



**NUTRITION®**

## **ANTIBODIES: A NOVEL SOLUTION TO GUT DYSBIOSIS**

# **IGY MAX®**

**WHITE PAPER**

### **NEUTRALIZES 29 DYSBIOTIC PATHOGENS**

IgY Max® contains strain-specific antibodies that neutralize 29 dysbiotic pathogens in the gut microbiome. Trials show that it rebalances microbiome composition, alleviates dysbiosis symptoms like gas and bloating, supports the immune system, and fortifies the gut barrier.

**[www.IgYNutrition.com](http://www.IgYNutrition.com)**

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# Executive Summary

IgY Max® uses avian antibodies to improve gut microbiome composition. The antibodies in IgY Max® neutralize 29 strains of enteric microbes that are associated with dysbiosis. Trials demonstrate that IgY Max®'s neutralization of these microbes is correlated with growth in probiotic bacteria counts and increased microbial diversity in the gut microbiome. Participants experienced a reduction in dysbiosis-related symptoms and an improvement in gut barrier integrity and inflammation biomarkers such as zonulin, histamine, hs-CRP, and DAO.

## Unique Advantages

The current standard of care for cases of dysbiosis, broad-spectrum antibiotics, often falls short of success. Antibiotics are limited in efficacy because they can not target specific pathogens. Instead, they kill both beneficial and non-beneficial residents of the microbiome. This breakdown of gut microbiome composition taken with the possibility of antibiotic resistance often renders antibiotics unsuccessful in preventing recurrence. Current research asserts that antibiotics successfully treat small intestinal bacterial overgrowth in only 50% of cases, for example. A more effective treatment for the gut microbiome would require that inflammatory pathogens are attacked while beneficial microbes are supported, which is what enteric use of strain-specific avian antibodies (IgY) can do.

IgY Max®'s ability to support beneficial microbes while attacking dysbiotic microbes renders it a powerful tool for fighting gut dysbiosis. Since gut microbiome dysbiosis may cause or exacerbate a long list of conditions and illnesses, IgY Max® relates to a wide variety of clinical applications. Over the last 22 years, IgY Max® has been studied in well-renowned universities, hospitals, and research centers for clinical application to the inflammation regulation, immune system function, fibromyalgia, sports performance, muscle soreness and repair, cardiovascular conditions, and more.

IgY Max® has the potential to revolutionize the modern approach to dysbiosis and dysbiosis-related conditions for the following reasons.

- IgY Max® is pathogen-specific and highly effective at neutralizing 29 dysbiotic pathogens, including *Klebsiella pneumoniae*, *E.coli*, *Salmonella*, *Shigella*, *Pseudomonas aeruginosa*, and various strains of *Staphylococcus* and *Streptococcus*
- Trials' participants experienced reduced dysbiosis-related symptoms and an improvement in gut barrier integrity and inflammation biomarkers such as zonulin, histamine, hs-CRP, and DAO
- IgY Max® has over 20 years of clinical history with zero cases of adverse effects
- Consumers with an egg allergy should not consume IgY Max®
- The only ingredient in IgY Max® is specifically immunized egg and a flow agent used in the drying process
- Consuming IgY Max® is as safe as eating an egg from the grocery store
- IgY antibodies have a long history of use in humans, solidifying their safety profile
- IgY antibodies are superior to IgG antibodies: they have 3-5 times higher immunogenicity, have 20 times more immunoglobulins per unit, and do not carry the risk of stimulating the human complement system or inflammatory cytokines
- Its market is enormous if not unlimited:
  - 60-70 million Americans experience gastrointestinal issues
  - IgY Max® is shown to benefit a long list of dysbiosis-related conditions
  - Anyone can benefit from consuming IgY Max®, except those with an egg allergy
- IgY Max® satisfies the rapidly expanding microbiome market's demands for gut health products
- IgY Max®'s immune system support fulfills consumers' desire for immune system supplements, a sector that has grown by 25% in North America since 2020
- IgY Max® is organic, non-GMO, all-natural, and additive-free, meeting consumers' preferences for clean-label products
- IgY Max® is affordable, allowing producers to maintain high profit margins
- IgY Max®'s ability to target specific dysbiotic pathogens specifically renders it more effective at rebalancing dysbiosis than any other microbiome product on the market

