



Review Article

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# Histamine Over-Activation Alleviation Using Dietary Supplements

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## Abstract

Histamine is a neurotransmitter and an important mediator of allergic reactions and inflammatory responses in the body. Some individuals have intolerance to high levels of histamine, leading to various symptoms such as headaches, flushing, hives, and digestive issues. Histamine is a compound produced by the immune system in response to allergens, injury, or infection. In the context of post-infection histamine activation, it refers to the body's immune response to a previous infection that leads to the overactive release of histamine. This can happen as part of the inflammatory response triggered by the immune system to combat pathogens, such as viruses like COVID-19. In addition to medications which are labeled as antihistamines, some dietary supplements that may help alleviate histamine activation include: Quercetin, Vitamin C, Diamine oxidase, Bromelain, and Omega-3 fatty acids. Using dietary supplements for regulating histamine over-activation may have benefits of being non-addictive, lessen side effects and even help to alleviate the excess histamine activation altogether by metabolic normalization.

**Keywords:** Allergic responses, Alzheimer's, Brain fog, Brain repair, Epilepsy, Fatigue, Hay fever, Herbal remedies, Histamine activation, Nasal congestion, Parkinson's, Post-infection histamine activation, Traumatic brain injury

**Abbreviations:** BDNF: Brain-Derived Neurotrophic Factor; BPH: Benign Prostatic Hyperplasia; DAO: Diamine oxidase; IBS: Irritable Bowel Syndrome; NAC: N-Acetylcysteine; NSAIDs: Nonsteroidal Anti-Inflammatory Drugs; ROS: Reactive Oxygen Species

## Introduction

Histamine is a natural compound in the body involved in various physiological processes, including allergic responses, inflammation, and regulating stomach acid. When histamine levels become elevated due to factors such as allergies, certain foods, medications, or underlying health conditions, it can lead to additional histamine stimulation and the development of symptoms. Symptoms of too much histamine stimulation can vary depending on the individual and the underlying cause, but common reactions may include: Skin responses such as itching, hives (urticaria), redness (erythema), swelling (angioedema), especially around the lips, eyes, face, and throat. The respiratory symptoms can be sneezing, runny or congested nose (rhinorrhea or nasal congestion), coughing, wheezing or shortness of breath. Gastrointestinal symptoms can involve abdominal cramps, diarrhea, nausea and vomiting, acid reflux or bloating. Cardiovascular symptoms can be fluctuations in blood

pressure, rapid heartbeat (tachycardia) or dizziness or lightheadedness. Neurological symptoms include headaches, dizziness, anxiety, fatigue and difficulty concentrating. The generalized symptoms are flushing (redness of the skin), feeling warm or feverish, fatigue, general malaise or feeling unwell and potential systemic reactions in severe cases, including anaphylaxis.

## Histamine Responses

It is important to note that not everyone will experience the same symptom or set of symptoms, and the severity of each symptom can vary from mild to severe. In cases of severe histamine stimulation or anaphylaxis, symptoms can progress rapidly and become life-threatening, requiring immediate medical attention. If one suspects experiencing symptoms of histamine stimulation or have a history of allergic reactions, it is essential to consult with a health-care provider for proper evaluation, diagnosis, and management.



Treatment may involve identifying and avoiding triggers, using antihistamines or other medications to manage symptoms, and in severe cases, carrying an epinephrine auto-injector for emergency use in case of anaphylaxis. Histamine is a compound produced by the immune system in response to allergens, injury, or infection. In the context of post-infection histamine activation, it refers to the body's immune response to a previous infection that leads to the increased persistent release of histamine. This can happen as part of the inflammatory response triggered by the immune system to combat pathogens, such as viruses like COVID-19 [1].

### Post-Infection Histamine Over-Responses

Post-infection histamine over-responses can occur as a result of the immune system's reaction to an infection. Histamine is a compound released by immune cells during an immune response and can cause various effects in the body, including increasing blood flow to affected areas, triggering inflammation, and promoting the migration of immune cells to the site of infection [2]. An over-response of histamine post-infection can lead to excessive inflammation and symptoms such as the increased vascular permeability that can result in swelling, redness, and heat in the affected area. Bronchoconstriction, in the respiratory system as excessive histamine can lead to narrowing of the airways, causing difficulty in breathing. Histamine can stimulate mucous production in the respiratory tract, leading to congestion and cough. Histamine can cause itching and hives on the skin as a response to allergic reactions or inflammation. Histamine release in the gastrointestinal tract can lead to symptoms like diarrhea, cramping, and nausea. For individuals experiencing post-infection histamine over-responses, treatment may involve medications such as antihistamines to reduce histamine effects, corticosteroids to manage inflammation, or other medications and supplements to address specific symptoms [2].

