

## **Chronic Psychological Stress Mediated Immune Modulation Induced Autoimmune Disease**

**Shrihari TG\***

Assistant Professor, Department of Oral Medicine and Oral Oncology, Krishna Devaraya College of Dental Sciences and Hospital, Bangalore, Karnataka, India

**\*Corresponding Author:** Shrihari TG, Assistant Professor, Department of Oral Medicine and Oral Oncology, Krishna Devaraya College of Dental Sciences and Hospital, Bangalore, Karnataka, India.

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### **Abstract**

Chronic psychological stress is a main etiological factor for autoimmune diseases by releasing neuropeptides activates inflammatory mediators such as IL-1, TNF- $\alpha$ , IL-6, and COX-2, proinflammatory cytokines induce activation of NF-KB a key transcription factor involved in chronic inflammation, immune modulation, cell proliferation, cell survival, angiogenesis, and augments autoimmunity. This article briefs about the role of chronic psychological stress mediated immune modulation induced autoimmunity.

**Keywords:** HPA-axis; Autoimmunity; Neuropeptides; Cortisol; NF-KB; Tregs

### **Chronic psychological stress induced immunomodulation leads to autoimmunity**

Chronic psychological stress, anger, hatred, depression, frustration induced release of CRH (Corticotropin releasing hormone) from hypothalamus activate HPA-axis through ANS release neuropeptides such as cortisol, noradrenaline, and ACTH activates inflammatory mediators such as IL-1 $\beta$ , TNF- $\alpha$ , IL-6 and COX-2, which activates NF-KB and STAT-3 key transcription factors involved in chronic inflammation (IL-1 $\beta$ , TNF- $\alpha$ ), immune modulation (IL-10, TGF- $\beta$ , iNOS), tissue damage (MMP's 2,9, ROS, RNS), cell proliferation (Cyclin D,E), angiogenesis (IL-8, COX-2, VEGF), cell survival (BCL-XL, BCL-2) [1-10]. NF-KB a key transcription factor induced expression of inflammatory mediators such as chemokines, cytokines, growth factors, and proteolytic enzymes involved in conversion of TH1 lymphocytic type to TH2 lymphocytic type mediated by IL-4, STAT6 transcription factor release IL-4, IL-13, IL-5 proinflammatory cytokines along with TH17 cells involved in chronic inflammation, immune modulation, and tissue damage. IL-1, COX-2, and TNF- $\alpha$  pro-inflammatory cytokines activate NF-KB a key transcription factor, IL-6, IL-10, EGF, FGF activate STAT-3 transcription factor, both transcription factors work together involved in cell proliferation by expression of cyclin D,E cell cycle regulatory proteins and cell survival by BCL-2, BCL-XL anti-apoptotic proteins. Growth factors such as EGF, FGF, VEGF involved in cell proliferation, cell survival, and angiogenesis. Altered induced regulatory T cells (iTregs) formed from TH1 cells mediated by TGF- $\beta$  inflammatory mediator release IL-4, IL-2, IL-10, IL-17, IL-13, IL-5, pro-inflammatory cytokines involved in immune modulation by inhibiting innate and adaptive immune cells (involved in decreased mitogenic response in lymphocytes, natural killer cell cytotoxicity is decreased, IgA secretion), otherwise normal regulatory T cells (nTregs) involved in self tolerance and immune homeostasis. Proteolytic enzymes such as matrix metallo proteases 2,9 (MMP'S 2,9) involved in tissue damage, all these changes leads to autoimmune disease [10-19].

### **Bibliography**

1. Silverstein AM. "Autoimmunity versus horror autotoxicus: The struggle for recognition". *Nature Immunology* 2.4 (2001): 279-281.
2. Silverstein A. "Horror autotoxicus, Autoimmunity and immunoregulation: The early history". *Transfusion Medicine and Chemotherapy* 32.6 (2005): 296-302.
3. Silverman MN and Sternberg EM. "Glucocorticoid regulation of inflammation and its behavioral and metabolic correlates: from HPA axis to glucocorticoid receptor dysfunction". *Annals of the New York Academy of Sciences* 1261 (2012): 55-63.

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4. Ljudmila Stojanovich. "Stress and autoimmunity". *Autoimmunity Reviews* 9.5 (2010): 271-276.
5. Sphepshelevich D and Shoenfeld Y. "Prediction and prevention of autoimmune diseases: additional aspects of the mosaic of autoimmunity". *Lupus* 15.3 (2006): 183-190.
6. Dube SA., *et al.* "Cumulative child hood stress and autoimmune diseases in adults". *Psychosomatic Medicine* 71.2 (2009): 243-250.
7. Prashant BP and Anusuya GH. "Psychosomatic disorders of the oral cavity- A Review". *American Journal of Oral Medicine and Radiology* 2.2 (2015): 96-102.
8. Manolache L and Petrescu-Seceleanu D. "Stress involvement as trigger factor in different skin conditions". *World Journal of Dermatology* 2.3 (2013): 16-26.
9. Chaudhary S. "Psychological stressors in oral lichen planus". *Australian Dental Journal* 49.4 (2004): 192-195.
10. Satyanarayana RTS. "Psychosomatic paradigms in psoriasis: psoriasis, stress and mental health". *Indian Journal of Psychiatry* 55.4 (2013): 313-315.
11. Segerstrom SC and Miller GE. "Psychological stress and human immune system. A meta-analytic study of 30 years of inquiry". *Psychological Bulletin* 130.4 (2004): 601-630.
12. Stojanovich L and Marisavijevich D. "Stress as a trigger of autoimmune disease". *Autoimmunity Reviews* 7.3 (2008): 209-213.
13. Jessop DS., *et al.* "Effects of stress on inflammatory autoimmune disease: destructive or protective?" *Stress* 7.4 (2004): 261-268.
14. Shoenfeld YZ., *et al.* "The mosaic of autoimmunity: Hormonal and environmental factors involved in autoimmune diseases". *Israel Medical Association Journal* 10.1 (2008): 8-12.
15. Sapolsky RM., *et al.* "How do glucocorticoids influence stress responses? Integrating permissive, suppressive, stimulatory, and preparative actions". *Endocrine Reviews* 21.1 (2000): 55-89.
16. Priyadarshini S and Palok A. "Effects of psychological stress on innate immunity and metabolism in humans: A systematic analysis". *Plos One* 7.9 (2012): e43232.
17. Shrihari TG. "Chronic psychological stress induced microbial imbalance (dysbiosis) mediated autoimmune disease-A current concept". *Gerontology and Geriatric Studies* 3.1 (2018): 1.
18. Shrihari TG. "Current concept of Auto-immune disease and holistic therapeutic approach". *EC Microbiology* 15.2 (2018): 103-107.
19. Shrihari TG. "Beta-Endorphins – Therapeutic Boon". *International Journal of Modern Pharmaceutical Research* 2.6 (2018): 7-8.

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