

ABB C1[®]:
Training Now for Future Immune Challenges



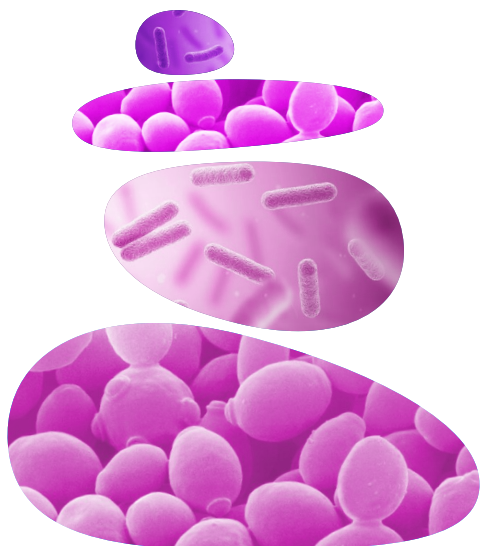
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Summary

Training has been an accepted part of our lives for a long time. When we are young, we get “potty-trained”. When we want to get physically fit, we train our bodies with cardiovascular activities, weights, and stretching. When we get older, we focus on “training the brain”. If you play a sport, you may train in a specific way to improve your reaction time, muscle memory, thought processes, speed, accuracy, or endurance. One area of training that often gets overlooked is training the immune system. Researchers have now shown that it is possible to train the immune system to make it react faster and more efficiently. This paper will discuss the latest research and unveil a product we should all seek to strengthen our immune system.



Immunity 101

To best understand trained immunity, we must look at the immune system and its inner workings. The immune system is broken down into two sections: Innate and Acquired (Diagram 1). The main difference between the two is we are born with innate immunity already functioning, and acquired immunity develops over time. Let's dive deeply into each to understand where trained immunity fits.

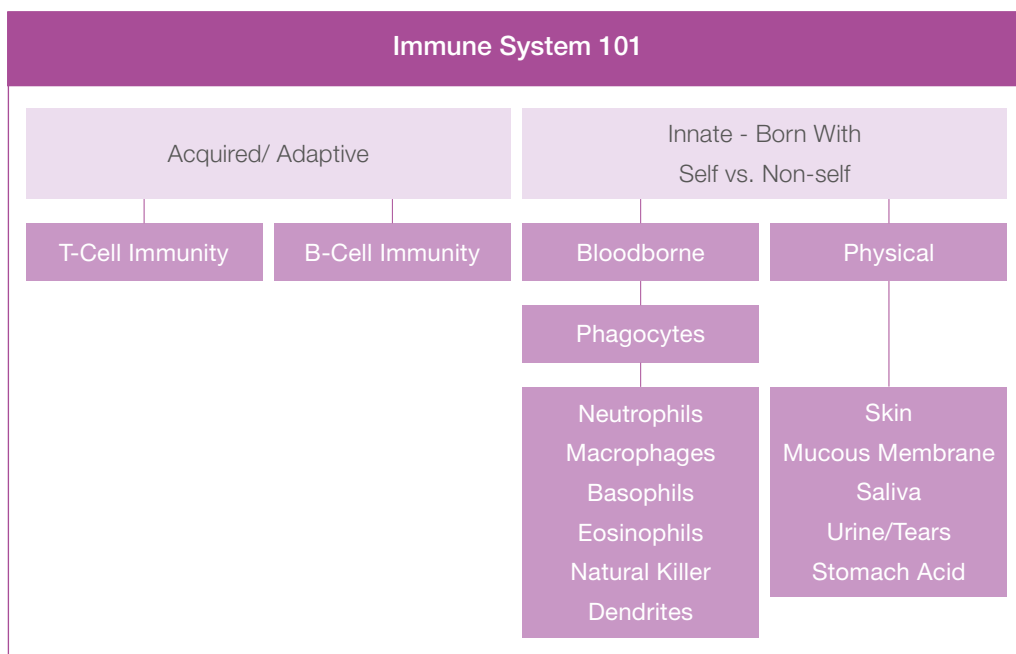


Diagram 1

Innate Immunity

As mentioned above, we are born with innate immunity. Innate immunity is designed to protect the body from outside invaders called pathogens. A pathogen is an organism that can cause disease and is sometimes referred to as an antigen or “non-self,” meaning the organism is not a part of the regular makeup of the body. Examples include bacteria, viruses, fungi, parasites, abnormally formed cells, and toxins. The diagram above shows that this system is divided into two main areas: Physical and Bloodborne. The physical parts of our innate immune system consist of the skin, tears, mucous, stomach acid, urine, and saliva. These provide a protective barrier as well as provide immune reactions to protect the body from the outside in.