### Viral Infections, Histamine Activation and Brain Effects

Viral infections can indeed have an impact on histamine-driven brain effects and potentially contribute to neurological complications. Viral infections can trigger inflammatory responses in the brain, leading to an increase in histamine release and activation. This heightened histamine activity can disrupt the delicate balance of neurotransmitters in the brain and contribute to neurotoxicity. Moreover, some viruses have been shown to directly affect histamine metabolism and signaling pathways in the brain. For example, certain viruses can alter the expression of histamine receptors or enzymes involved in histamine synthesis and degradation, leading to dysregulation of histamine levels. In the context of viral infections, histamine-induced neurotoxicity may exacerbate brain damage and neurological symptoms [3]. Neurological manifestations of viral infections can range from mild symptoms like headache and confusion to more severe outcomes such as encephalitis and cognitive impairment. Researchers continue to investigate the intricate relationship between viral infections, histamine-driven brain effects, and neurological damage to better understand the mechanisms involved and identify potential therapeutic targets to mit-

igate these effects. Preventing viral infections and managing histamine levels in the brain may be important strategies in protecting against neurotoxicity and related brain damage.

### Histamine and Brain Damage

Histamine is a neurotransmitter in the brain that plays a role in regulating various functions such as mood, sleep, and cognition [4]. When histamine receptors are activated in appropriate amounts, it helps to balance these functions. However, excessive activation of histamine receptors in the brain can potentially lead to neurotoxicity and brain damage. Histamine-induced neurotoxicity is thought to occur through several mechanisms, including oxidative stress, calcium overload, and inflammation. High levels of histamine can lead to the generation of Reactive Oxygen Species (ROS) and disruption of the blood-brain barrier, which can result in neuronal damage and cell death. Research suggests that histamine-mediated neurotoxicity may be involved in various neurological conditions, such as stroke, epilepsy, and neurodegenerative diseases like Alzheimer's and Parkinson's [4]. Excessive histamine release or impaired histamine metabolism has been implicated in contributing to the progression of these conditions by promoting neuronal injury. Therefore, maintaining histamine homeostasis in the brain is crucial for overall brain health. Understanding the complex interplay of histamine signaling and its effects on brain function is important for developing potential therapeutic strategies to mitigate histamine-induced neurotoxicity and prevent associated brain damage [4].

### Brain Damage from Histamine Examples

Histamine-driven brain damage can manifest in various neurological conditions where histamine levels or histamine receptor function are dysregulated. Some examples of histamine-driven brain damage include; Stroke where histamine has been implicated in neuro inflammation and neuronal damage following a stroke. Excessive release of histamine during a stroke can contribute to the formation of reactive oxygen species and inflammation, leading to further injury to the brain tissue [4]. Some examples of histamine-driven brain conditions include: Epilepsy, Alzheimer's disease, Parkinson's disease, and traumatic brain injury.

#### In Epilepsy

Histamine has a complex role in modulating excitatory and inhibitory neurotransmission in the brain. Abnormal histaminergic signaling has been associated with seizure activity and epileptic disorders. Histamine receptors play a role in regulating neuronal excitability, and dysregulation of these receptors can contribute to the development and progression of epilepsy [4].

#### In Alzheimer's disease

Histamine dysfunction has been observed in patients with Alzheimer's disease. Changes in histamine levels and histamine receptor expression in the brain have been linked to cognitive decline and neurodegeneration in Alzheimer's patients. Histamine-driven neurotoxicity may contribute to the pathology of Alzheimer's disease [4].

### In Parkinson's disease

Alterations in histamine signaling have also been reported in Parkinson's disease. Histamine receptors are found in regions of the brain affected by Parkinson's, and histamine modulation has been suggested as a potential target for therapeutic interventions in Parkinson's disease [4].

### For Traumatic Brain Injury

Histamine levels can increase following a traumatic brain injury, leading to neuro inflammation and oxidative stress. Histamine-mediated neurotoxicity may exacerbate damage to brain cells and contribute to long-term neurological deficits following a brain injury [4].

