



# IMMUNE CHARGE+™ THROAT SPRAY

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**Immune Charge+™ Throat Spray** is a synergistic blend of the essential mineral zinc complexed with the flavonoids quercetin, luteolin, and propolis. Our zinc throat spray is designed to support effective cellular uptake of zinc in the throat and upper respiratory tract for healthy immune function during travel and when exposure to external immune threats is unavoidable.\*

## EDUCATION

### THE ROLE OF ZINC IN IMMUNITY & THE SCIENCE OF ZINC IONOPHORES

Zinc is an essential micronutrient in the human diet that is critical for healthy immune function.<sup>1</sup> Zinc is crucial for the normal development of cells within the innate immune system, which comprises the body's frontline defenses against microbial invaders.<sup>2</sup> Cytokine production is also significantly influenced by zinc availability, with zinc insufficiency compromising cytokine mobilization in response to pathogens.

Within cells, most zinc cations are bound to proteins, acting as enzymatic cofactors or structural components of proteins. A minority of zinc is present as free, or "labile," zinc, present in its free ionic form or loosely bound to proteins. Labile zinc acts as a second messenger molecule, modulating numerous signaling pathways, including those involved in immune function.

Mammalian cells contain an array of zinc transporters from the Znt and ZIP transporter "families" that transport zinc from the extracellular milieu into the cell itself. However, cutting-edge research indicates that zinc's immunity-enhancing properties exponentially increase when delivered as a zinc ionophore. This chemical compound reversibly binds zinc ions, transporting zinc across cell membranes independently of zinc transporters.

What substances in nature act as zinc ionophores? Quercetin, a plant flavonoid found in onions, green tea, apples, and berries, demonstrates remarkable zinc ionophore activity. It chelates zinc cations, facilitating their transport across lipid membranes, and enhancing intracellular zinc levels.<sup>3</sup> While quercetin enhances total zinc levels inside cells, it also inhibits zinc toxicity, maintaining optimal intracellular levels of this vital micronutrient.<sup>4</sup>

Quercetin also demonstrates antimicrobial properties independent of its role as a zinc ionophore. It demonstrates antiviral activities and balances immune function, dampening unproductive immune responses.<sup>5,6</sup> Complexation of quercetin with zinc also enhances quercetin bioavailability, allowing greater amounts of the beneficial polyphenol to enter cells.

Luteolin is a flavonoid found in a variety of fruits, vegetables, and medicinal herbs that also demonstrates zinc ionophore activity.<sup>7</sup> Complexation with zinc may increase the bioavailability of this flavonoid within cells, where it can exert additional beneficial effects including direct antiviral and anti-inflammatory properties.<sup>8</sup>



## Supplement Facts

Serving Size: 0.54 mL (3 Pumps) Amount % Daily  
Servings Per Container: 24 Per Serving Value

Zinc (as Zinc Acetate)	0.5mg	5%
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Proprietary Zinc Complex	12mg	**
Phospholipids (from sunflower seed lecithin), Zinc Acetate, Quercetin Dihydrate (from Sophora japonica flower), Luteolin extract, Propolis extract		

\*\*Daily Value not established

**Other Ingredients:** Glycerin, water, ethanol, tocopherols, medium chain triglycerides, natural mint oils, natural citrus oils, natural mixed tocopherols

## ZINC IONOPHORES AND THE IMMUNE SYSTEM

### Zinc Ionophores May Inhibit Microbial Invasion of Respiratory Cells and Fortifies Mucosal Barriers

Cells of the upper respiratory and gastrointestinal tracts, which converge at the pharynx (throat), serve as crucial frontline defenses against external invaders, including bacteria and viruses. Delivery of zinc directly to the tissues of the throat and the upper respiratory tract has been found to prevent pathogen entry into respiratory epithelial cells.<sup>9</sup> Zinc also fortifies mucosal immune defenses in the upper respiratory and gastrointestinal tracts by inducing beneficial structural changes in tight junction complexes, the proteins that bind epithelial cells together.<sup>10</sup> These changes strengthen membrane barrier integrity, creating a robust line of defense against external invaders.<sup>11</sup>

Quercetin provides additional mucosal barrier support by activating AMPK, an evolutionarily-conserved pathway that is a central regulator of metabolism, growth, and energy production. AMPK activation is known to regulate the apical junctions and barrier integrity of the intestinal mucosal epithelium; the pharynx (throat) represents the very beginning of the gastrointestinal tract, so there is reason to believe that AMPK activation may support barrier integrity and immune resilience in this critical location as well.<sup>12</sup>

Quercetin provides further support for mucosal barrier integrity by acting as an agonist at aryl hydrocarbon (AhR) receptors in the intestine.<sup>13</sup> AhR activation defends the respiratory and gut barriers against environmental stressors, such as infectious agents. Since the throat sits at the crossroads of the respiratory and gastrointestinal system, AhR activation may fortify immune defenses in this vital tissue.<sup>14,15</sup>

### Zinc Supports the Redox System

The body's redox system refers to its balance between reactive oxygen species (ROS), reactive nitrogen species (RNS), and scavenging by antioxidant compounds. The cellular redox state plays a critical role in the immune defense against viral invaders. Emerging research indicates that zinc plays an essential role in maintaining the body's redox system, supporting robust immune defenses.<sup>16</sup>

### Propolis Establishes a Resilient Internal Terrain

Pathogens have a more challenging time invading host cells and causing disease when the body's internal terrain is immunologically resilient. Propolis, a resinous mixture produced by honeybees, offers powerful immunomodulatory effects in addition to antibacterial, antiviral, and antifungal properties, improving the resilience of the body's internal terrain.<sup>17,18</sup>

### Flavonoids and Propolis Attenuate Unproductive Inflammatory Signaling

Quercetin induces the expression of enzymes that balance inflammatory and anti-inflammatory signaling pathways in the body. It activates the Nrf2 pathway to increase the activity of antioxidant enzymes such as superoxide dismutase (SOD) and inhibiting the pro-inflammatory signaling pathway NF-kappa B. Luteolin suppresses the expression of inflammatory mediators, inhibiting pathogen-triggered respiratory inflammation.<sup>19</sup> It also stabilizes mast cells, which are immune cells implicated in airway reactivity.<sup>20</sup>

Propolis may also attenuate inflammasome activation in acute viral infections, inhibiting unproductive signaling while allowing the immune system to target foreign invaders efficiently.<sup>21</sup>

**Quicksilver Delivery Systems®** 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 enhance the lymphatic circulation of nutrients and intracellular delivery, after ingestion.\*

**Suggested use:** Spray 3 pumps towards the back of your throat. Repeat to desired dosage.

**Daily Immune Maintenance:** 1 dose (3 sprays) daily.

**Intensive Immune Support:** 1 dose (3 sprays) every 1–2 hours when in public and/or travelling.

References available at [quicksilverscientific.com/immunechargethroatsprayreferences/](https://quicksilverscientific.com/immunechargethroatsprayreferences/)

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