Bloodborne parts of innate immunity are often referred to as phagocytes, which perform a process known as phagocytosis. Phagocytosis is considered one of the most important processes during the innate immune response. Once phagocytes arrive at the infectious site, they ingest microbial pathogens. Phagocytes include cells known such as neutrophils, macrophages, basophils, eosinophils, natural killer cells, and dendritic cells. Many of these cells also produce cytokines (considered messengers) that either stimulate or slow down the immune system. Cytokines also help the innate immune system activate the acquired immune system.

Innate Immunity's Main Purpose: To immediately prevent the spread and movement of pathogens throughout the body.

Activity: This system is always active and offers an immediate response.

Acquired Immunityⁱ

Acquired immunity is considered our second line of defense against non-self and pathogens. Acquired immunity takes over when the innate immune system cannot destroy a pathogen. Acquired immunity uses “memory” to learn about the threat and enhances the immune response accordingly. This system is specific to each unique pathogen. A few examples of acquired immunity would be a vaccine or an allergy shot. The administration of a small dose of a pathogen to your body so your immune system is exposed to it enough to form antibodies to fend off your next exposure to that pathogen.

Acquired immunity is often referred to as adaptive immunity due to the body needing to be exposed to the pathogen previously and then adapt to be able to fend off the foreign invader. The acquired immune system consists primarily of B cells, T cells, and antibodies.

- **B Cells** are formed in bone marrow, i.e., B-cell, and are broken down into two types of cells, effector and memory.
 - Effector cells — Help the body produce more antibodies.
 - Memory cells — Remember the previous pathogen for future exposure.
- **T Cells** are formed in the bone marrow and migrate to the thymus, i.e., T-cell. There are several types of T-cells, including T-helper cells, Cytotoxic T cells, and T regulatory cells.
 - T-helper cells activate T, B, and other immune cells to respond.
 - Cytotoxic T cells remove pathogens and infected host cells (for example, a cell infected by a virus).
 - T regulatory cells help distinguish between self and non-self (reducing the risk of autoimmune diseases).
- **Antibodies** detect pathogens and other potentially harmful substances (toxins) and attach to them. This attachment either neutralizes the pathogen, marks the pathogen for destruction by another immune cell, or removes the pathogen from the body completely.

Acquired Immunity's Main Purpose: The second line of defense is to help protect the body from a specific pathogen.

Activity: Acquired immunity can take up to 4 days to become effective. Even though acquired immunity does not respond quickly, it is highly specific and sustained for extended periods (months to years).ⁱⁱ

Optimizing the Two Sections of the Immune System

Even though these two sections of the immune system should operate seamlessly, key factors can play a role in their ability to function optimally. To help support these two systems, the following are key areas which will have an impact on your immune system functioning optimally.

Reduce Stress

Short-term stress primarily enhances innate immunity and secondarily enhances adaptive immunity. Long-term stress suppresses or dysregulates both innate and adaptive immune responses.ⁱⁱⁱ It also causes a significant decrease in numbers and percentages of lymphocytes, B-cells, NK cells, and monocytes. In summary, stress decreases immune cell numbers and function and increases active immunosuppressive mechanisms.^{iv}

Get More Sleep

There is an association between short sleep duration and infection risk while exerting a strong regulatory influence on immune functions.^v Just one night of total sleep deprivation decreases neutrophil function.^{vi} At the same time, prolonged sleep curtailment and the accompanying stress response produce immunodeficiency.^{vii} Lack of sleep is directly linked to decreased immune cells such as leukocytes, monocytes, lymphocytes, lymphocyte subsets (i.e., B cells, CD4 and CD8 T cells, NK cells), and overall immune cell activity.^{viii}

Diet

Adequate and appropriate nutrition is required for all cells to function optimally. An “activated” immune system further increases the demand for energy during periods of infection. For the best immunological outcomes, would be nutrition, which supports the functions of immune cells allowing them to initiate effective responses against pathogens but also to resolve the response rapidly when necessary and to avoid any underlying chronic inflammation. Undernutrition is well understood to impair immune function, whether because of food shortages or famines in developing countries, or as a result of malnutrition arising from periods of hospitalization in developed countries. The extent of impairment that results will depend upon the severity of the deficiency,^{ix}

Address Nutritional Short Falls

In reality, our diet should be all we need to address the nutritional needs of the immune system. The truth is, nutritional depletions are quite prevalent and in the case of immunity, two minerals rise to the top: Selenium and Zinc.