These examples highlight the diverse ways in which histamine-driven mechanisms can contribute to brain damage in various neurological disorders. Understanding the role of histamine in these conditions is essential for developing targeted interventions to prevent or mitigate histamine-induced neurotoxicity and its consequences on brain health.

### Brain Fog and Fatigue and Histaminic Involvement

Brain fog and fatigue can indeed be associated with histamine-driven reactions in certain individuals, particularly those with histamine intolerance or histamine-related conditions. Histamine is a neurotransmitter that can affect cognitive function, mood, and energy levels, among other physiological functions [5].

Histamine intolerance occurs when there is an imbalance between histamine levels in the body and the capacity to break down histamine. In individuals with histamine intolerance, ingesting histamine-rich foods or experiencing increased histamine release can lead to a range of symptoms, including brain fog and fatigue [1].

Histamine can influence neurotransmitter release in the brain, affecting alertness, concentration, and cognitive function. Excessive histamine levels or altered histamine metabolism can disrupt neurotransmitter balance and lead to symptoms of brain fog, characterized by difficulty concentrating, mental clarity, and memory recall [5].

Fatigue can also be a common symptom of histamine-driven reactions. Histamine has been shown to affect energy metabolism and mitochondrial function in cells, potentially contributing to feelings of fatigue and low energy levels. Histamine-induced inflammation and oxidative stress can further exacerbate fatigue by placing additional strain on the body [1].

In individuals who are sensitive to histamine or have underlying histamine-related issues, such as histamine intolerance or mast cell activation syndrome, fluctuations in histamine levels can trigger symptoms like brain fog and fatigue. Managing histamine intake through diet, identifying and avoiding histamine triggers can help alleviate these symptoms and improve overall well-being [5].

### Additional Histamine Effects

Histamine is known to play a role in various physiological pro-

cesses in the body, including regulating immune responses, inflammation, and allergic reactions [1]. In the context of post-infection histamine activation, several factors and mechanisms may be at play including, the immune response: After an infection, the immune system may remain activated, leading to the continued release of inflammatory mediators like histamine [6]. This ongoing immune response can contribute to persistent inflammation and symptoms even after the infection has been cleared. Histamine is involved in processes related to tissue repair and remodeling following infection or injury [6]. Excessive or prolonged histamine activation post-infection may disrupt these processes, leading to tissue damage or dysfunction. Histamine can cause blood vessels to dilate and become more permeable, allowing immune cells and molecules to reach the site of infection or injury [1]. In the context of post-infection histamine activation, persistent vasodilation and vascular permeability can contribute to inflammation and tissue damage [6]. Histamine is a key player in systemic allergic reactions and anaphylaxis [1]. In cases where post-infection histamine activation is dysregulated, it may lead to persistent systemic symptoms such as hives, itching, swelling, low blood pressure, and even potentially life-threatening reactions in severe cases.

### Histamine Management

Management of post-infection histamine activation may involve a combination of approaches, such as antihistamine medications whereby antihistamines can help block the effects of histamine and alleviate symptoms such as itching, swelling, and inflammation (Kawauchi et al., 2019); anti-inflammatory therapies work in cases of persistent inflammation post-infection, anti-inflammatory treatments may be prescribed to help control the immune response and reduce tissue damage; while supportive care including adequate rest, hydration, and a balanced diet can support the body's recovery from infection and help regulate the immune response, including histamine activation [1]. In addition to medications which are labeled as antihistamines, some dietary supplements that may help alleviate histamine activation include: Quercetin, Vitamin C, Diamine Oxidase (DAO), Bromelain, and Omega-3 fatty acids. Using dietary supplements for regulating histamine activation may have benefits of being non-addictive, lessen side effects and even help to alleviate the histamine activation altogether by metabolic normalization [8]. Diamine Oxidase (DAO) is an enzyme that helps breakdown histamine in the body. While DAO is primarily produced in the body, some foods contain natural food sources of DAO or nutrients that may support DAO activity. Including foods that are rich in DAO or that can enhance DAO activity in the diet may be beneficial for individuals with histamine intolerance or those looking to support histamine metabolism [8].

