Burnbrae Farms Promuna beverage builds on Natural Benefits of Egg Yolk Antibodies (IgY)

Overview

Antibodies are a critical part of immune health, and generally speaking, more are better. Antibodies are Y-shaped proteins that have the ability to find and attach themselves to pathogens, like a harmful bacteria or virus. To make it simple, once an antibody attaches itself to a pathogen, it helps your immune system to neutralize and eliminate it. The higher the quantity and diversity of antibodies you have in your body, the greater the chance harmful pathogens can be found and disabled when they arrive.

In the same way that human breast milk is very rich in antibodies, chicken egg yolk is also very rich in antibodies (called IgY). This is nature's way of passing as much of a mother's natural immunity as possible to their vulnerable offspring, in other words, an immune headstart! Because human antibodies and chicken IgY antibodies are structurally and functionally very similar, consuming raw egg yolks that are rich in antibodies can increase the amount and diversity of antibodies in your gastrointestinal tract.

Unfortunately, cooking yolks also denatures or breaks apart the antibodies, which means they are no longer effective. To overcome this limitation, Burnbrae Farms, a Canadian family egg business, has developed a special production process that protects the IgY antibodies from this degradation while still effectively pasteurizing the product for overall safety. The pasteurized egg yolk has been incorporated into a new beverage called Promuna. Working with Burnbrae, Immune Biosolutions, an innovative biotech company, has developed a methodology for testing to ensure the IgY antibodies are present in the Promuna drink and are therefore available to support the immune function of those who drink it regularly.

DETAILED SCIENTIFIC DISCUSSION:

Improving one's health is the aspiration of a large part of the population who is always looking for new ways to better their nutrition. The demand for new scientifically proven nutraceutical products (functional foods, dietary supplements, and medical foods) is constantly increasing and a lot of new products are commercialized every year. Among the therapeutic areas, digestive health has a widespread interest.

Burnbrae Farms is a Canadian family business that has been producing eggs for over 75 years, which has developed a particular expertise in egg pasteurization and liquid egg products. Immune Biosolutions is an innovative biotechnology company specializing in the discovery and engineering of chicken antibodies for targets with recognized, but unexploited therapeutic and diagnostic potential. By combining their expertise, they are committed to improving food with a particular focus on immune and digestive health.

Eggs Are a Unique and Exceptional Food

Eggs are an interesting food well known for their many vitamins and minerals and high protein content. However, a lesser-known benefit of eggs is their great contribution of antibodies and the benefits associated with these unique Y shaped protein molecules.

Antibodies are a Key Player in Immune Health

The immune system plays an important role in maintaining your overall health and is divided in two main mechanisms:

- Innate immunity, which consists of physical (skin and mucus), chemical and non-specific cellular, and
- Adaptive (or acquired) immunity is created in response to exposure to a foreign element or antigen (e.g. bacteria, virus or toxin) by the development of the immune cells, B cells and T cells (lymphocytes), with specific countermeasures, such as antibodies.

Secreted by B cells, antibodies are central to this mechanism of acquired immunity in recognizing foreign bodies and activating the lymphocytes T to trigger their elimination.

Furthermore, there are two types of antibodies: natural and acquired. Natural antibodies are present in the body without any previous foreign antigen exposure and are part of the innate immunity of all vertebrates. They confer an immediate wide-spectrum protection against infections by inducing the formation large immune complexes. The acquired antibodies are developed after exposure to a pathogen, infection, and vaccination. They are specific to a particular antigen and often memorized by the immune system after they have been produced once.

The Interest in Chicken Antibodies

There is an increasing interest in the immunoglobulin type Y (or IgY), a specific type of chicken antibody. This type of antibody, present in birds, reptiles, and amphibians, is similar to human IgG antibodies. IgG antibodies are the most abundant antibody in our blood and play a major role in long-term adaptive immunity. These antibodies (IgGs in humans, IgY in chickens) are the natural defence against pathogens and are extremely effective in neutralizing or eliminating invading microorganisms.

Chicken IgY antibodies are abundant in the egg yolk; each chicken egg contains between 100 mg and 200 mg of IgY. Throughout its life, the chicken's IgY profile evolves according to its exposure to pathogens. In conventional farming, chickens are often administered vaccines to help them produce antibodies or gain protection against problematic diseases, avian-specific pathogens and more universal pathogens affecting humans, such as influenza and Salmonella.

Hen Antibody Transfer in Eggs: Breastfeeding Avian-Style

Similar to the milk produced by breast-feeding mammals, hens transfer IgY antibodies into the egg yolk to protect their offspring in their first days of life. Hence, egg yolks are rich in IgYs as part of a natural process that allows the hen to transfer its natural and acquired immunity to its offspring before the chick's own immune system is fully developed.

The Antibacterial and Antiviral Properties of the IgY

The interest in IgY antibodies in egg yolks relies on their ability to protect against bacterial (1) and viral infections (2), as well as their cost-efficient production and edible nature. Several studies have investigated their intrinsic properties to better characterize their protective potential.

In animal agriculture, infections represent a continual concern. Farmers commonly use antibiotics, the drugs used to inhibit the growth of bacteria and treat infections, to prevent disease propagation and maintain animal health and growth. However, antibiotic resistance is now a major concern and alternative solutions are needed (3).

IgY have been widely studied as an interesting approach for prophylaxis (action to prevent disease) and treatment of gastrointestinal infections in farm animals. A meta-analysis (study that that provides a statistical analysis of the combined results of multiple scientific studies) showed the benefits of IgY in preventing diarrhea in animals including piglets, mice, poultry and calves (4).