- Selenium is a potent antioxidant that enhances cytotoxic effector cells' function, maintains T-cell maturation and functions, and T-cell-dependent antibody production.^x Recent review articles on selenium deficiency and viral infection show that lower blood levels of selenium are associated with a worse prognosis of infectious disease.^{xi} In addition, supplementing with selenium is recommended, or raising antiviral resistance.^{xii}
- Zinc's impact on immune health has been shown in multiple areas, including antioxidant properties, strengthening of the immune system, normal development, and function of cells such as neutrophils and natural killer cells. Zinc deficiency also affects the development of acquired immunity by preventing the outgrowth and certain functions of T lymphocytes and B lymphocyte development and antibody production. Zinc deficiency also adversely affects Macrophages, which can contribute to more dysregulation of the immune system.^{xiii}

Introduction to Trained Immunity

The ability of the innate immune system to develop adaptive features and provide long-term protection against pathogenic reinfection is termed trained immunity. Trained immunity describes the immunological process by which innate immune cells “acquire” short-term memory towards pathogens. For example, after exposure to a specific pathogen, innate immune cells can adjust their response toward the next “attack”. This results in an enhanced response to previously encountered pathogens.^{xiv} Even though the innate immune cells return to an inactivated state when the original pathogen is eliminated, the trained innate system can now respond faster and more robustly with its subsequent encounter with another pathogenic invasion (Image 1). The trained immune response differs from an acquired immune response because it can be unrelated to the original pathogen.^{xv}

Like the acquired immune response, trained immunity is associated with a heightened immune reaction in response to reinfections. In general, trained immunity provides relatively short-term protection from about three months to 1 year. Innate immune memory properties have been described in several cell populations, including monocytes/macrophages, neutrophils, dendritic and NK cells,^{xvi}

Trained Immunity’s Main Purpose

- Leads to an **enhanced immune response** to a second unrelated challenge.
- It is a **powerful bridge between innate and adaptive immunity**.
- It is an **improved response against infections**.
- **Develops adaptive features** and provides long-term protection against pathogenic reinfection.
- It is **important for vaccine responses**.
- It is a potential therapeutic strategy to manage various health conditions associated with immune system malfunctioning.

Activity: Immediately and lasts 3 to 12 months

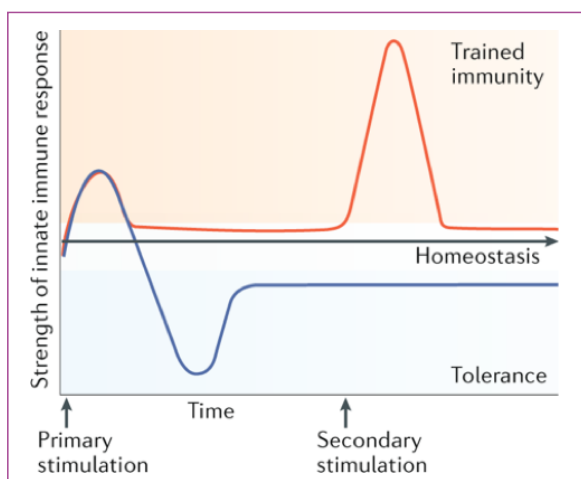


Image 1

ABB C1[®]: Trained Immunity and Beyond

What is ABB C1[®]?

ABB C1[®] is a synergistic combination of three *Saccharomyces cerevisiae* (Baker's yeast) based ingredients: beta-1,3/1,6-glucan complex, selenium-rich postbiotic and zinc-rich postbiotic.

To best understand the synergistic impact ABB C1[®] has on the immune system and, more specifically, **trained immunity**, let's look at all three ingredients individually.

Beta-1/3,1/6-glucan Complex from *Saccharomyces cerevisiae*

Avoid the Confusion: Not all Beta-glucans are created equally!

The name beta-glucan is often used generically, like saying Kleenex[®] for a tissue. Just as not all tissues are the same quality as a Kleenex[®], not all beta-glucans are the same. In nature, beta-glucans are found in many different sources and have entirely different chemistry, uses, and efficacy. Beta-glucans from cereal grains (Beta-1,3/1,4-glucan) are best for lowering cholesterol. Mushroom beta-glucan (beta-1,3/1,6-glucan) has not been well studied, and research has been mixed regarding its impact on health. Next, we have Beta-1,3/1,6 beta-glucan derived from the cell membrane of *Saccharomyces cerevisiae* which has numerous studies proving its safety and efficacy for the immune system support. Studies have demonstrated that beta-1/3,1/6-glucan from yeast can:

- Strengthen the immune system.^{xviii}
- Enhance immune system response to vaccination.^{xix}
- Enhance the protection against allergies.^{xx}
- Promote healthy inflammatory responses.^{xxi}
- Support respiratory health.^{xxii}
- Protect in periods of excess physical and emotional stress.^{xxiii xxiv}

Something New

ABB C1[®] Beta-glucan is something unique and revolutionary. ABB C1[®]'s beta-glucan is a **high-complexity blend of two individual Beta-glucans (Beta-1,3/1,6-glucan) from *Saccharomyces cerevisiae*** and is patent pending.