Examples of foods that are considered to be DAO-rich or supportive of DAO activities include: Freshly cooked meats, such as beef, pork, chicken, and turkey, are good sources of DAO. Avoid processed meats, cured meats, and leftovers, as they may contain higher levels of histamine. Fresh fish, especially non-histamine-producing fish such as salmon, mackerel, and tuna, can be good sources of DAO. It's best to consume freshly cooked fish and avoid smoked or

canned varieties. Fresh Fruits; certain fruits, including citrus fruits like oranges and lemons, are believed to support DAO activity. Apples, pears, and berries are also considered to be beneficial for histamine metabolism. DAO-rich vegetables include leafy greens like spinach and kale, as well as cruciferous vegetables such as broccoli, Brussels sprouts, and cabbage. Consuming a variety of fresh vegetables can provide nutrients that support DAO function. Healthy Fats; foods rich in omega-3 fatty acids, such as fatty fish, flaxseeds, and walnuts, can help reduce inflammation and support overall immune function, potentially aiding in histamine metabolism. Herbs and Spices; certain herbs and spices like parsley, basil, and cilantro are believed to have natural antihistaminic properties and may support histamine metabolism. Incorporating these herbs and spices into your meals can add flavor and potential health benefits. Digestive Enzymes, while not foods themselves containing DAO may help support histamine metabolism when taken with meals high in histamine or when symptoms of histamine intolerance occur. It's important to note that individual responses to DAO-rich foods can vary, and it's recommended to experiment with your diet and track how your body responds to different foods. If you suspect histamine intolerance or have concerns about histamine-related issues, consider consulting a healthcare provider or a registered dietitian for personalized guidance on managing your diet and incorporating DAO-rich foods into your meals effectively.

## Solutions commonly used for Managing the Histamine Response

Reducing histamine response to infections can help manage symptoms and prevent excessive inflammation in the body. Some strategies to help mitigate histamine over-responses during infections include:

### Antihistamines

Over-the-counter or prescription antihistamines can help block the effects of histamine in the body, reducing symptoms such as itching, sneezing, and swelling. These medications can be particularly helpful in managing allergic reactions or histamine-related symptoms during infections.

### Anti-inflammatory Medications

Nonsteroidal Anti-Inflammatory Drugs (NSAIDs) or corticosteroids can help reduce inflammation and suppress the immune response, which may help decrease histamine release and its effects in the body.

### Prebiotics and Probiotics

Maintaining a healthy balance of gut bacteria through prebiotic support and probiotics may help regulate the immune response and reduce histamine release. Prebiotics and Probiotics can also support overall immune function during infections.

### Low-Histamine Diet

Some foods contain higher levels of histamine or can trigger histamine release in the body. Following a low-histamine diet by avoiding or reducing intake of histamine-rich foods such as aged cheeses, fermented foods, alcohol, and processed meats may help alleviate histamine-related symptoms.

### Stress Management

Stress can exacerbate inflammation and immune responses, including histamine release. Practicing stress-reducing techniques such as mindfulness, meditation, yoga, or deep breathing exercises may help modulate the immune response and reduce histamine over-responses.

### Stay Hydrated

Drinking an adequate amount of water can help flush out toxins and metabolic byproducts, potentially reducing histamine accumulation and symptoms associated with histamine over-responses.

### Consult a Healthcare Provider

For persistent or severe histamine-related symptoms during infections, it is important to seek medical advice from a healthcare provider.

## Managing Histaminic Activation Naturally

Histamine responses can be modulated through various non-pharmacological approaches and lifestyle changes. Some strategies that may help in managing histamine-related issues without relying solely on medications include:

### Dietary Modifications

Adjusting your diet to reduce histamine intake can be beneficial for individuals with histamine intolerance. Avoiding or minimizing histamine-rich foods such as aged cheeses, fermented foods, processed meats, and certain vegetables like tomatoes and eggplants can help lower histamine levels in the body.

### Histamine-Reducing Foods

Incorporating foods that have DAO (diamine oxidase) activity, an enzyme that helps break down histamine, may be helpful. Examples include fresh meats, poultry, fish, certain fruits, and vegetables. Probiotic-rich foods can also support gut health and potentially improve histamine metabolism.

### Stress Management

Stress can trigger histamine release and exacerbate symptoms in individuals with histamine-related conditions. Practicing stress-reducing techniques such as meditation, deep breathing exercises, yoga, or mindfulness can help modulate the body's stress response and minimize histamine reactions.

### Supplements

Certain supplements may support histamine metabolism and reduce symptoms. For example, vitamin C, quercetin, bromelain, and DAO enzyme supplements are believed to help in managing histamine intolerance.

### Physical Activity

Regular exercise can help regulate immune function, reduce inflammation, and support overall health, potentially improving histamine-related symptoms. Choose activities that you enjoy and that suit your fitness level.

