immune Modulation; Neuropeptides; Cortisol; NF-KB; IL-1; IL-6; COX-2; TNF- $\alpha$

### Introduction

Endorphins are endogenous morphine, neuropeptides produced in pituitary gland response to stress and pain. There are three types of endorphins betaendorphin, enkephalin, and dynorphin binds with mu, kappa and delta receptors situated on nervous system and immune cells. Beta-endorphin is an abundant endorphin, more potent than morphine, synthesized and stored in the anterior pituitary gland, precursor of POMC (Proopiomelanocortin). Endorphin receptors are increased during stress such as inflammation and binds abruptly with endorphins.

### Beta-endorphin Immunestimulatory activity

Endorphin receptors are situated on most innate and adaptive immune cells. Binding of betaendorphin to the mu receptors situated on innate and adaptive immune cells such as neutrophils, macrophages, dendritic cells, natural killer cells, T cells, B cells, and mast cells, results in activation of immune cells (immune-stimulatory activity), produce opsonin, granzyme-B, IFN- $\gamma$  and antibodies involved in anti-inflammatory activity, antiviral activity, antibacterial activity and antitumor activity [1-20].

Beta-endorphin inhibits chronic psychological stress induced activation of sympathetic nervous system activity, activation of parasympathetic nervous system activity of autonomic nervous system (ANS) results in activation of IL-2, IFN- $\gamma$  immunestimulatory cytokines.

Beta endorphin inhibits immune modulation by inhibiting chronic psychological stress induced activation of NF-KB a key transcription factor induce inflammatory mediators by inhibiting HPA-axis mediated release of cortisol, ACTH and noradrenaline neuropeptides through autonomic nervous system results in inhibition of inflammatory mediators such as IL-1 $\beta$ , IL-6, TNF- $\alpha$  and COX-2 which inhibits NF-KB a key transcription factor involved in chronic inflammation induced immune modulation by releasing pro-inflammatory cytokines such as IL-4, IL-5, IL-10, IL-13, IL-17 and TGF- $\beta$  [22,24,26].

Beta-endorphin inhibits chronic psychological stress induced activation of NF-KB a key transcription factor involved in chronic inflammation and tumor progression, which antagonize P53 tumor suppressor gene, a guardian of the genome involved in immunosurveillance, mutated in more than 50% of all cancers by inflammatory mediators such as NO (nitric oxide), ROS (Reactive oxygen species), and RNS (Reactive nitrogen species) free radicals, AID (Activation induced cytidine deaminase) enzyme expressed by NF-KB transcription factor [20-27].

Intense physical exercise Creates a relaxed psychological state known as "Runner's High". Endorphins are produced during yoga, pranayama, mindful meditation, intense physical exercise, Love, Tender, care, acupuncture, music therapy, pranic healing, sympathy and empathy in caring the patient [5-10].

## Conclusion and Future Perspective

Beta-endorphin are an abundant endorphin synthesized and stored in the anterior pituitary gland. It has got immune-stimulatory activity and inhibits chronic psychological stress induced activation of NF-KB a key transcription factor mediated immune modulation. Beta endorphin can be used in holistic preventive and therapeutic applications in treatment of various diseases such as cancer and infectious diseases without adverse effects and inexpensive. Thorough understanding of beta-endorphin, mechanisms of actions and its immune-stimulatory activity, dose dependent duration of action, prognosis related to disease helpful for future therapeutic applications.

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