

Role of Pineal and Pituitary in Immunomodulation: A Systematic Review

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Abstract: *The neuroendocrine-immune axis represents a highly coordinated, bidirectional communication network crucial for maintaining physiological homeostasis. Within this network, the pineal and pituitary glands serve as central orchestrators. This systematic review synthesises the current literature exploring the immunomodulatory roles of pineal melatonin and pituitary hormones, with a specific focus on findings derived from murine models. Evidence consistently demonstrates that pineal melatonin acts as a potent pleiotropic immune enhancer. By exerting anti-apoptotic and antioxidant effects, melatonin protects critical lymphoid organs specifically the thymus and spleen against stress-induced involution and cellular depletion. Concurrently, the pituitary gland exerts a multifaceted regulatory influence; while pituitary prolactin acts as a vital survival factor that stimulates lymphocyte proliferation and cellular immunity, the hypothalamic-pituitary-adrenal (HPA) axis counterbalances this by mediating immunosuppressive pathways to prevent auto-reactivity. Ultimately, murine research delineates a precise immunological balance governed by these neuroendocrine components. Deciphering the exact intracellular signalling mechanisms of melatonin and prolactin in mice provides a critical foundational framework for the future development of targeted neuro-immunomodulatory therapies aimed at managing stress-induced immune-deficiency and autoimmune disorders*

Keywords: Glucocorticoids (GCs), Pineal, Pituitary, Melatonin, Lymphoid organ, Thymus, Spleen, Leukocytes, Immunomodulation, Immunosuppressive, Mice