ABB C1®'s Beta-glucan complex possesses superior bioactivity, resulting in an **enhanced trained innate immune response**.

The complex has shown the ability to activate multiple immune receptors and metabolic enzymes, which provides a **synergistic impact on the innate immune system**. ABB C1® Beta-glucan complex yields a more robust secondary response by the immune system (Trained Immunity) compared to other Beta-glucans.

*Selenium-rich Postbiotic from *Saccharomyces cerevisiae**

The selenium-rich postbiotic found in ABB C1® is quite different than other selenium ingredients because selenium is organically bound during a fermentation process and incorporated into the selenoproteins which can produce immediate biological effects after intake. Selenium-rich postbiotic from *Saccharomyces cerevisiae* is less toxic and better absorbed than other forms of selenium.^{xxv xxvi}

Selenium-rich Postbiotic *Saccharomyces cerevisiae* offers an improved bioavailability compared to other forms of selenium.

*Zinc-rich Postbiotic from *Saccharomyces cerevisiae**

Zinc is an essential trace element for all living organisms and plays important roles in growth and development, immune function, neurotransmission, vision, reproduction, sense of taste, and influences fluid and electrolyte balance in the intestinal tract.^{xxvii} Zinc is also involved in many aspects of cellular metabolism and is required for the activity of hundreds of enzymes.^{xxviii} As with the Zinc-rich postbiotic mentioned above, the Zinc-rich postbiotic found in ABB C1® is quite different than other zinc ingredients because zinc is covalently bound during manufacturing process. Zinc-rich postbiotic from *Saccharomyces cerevisiae* has been shown to provide superiority over other salt forms of zinc regarding absorption and retention.^{xxix} In the case of Zinc-rich postbiotic, there is also a positive interaction between elemental zinc and its yeast carrier which provides for better absorption of the mineral. This also helps avoid zinc's reaction with other substances in the gut and therefore can help reduce chance of toxicity.

Proven Synergy

We learned earlier that the patent pending Beta-glucan complex in ABB C1® provides a synergistic impact on the immune system. Research has proven that there are other areas of synergistic combinations found within ABB C1® too. Examples: When combined, zinc and selenium supplementation showed a superior protective effect against respiratory infection, with an increase in the rate of subjects free of infection in 6 months.^{xxx} The combination of selenium with beta-glucan improves the immune modulatory effects of beta-glucan.^{xxxi}

ABB C1[®]: Three Unique Mechanisms of Action = 1 Powerful Product

If a target was on the wall and you were standing 30 feet from it and had just one pebble to throw at it, the likelihood of hitting it in the middle would be low. But, if you had a handful of pebbles and made the same throw, your probability of hitting the target would increase significantly. This is precisely what ABB C1[®] provides: Three big pebbles (mechanisms of action) and one target (the immune system):

1. Induction of Trained Immunity

- a. Beta-1,3/1,6-glucan is considered an ideal inducer of trained immunity.^{xxxii}
 - i. Example: Beta-1/3-1/6-glucan complex impacts neutrophils and will activate them to go into action quickly when there is a threat against the body from a pathogen.

2. Modulation of the Microbiome

- a. *Saccharomyces cerevisiae* appears to have an impact on the gut in several different ways:
 - i. Bind and neutralize gut pathogen growth and neutralize pathogenic toxins.^{xxxiii}
 - ii. Reduce inflammation.^{xxxiv}
 - iii. Strengthen the gut lining.^{xxxi}
 - iv. Immune modulating effects.

3. Targeted Immune System Nutrition

- a. Selenium-rich postbiotic from *Saccharomyces cerevisiae*
 - i. Potent antioxidant.
 - ii. Enhances the function of cytotoxic effector cells.
 - iii. Maintains T-cell maturation, functions, and T-cell-dependent antibody production^{xxxvi}.
 - iv. Selenium deficiency is associated with a worse prognosis of infectious disease.^{xxxvii}
 - v. Supports antiviral resistance.^{xxxviii}
- b. Zinc-rich postbiotic from *Saccharomyces cerevisiae*^{xxxix}
 - i. Antioxidant properties.
 - ii. Strengthening of the immune system.
 - iii. Supporting the healthy production and function of key immune cells (neutrophils and natural killer cells).
 - iv. Zinc deficiency also adversely affects Macrophages, which can contribute to more dysregulation of the immune system.
 - v. Positive impact on the development of acquired immunity.
 - 1. Preventing both the outgrowth and certain functions of T and B lymphocyte development and antibody production.