# What is IgY Max®?

IgY Max® is a specifically immunized egg-based supplement containing polyvalent, antigen-specific antibodies that target and neutralize 29 dysbiotic pathogens commonly found in the human microbiome, including *Klebsiella pneumoniae*, *E. Coli*, *Salmonella*, *Shigella*, *Pseudomonas aeruginosa*, various strains of *Staphylococcus* and *Streptococcus*. IgY Max® antibodies are effective throughout the entire length of the gastrointestinal tract. They have a high pathogen-antibody affinity and inhibit bacterial adhesion, suppress colonization, and neutralize each targeted pathogen thoroughly (1, 2, 3). Neutralized pathogens are expelled from the gut through the stool.

The product's neutralization of dysbiotic microbes allows beneficial microbe populations to multiply and diverse microbes to take residence in the gut microbiome (4). This positive shift in microbiome composition reduces the damage that dysbiotic pathogens exert and increases the benefits probiotic microbes confer. Studies of IgY Max® confirm this, showing that IgY Max® leads to increased counts of beneficial flora, improved gut barrier integrity, and decreased inflammation over eight weeks of use. In addition, the studies showed improved inflammatory cytokine, high-sensitivity C-reactive protein, zonulin, histamine, and diamine oxidase levels [See the "Studies of IgY Max®" section for details].

Perhaps most importantly, participants reported a decrease in symptoms of dysbiosis following consistent consumption, including improved stool regularity and composition, decreased bloating and gas, and higher energy levels. Though unofficial, the abundance of positive Amazon reviews also points to consumers' experiences being positive.

## Use of IgY Max®

Users should mix two to four grams of IgY Max® into a cool liquid or food like fruit juice, milk, water, or yogurt. Mixing it with orange juice is especially palatable. It should not be heated. Heat may cause partial denaturing of the antibodies. The recommended dosage is two to four grams of IgY Max® daily for eight or more weeks. IgY Nutrition recommends incorporating IgY Max® into a daily meal replacement shake, drink, or smoothie routine to encourage consistent use. IgY Max® is marketed as a powder with no additives. It can be put into capsules, flavored chewables, or shakes.

## How IgY Max® is made

IgY Nutrition harnesses natural passive immunity processes to develop its antibodies. Passive immunity is the transfer of antibodies from one organism to another (17). This transfer occurs naturally in mammals through breastfeeding. Avian organisms such as chickens transmit antibodies to their young through the yolks of their eggs. This transfer fortifies the offspring's immune systems with already responsive antibodies, which the mother has developed in response to pathogen

exposure.

Chicken-derived antibodies, called IgY, work well in the human gut (18). Scientists at IgY Nutrition can design IgY antibodies to have targets of their choosing by vaccinating hens with specific pathogens. This is a patented process - IgY Nutrition vaccinates hens with 29 pathogens deleterious to the gut microbiome. After vaccination, the hens are allowed time to produce and transmit antibodies in their egg yolks. Eggs are then collected and spray dried. The dried egg is then pasteurized and subjected to extensive laboratory testing. The result, IgY Max®, is whole egg powder. The only additive is the flow agent used in the drying process. Using chickens as living antibody factories provides several advantages. The process is economical, fast, safe, and health-conscious. [See the "The Market" section for details].

## Safety

Consuming yolk-derived antibodies is as safe as eating an egg from the grocery store (17, 18). All eggs contain antibodies to hundreds of pathogens, but they are denatured when the eggs are cooked. IgY Max® egg powder contains targeted antibodies relevant to the human microbiome: 29 of the most common dysbiosis-causing pathogens.

IgY Max® is pasteurized and subjected to extensive laboratory testing during the production process.

IgY Max® is a safe option for everyone except those with an egg allergy. IgY Max® is sGRAS (self-affirmed), holds an FDA Food Additive Master File number, has been NSF® Certified for Sport™, and is Kosher and Halal certified. It is natural, non-GMO, gluten-free, and does not contain additives. The only ingredient is egg and a flow agent used in the egg drying process, making it a preferable choice for health-conscious consumers.