In humans, directed IgY has been shown to be effective the prevention and treatment of many different diseases, such as intestinal disorders (celiac disease, cholera, and diarrhea), gastric conditions (gastritis and *Helicobacter pylori*), mouth infections (candidiasis, dental caries, and periodontitis of the oral cavity), metabolic syndrome, cystic fibrosis and other viruses and pathogens (norovirus, enterovirus and influenza), as well as toxins (dust mites, and snake venom) (5).

IgY acts on bacteria and viruses to limit their proliferation

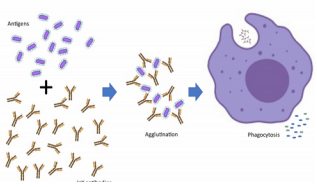

Diagram 1: Phagocytosis

IgY antibodies exploit many mechanisms to eliminate bacteria in the gut and to prevent their replication (6). For example, IgY antibodies cause the agglutination (process that occurs when an antigen is mixed with its corresponding antibody) of pathogens (virus, bacterial, fungal) (7) by inhibiting their adhesion to the intestinal mucus and cells (8-9). These antibodies can bind to the surface of gram-negative bacteria through their fimbriae or pili, flagella, lipopolysaccharides, and outer membrane proteins. This interaction can block or impair the bacterial proliferation and lead to structural alterations increasing the susceptibility of bacterial cells to phagocytosis (process by which a cell uses its plasma membrane to engulf a large particle (≥ 0.5 µm) (See Diagram 1)(9-11). Chicken antibodies can also decrease the toxin production and

secretion by altering the cellular signalling processes (6) and can prevent the internalization of bacteria by the epithelial cells. So the human consumption of IgY antibodies can reduce the ability of bacteria to penetrate tissue walls including blood vessels and organs (12). IgY can also inhibit cell-to-cell spread of virus particles to limit the viral propagation (7).

The potential of IgY to prevent or treat intestinal problems

When we eat eggs, common in the human diet, we naturally eat chicken antibodies. IgY are safe and not immunogenic for humans as millennia of consumption can attest. Moreover, because they do not bind to the Fc receptors of human immune cells, IgY antibodies do not induce an IgE response nor do they react with the human complement system, minimizing the risk of an allergenic or inflammatory response (6). In sum, antibodies are at the center of the defence against pathogens of all types and act in many ways to protect its host.

With all the beneficial effects on gastrointestinal health, chicken antibodies can be consumed orally to provide a quick way to prevent gastrointestinal symptoms and support the immune system.

The Concentration of all the Benefits of Egg Yolks in the Nutritive Promuna Egg Shake

One limitation of obtaining the full benefits of IgY antibodies is that cooking eggs denatures or breaks apart the antibodies rendering them ineffective and no longer able to bind to their targets; cooked eggs are still a good source of protein, but not able to realize the full potential of their contribution to human health. To overcome this limitation, a new pasteurization process was designed by Burnbrae Farms to protect IgY antibodies in the product from this degradation, yet still rendering the beverage safe for consumption and ready to eat.

To enjoy all the benefits provided by the IgY antibodies, the egg-yolk enriched beverage Promuna from Burnbrae Farms provides an interesting option. Besides being a nutritive food, rich in other nutrients supporting overall health, as well as a strong immune system, the egg yolk in Promuna also provides a natural source of antibodies promoting better digestive and immune health for those who consume this product regularly.

ABOUT IMMUNE BIOSOLUTIONS:

IMMUNE BIOSOLUTIONS is an innovative biotechnology company specializing in the discovery and engineering of chicken antibodies for targets with recognized, but unexploited therapeutic and diagnostic potential.

Founded in 2012 by three entrepreneurial scientists, Immune Biosolutions has been supported by many prestigious entrepreneurship and scientific awards to create their "antibody discovery platform" and have substantiated this platform through several collaborations with various North American and European pharmaceutical partners. In 2015, they took the bold step of

initiating their own therapeutic antibody pipeline, with a primary focus on cancer and infectious diseases.

ABOUT BURNBRAE FARMS:

BURNBRAE FARMS is a 6th generation family owned and operated Canadian company that has been producing eggs for over 75 years. With egg grading, breaking, and farming operations in five provinces across Canada, it has been privately owned and operated by the Hudson family since it was founded in 1891.

Burnbrae Farms eggs and egg products can be found in grocery stores, restaurants, and homes across Canada. They were the first to introduce many important innovations in the egg category including products like Naturegg Free Run, Organic, and Omega 3 shell eggs; Naturegg Simply Egg Whites and EGGCreations! liquid products; Naturegg Eggs2go! ready-to-eat hardboiled eggs; and EGGBakes! and EGGBites! frozen crustless quiches… winning an incredible 14 Grand Prix new product awards from the Retail Council of Canada.

To learn more visit burnbraefarms.com.

References

(1) Zuniga A, 1997, Immunol Med Microbiol 18:153–161
(2) Xiao C, 1998, C. Chinese Journal of Veterinary Science and Technology 28:21– 13
(3) Centers for Disease Control and Prevention, 2013, Antibiotic Resistance Threats in the United States
(4) Diravyam T, 2014, PLoS One 20: e97716
(5) Hlaing Myat T, 2017, Food Science of Animal Resources 37c: 1-9
(6) Owusu-Asiedu A, 2003. J Anim Sci 81:1781–1789.
(7) Wu GM 2013 Heilongjiang Animal Science And veterinary Medicine: 140–142.
(8) Muhammad K2001 Int J Agric Biol 3: 413– 415
(9) Malik MW, 2006 Journal of veterinary science 7:43–46
(10) Rahimi S, 2007,Journal of Poultry Science 6:207–210. 65.
(11) El-Ghany WA 2011 Global Veterinaria 6 (1): 16–24.
(12) Ozpinar H, 1996 Preventive Veterinary Medicine 27:67–73R