



# THYMULIN ZINC COMPLEX

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**Thymulin Zinc Complex** is an immune and longevity formulation delivering the naturally occurring, bioactive peptide thymulin, in a highly absorbable oral liposomal format. Thymulin is a thymic peptide essential for T-cell differentiation, maturation, and immune balance, playing a central role in healthy immune system communication. Its biological activity depends on zinc binding, which stabilizes the peptide and enhances its immunomodulatory effects.

Quicksilver Delivery Systems® technology provides a practitioner-grade, non-injectable alternative for supporting thymic function and immune optimization.

Produced naturally by thymic epithelial cells, thymulin modulates the activity of T-lymphocytes, macrophages, and cytokine signaling, helping regulate both innate and adaptive immune responses. Thymulin's activity has been shown to decline with thymic involution and aging, contributing to reduced immune resilience. Replenishing thymulin, particularly in its zinc-bound form, supports thymic output, immune coordination, and healthy inflammatory balance.



## Supplement Facts

Serving Size: 1 mL (2 Pumps)	Servings Per Container: 30	
	<b>Amount Per Serving</b>	<b>% Daily Value</b>
Zinc (as Zinc Acetate)	220mcg	2%
Serum Thymic Factor Acetate (Thymulin)	2.5mg	**

\*\*Daily Value not established

**Other Ingredients:** Water, glycerin, highly purified phospholipids, ethanol, tocopherol, natural mixed tocopherols, natural citrus oils

## EDUCATION

The thymus gland is an essential organ of the immune system, located behind the sternum.<sup>1</sup> Previously thought of as a graveyard for dying cells, it is now considered critical for immune system development and long-term immune resilience. The thymus is the central hub for the adaptive immune response, storing T-lymphocytes and orchestrating the cell cycle of T-cells.<sup>2</sup> What's more, the thymus supports key immune processes, such as immune surveillance, self-tolerance, and infection control, helping establish the foundation for long-term adaptive immunity.

The thymus produces several key hormones that coordinate immune activity. Thymopoietin and thymosin contribute to T-cell formation and maturation, while thymulin supports the development of functional T-cells and communication between the thymus and pituitary glands.<sup>3</sup> Although each hormone plays an important role, emerging evidence suggests that thymulin plays a broader role in neuro-endocrine-immune signaling.<sup>3</sup> As such, it may support healthy systemic responses in those experiencing premature thymic aging.

### THE THYMULIN PATHWAY

Thymulin is a zinc-dependent nonapeptide produced by thymic epithelial cells. Recent evidence points to its comprehensive roles in promoting signaling between the nervous, endocrine, and immune systems.<sup>3</sup> It acts locally and systemically, interacting with immune and pituitary targets to help coordinate immune and endocrine communication.

Importantly, thymulin regulates T-cell surface markers (i.e., CD3, CD4, and CD8), facilitating proper immune cell maturation.

It supports T-cell differentiation both within and outside of the thymus and helps balance immune responses by enhancing natural killer (NK) cell activity while modulating cytokine signaling in peripheral and neural tissues.<sup>4</sup>

## **THYMIC INVOLUTION, IMMUNOSENESCENCE, AND INFLAMMAGING**

While the thymus and thymulin are integral to immune system development and surveillance, the thymus naturally undergoes involution with age, leading to decreased thymulin production.<sup>2,3</sup> However, chronic stress, environmental toxins, and systemic inflammation can accelerate this process.<sup>5,6</sup> Hallmarks of immune system aging—immunosenescence and inflammaging—are characterized by diminished T-cell differentiation and function, increasing vulnerability to physiological stressors.<sup>7,8</sup>

Although aging is a natural driver of thymic involution, research suggests that thymic signaling can be supported and partially restored.<sup>9</sup> Preclinical evidence suggests thymulin may help support healthy T-cell and cytokine signaling as endogenous levels decline.<sup>4,10,11,12</sup> By promoting thymic function and immune balance, thymulin may help support resilience and repair capacity associated with immune aging.

## **IMMUNE COMPETENCE FOR HEALTHY AGING**

Given its essential role in immune health, thymulin helps support coordination between the adaptive and innate immune branches.<sup>11</sup> Importantly, it promotes immune tolerance and supports regulatory T-cell (Treg) activity, as well as the responsiveness of immune cells, thereby contributing to a balanced immune environment. Preclinical trials demonstrate thymulin's immunoregulatory effects, particularly in supporting healthy inflammatory responses.<sup>13,14</sup>

Some studies suggest thymulin may be beneficial in immunocompromised or zinc-deficient states.<sup>15,16</sup> Zinc itself is an essential cofactor for thymulin activity and thymic hormone synthesis. Evidence shows that zinc supplementation in zinc-deficient individuals can support thymulin production and immune health in aging populations.<sup>17</sup> Because thymulin's bioactivity requires zinc binding, co-supplementation with both thymulin and zinc may promote their effects.<sup>4</sup> Overall, thymulin may support healthy immune competence—an essential factor in promoting wellness during the aging process.

## **RESTORED SIGNALING PATHWAYS: NEUROENDOCRINE BALANCE**

Thymulin plays a role in the signaling between the immune, endocrine, and nervous systems.<sup>11,18</sup> Animal studies highlight its involvement in the development of reproductive function, growth, and hypothalamic-adrenal axis regulation.<sup>18</sup> Through this neuro-endocrine-immune crosstalk, thymulin may help support balanced stress responses, metabolism, and immune activity.

Preclinical research also shows that thymulin may modulate pituitary hormones, including growth hormone, thyroid-stimulating hormone, and gonadotropins, and interacts with adrenocorticotrophic hormone (ACTH) and prolactin.<sup>19,20,21</sup> Thymic involution may reduce sensitivity in this axis, influencing inflammatory and metabolic responses.<sup>22</sup>

In the brain, thymulin modulates neuroimmune communication and may influence nociceptive pathways involved in stress and signaling.<sup>18</sup> Thymulin acts on microglial cells to help modulate neuroinflammatory activity and may promote neuroprotective signaling. By balancing inflammatory cytokines and supporting antioxidant defenses, thymulin may help support cognitive and neural health. Overall, thymulin's systemic role serves as a connection between immune and endocrine balance, contributing to whole-system resilience in the context of aging and chronic stress.

**Quicksilver Delivery Systems**<sup>®</sup> improve upon liposomal and emulsification technology with smaller, more stable particles made from the highest-grade ingredients available. In addition to exceptional absorption rates, these tiny liposomal and nanoemulsified particles increase diffusion across mucus membranes, enhance lymphatic circulation of nutrients and support cellular delivery.