The proof is in the Science

While the scientific information above regarding the three components that make up ABB C1[®] is compelling enough, studies are specific to ABB C1[®].

Study 1: Impact of ABB C1[®] Supporting Vaccinated Individuals^{x1}

This study evaluated both the tolerance and efficacy of ABB C1[®] or a placebo in those who received either a flu vaccine (Chiromas[®]) or a COVID-19 vaccine (Comirnaty[®]).

Study Format: Single-Center, randomized, double-blind, placebo-controlled.

Participants: 72 healthy volunteers (34 flu vaccine group & 38 COVID-19 vaccine group).

Duration of Treatment: Flu vaccine = 30-days, COVID-19 vaccine = 35-days.

Results:

- ABB C1[®] enhanced the immune system's response to both the flu and COVID-19 vaccinations compared to placebo. After a single dose, these results showed a T-lymphocyte, IgM, and IgG antibodies response. The highest levels of antibodies were seen on the last day of testing.
- ABB C1[®] also increased blood concentrations of the vital immune minerals zinc and selenium compared to those taking the placebo.
- ABB C1[®] enhanced the immune system response with the second dose of COVID-19, which indicates ABB C1[®] stimulated Trained Immunity.
- ABB C1[®] is well tolerated.

Study Conclusion: ABB C1[®] appears to stimulate trained immunity compared to placebo. This also indicates that ABB C1[®] provides reliable absorbable micronutrients that enhance immune function. The effect is not limited to influenza but can work for other vaccines. ABB C1[®] supplementation in conjunction with vaccine administration is encouraged due to its certain safety and tolerability.

Study 2: Impact on Gut Barrier, Anti-inflammatory Effects, and Stimulation of Phagocytosis ^{xli}

This study evaluated the anti-inflammatory effects, protection of the gut barrier integrity, and the stimulation of phagocytosis (Pac-MAN) of ABB C1®.

Study Format:

- a) Caco-2 cells (Intestinal lining cells) for inflammatory and gut barrier integrity analysis.
- b) Mice (both sexes) to measure phagocytosis.

Results:

- ABB C1® significantly reduced the two primary inflammatory compounds, IP-10 and MCP-1 levels compared to controls.
- ABB C1® showed significant abilities to protect the gut lining from disruption caused by *Escherichia coli* (*E. coli*).
- ABB C1® improved the build-up of the gut lining over the 22 days compared to the negative control.
- ABB C1® showed the highest phagocytosis activity compared to algal beta-1,3-glucan and yeast beta-1,3/1,6-glucan.

Study Conclusion: Taken together, these three experimental studies show that ABB C1® exhibited anti-inflammatory properties, protection of the gut lining, and stimulated phagocytosis.

The Homestretch

If we were in a race, the homestretch is where your training means the most. Regarding immune health, training the immune system is key to be able to go down the homestretch and cross the finish line first (increasing our chance of fending off infection). We now have the ability, through dietary supplements (ABB C1®), to train our innate immune system to act even faster and more efficiently. By training our innate immune system we also form a bridge between it and our adaptive immune system. These two functions lead to an overall improvement in immune activity towards infections and benefits those receiving vaccinations. Simply put, training the immune system offers a strategic approach to boosting overall immunity, and helping the body manage health conditions associated with a malfunctioning immune system.

Keep in mind that ABB C1® offers the immune system not just one, but **three unique and differing mechanisms of action**. These three combine to give the immune system the strength to make it “down the stretch” and finish the race a winner.

ABB C1®: Training the Immune System to Be a Thoroughbred

- Induces a balanced immune response.
- Does not trigger an overactive immune response (Cytokine Storm).
- Clinically proven vaccine adjuvant
- Faster and more intense release of antibodies (IgM) in response to vaccine antigens.
- Provides vital nutrients for viral defense.
- Exerts microbiome modulating effects with postbiotic yeasts.
- Protects the integrity of the gut.
- Quicker, more innovative, and more effective immune response.
- Simultaneously reinforces innate and adaptive immune defenses.

Formulate for Success: Get Creative

ABB C1® is available in stick packs, capsules, tablets, snack bars, gummies & bulk powder.

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