### Allergen Reduction

Minimizing exposure to allergens, such as dust mites, pet dan-

der, and pollen, can help reduce histamine release and allergic reactions. Using air purifiers, maintaining a clean living environment, and avoiding known triggers can be beneficial.

### Hydration

Staying well-hydrated can support detoxification processes in the body and help flush out excess histamine. Drink plenty of water throughout the day to maintain optimal hydration.

### Sleep Hygiene

Quality sleep is essential for overall health and immune function. Establishing a bedtime routine, creating a comfortable sleep environment, and prioritizing restful sleep can help support histamine regulation.

### Mindful Eating

Pay attention to how your body responds to different foods and keep a food diary to track potential triggers. This can help identify specific foods that may worsen histamine-related symptoms and guide dietary modifications.

By implementing these non-pharmacological strategies and making lifestyle changes, individuals with histamine-related conditions may be able to modulate their histamine responses and alleviate symptoms without relying solely on medications. It's important to work closely with a healthcare provider or a registered dietitian to develop a comprehensive and personalized approach to managing histamine intolerance or other histamine-related issues.

## Herbal Remedies

Several herbal remedies are believed to have potential antihistaminic properties and may help in managing histamine-related issues like allergies, histamine intolerance, and associated symptoms. It's important to note that while some individuals may find relief from herbal remedies, scientific evidence supporting their efficacy in histamine-related conditions varies.

## Key Health Benefits

Antioxidant Support and Oxidative Stress Management by combining potent antioxidants, Hay Fever A & B products work to neutralize free radicals and support your body's resilience against environmental stresses.

Capsule A is a herbal combination meant to slow down the histamine reactions including Respiratory and Immune System Enhancement ingredients: Carefully selected for their traditional use in supporting respiratory health and immune response, these capsules offer a balanced approach to maintaining well-being very quickly.

Capsule B is meant to absorb allergens and promote healing, including Digestive Comfort and Detoxification Support Ingredients known for their soothing effects on the digestive system and support for the body's natural detoxification processes offer a gentle, effective approach to digestive health.

## The Main Benefits Associated with Active Ingredients in Hay Fever A

Bromelain is an enzyme found in pineapples that helps break

down protein, potentially easing digestion and reducing inflammation in the gastrointestinal tract. It may reduce inflammation, swelling, and pain, particularly in the nose and sinuses, muscles, and joints [9,10].

Butterbur (*Petasites hybridus*) has been shown to reduce the frequency of migraine headaches in some people. May be effective in reducing symptoms of hay fever, such as sneezing, itching, and nasal congestion [11,12]. Echinacea (*Echinacea purpurea*) is widely used to prevent or reduce the symptoms of colds and other infections by boosting the immune system. It may have anti-inflammatory effects beneficial for overall health and well-being [13,14].

Ginger Root (*Zingiber officinale Roscoe*) is known for its ability to alleviate nausea and vomiting, including morning sickness and motion sickness. Contains gingerol, which has potent anti-inflammatory and antioxidant effects, potentially reducing pain associated with arthritis [15,16].

Licorice Root (*Glycyrrhiza glabra*) is used to treat digestive issues, including stomach ulcers, heartburn, and indigestion due to its soothing properties. It may ease respiratory conditions by helping to loosen and expel phlegm. Licorice root can have a beneficial effect on adrenal function, helping to maintain adequate cortisol levels [17,18].

N-Acetylcysteine (NAC) Acts as a precursor to glutathione, one of the body's most important antioxidants, helping to reduce oxidative stress and cellular damage. Helps thin and loosen mucus in the airways, making it particularly beneficial for conditions such as chronic bronchitis. Supports liver health and detoxification, especially in cases of acetaminophen (Tylenol) overdose, by replenishing glutathione levels [19,20].

Perilla (*Perilla frutescens*) is rich in flavonoids that may reduce allergic reaction symptoms, such as in seasonal allergies. It contains compounds that exhibit anti-inflammatory and antioxidant properties, supporting overall health. Traditionally used to treat asthma and other respiratory conditions by reducing inflammation and supporting immune health [21,22].

Quercetin is a flavonoid that offers strong antioxidant protection against free radical damage. It may reduce inflammation and symptoms of conditions like arthritis. Has been associated with reduced blood pressure and improved heart health [23,24].

Sea Buckthorn (*Hippophae rhamnoides*) is high in vitamins, minerals, antioxidants, and omega fatty acids, supporting overall health. Often used in topical treatments to improve skin issues like eczema, acne, and signs of aging due to its nourishing properties. May support digestive health by protecting the stomach lining and promoting healing of ulcers [25,26].

Stinging Nettle (*Urtica dioica*) can help relieve symptoms of Benign Prostatic Hyperplasia (BPH) and urinary issues. May reduce inflammation and pain associated with conditions like arthritis. Acts as a natural antihistamine, potentially reducing hay fever symptoms [27].

Vitamin C (*Ascorbic Acid*) boosts the immune system and helps fight off infections. Protects the body's cells from damage and sup-

ports skin health [28,29]. Yarrow (*Achillea millefolium*) is traditionally used for its ability to stop bleeding and heal wounds. It can stimulate the digestive system, easing issues like indigestion and cramping. Its anti-inflammatory properties may help reduce symptoms in conditions like IBS (Irritable Bowel Syndrome) and eczema [30,31].

### The Main Benefits Associated with Active Ingredients in Hay Fever B

Activated Charcoal is known for its ability to absorb toxins, allergens, and chemicals, making it useful in cases of poisoning or overdoses, if it's administered in a medical setting. May relieve gas and bloating by binding to byproducts in foods that cause discomfort. Although more research is needed, it's often promoted for general detoxification [32,33].

Butterbur (*Petasites hybridus*) has been shown to reduce the frequency of migraine headaches in some people. May be effective in reducing symptoms of hay fever, such as sneezing, itching, and nasal congestion [11,12].

Mullein (*Verbascum thapsus*) is traditionally used to relieve respiratory conditions like coughs, bronchitis, and asthma due to its expectorant and anti-inflammatory properties. Can help reduce inflammation in various parts of the body, supporting overall health and comfort. Sometimes used in the form of ear drops to treat ear infections, although more research is needed for conclusive evidence [34,35].

Rosemary (*Rosmarinus officinalis*); Some studies suggest that rosemary may improve concentration, performance, speed, and accuracy in cognitive tasks. Contains antioxidants and anti-inflammatory compounds that may help boost the immune system and improve blood circulation. Often found in hair care products, rosemary oil has been linked to preventing baldness, slowing graying, and treating dandruff and dry scalp [36,37].

Turmeric (*Curcuma longa*); the active compound in turmeric, curcumin, has powerful anti-inflammatory effects and is a strong antioxidant. May boost Brain-Derived Neurotrophic Factor (BDNF), linked to improved brain function and a lower risk of brain diseases. Can improve several factors known to play a role in heart disease, and its antioxidant and anti-inflammatory properties are believed to be beneficial for heart health [38,39].

Vitamin C (Ascorbic Acid) boosts the immune system and helps fight off infections. It also protects the body's cells as an antioxidant from damage and supports skin health [28,29].

### Conclusion

Dietary supplements can play a role in reducing histamine over-responses by modulating the immune system, supporting a healthy inflammatory response, and helping to maintain optimal levels of histamine in the body. Some dietary supplements that may help reduce histamine over-responses include:

Quercetin is a flavonoid with antioxidant and anti-inflammatory properties. It is believed to inhibit histamine release from mast cells, thereby reducing histamine-related symptoms. Quercetin

supplements are often used to support immune health and manage allergic reactions.

Vitamin C is a potent antioxidant that can help reduce inflammation and oxidative stress in the body. It may also help stabilize mast cells and reduce histamine release. Vitamin C supplements are known to support immune function and may be beneficial in managing histamine over-responses.

Bromelain is an enzyme found in pineapple that has anti-inflammatory properties. It may help reduce inflammation and swelling associated with histamine release. Bromelain supplements are sometimes used to support digestion and reduce inflammatory responses.

Prebiotics and Probiotics, supplements can support beneficial bacteria that can help balance the gut microbiota and support immune function. Maintaining a healthy gut microbiome is important for regulating immune responses, including histamine release.

N-Acetylcysteine (NAC): NAC is a precursor to glutathione, a powerful antioxidant involved in reducing inflammation and oxidative stress. NAC supplements have been studied for their potential to modulate immune responses and reduce histamine levels in the body.

Using dietary supplements for regulating histamine over-activation may have benefits of being non-addictive, lessen side effects and even help to alleviate the excess histamine activation altogether by metabolic normalization.

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### Conflict of Interest

None.

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