# Pathogen-specificity: the missing component

## About dysbiosis & poor digestive health

Recent scientific initiatives have investigated the microbiome's influential role in human health. For example, current knowledge of gut health can be traced back to the Human Genome Project's scientific findings. Through this research, scientists discovered that the microbiome has about 150 times more genes than the entire human body. This finding sparked the Human Microbiome Project (HMP) launch in 2008, the first organized effort to research intestinal flora. Scientists have discovered aspects of the microbiome that directly affect human health (5).

The project provided evidence that a culprit of poor digestive health is often dysbiosis, which is defined as a detrimental shift in human microbiome composition (6). Broad-spectrum antibiotics, over-the-counter NSAIDs, chemical consumption, alcohol, food additives, stress, and poor diet can cause dysbiosis. Patients with

dysbiosis have decreased amounts of beneficial microbes and increased amounts of detrimental microbes inhabiting their intestinal tracts.

Beneficial microbes are essential to the body; they confer benefits such as metabolism regulation, vitamin production, and exclusion of harmful organisms. Since those with dysbiotic microbiomes lack adequate counts of beneficial microbes, the body misses out on some of the benefits they provide.

Harmful or "dysbiotic" microbes, often harm the body (7). They increase inflammation, injure the gut barrier, and cause digestive symptoms such as stool irregularity, flatulence, cramping, and bloating.

Gut microbiome dysbiosis is implicated in a long list of conditions. The National Institute of Health includes IBS, inflammatory bowel disease (IBD), mental health conditions, obesity, allergic disorders, Type 1 diabetes mellitus, thyroid and other hormone imbalances, autism, rheumatoid arthritis, and even cancer on

their list of diseases related to the health of the gut microbiome (8). Dysbiosis is thought to have such far-reaching consequences because of its stimulation of systemic inflammation pathways. Those with dysbiotic microbiomes have increased systemic levels of IL-6, IL-8, and TNF alpha, which are inflammation mediators. Dysregulation of IL-6, IL-8, and TNF alpha is often implicated in many of the conditions listed by the National Institute of Health above (9). Dysbiosis's stimulation of these inflammatory pathways may be part of the reason that dysbiosis has such systemic consequences.

Interventions that can effectively address dysbiosis have significant implications for consumers struggling with various conditions. IgY Max® may be beneficial for a variety of clinical applications. Several studies of IgY antibodies for enteric use, and studies of IgY Max® itself, have pinpointed which conditions the antibodies can help. In every study of IgY Max®, the clinical outcomes have been positive [See the "Studies of IgY Max®" section for details].

## Implications of poor digestive health

Gastrointestinal symptoms are burdensome to the healthcare system, the economy, and millions of individuals' well-being. Digestive complaints affect 60-70 million people in the United States. They account for an astronomical \$40 billion in primary care visits alone (10). Workers with digestive issues are reported to be 15% less productive than their healthy coworkers, a substantial cost to the economy (11). Even minor digestive complaints are associated with more time off work and a decreased quality of life. Because of the burdens that digestive afflictions pose, gastrointestinal health has become a rapidly-growing healthcare market. In 2020, the market for gastrointestinal therapies was valued at \$46 billion and was projected to grow at a compound annual growth rate of 4.4% (12). Only three years later, in 2023, the market was valued at \$53.5 billion (13), exceeding growth rate expectations. Demand for effective microbiome treatments is ripe.

## What antibiotics are missing

The current standard of care for pathogen-induced dysbiosis, broad-spectrum antibiotics such as Rifaximin, often fall short of success (13, 14). Current research asserts that antibiotics successfully treat small intestinal bacterial overgrowth in only 50% of cases, for example (15).

One of antibiotics' most pressing shortcomings is its tendency to kill both 'bad' and 'good' residents of the microbiome. This breakdown in gut microbiome composition makes the individual more susceptible to chronic dysbiosis. Antibiotic resistance may lead to re-infection as well.

A more effective approach for the gut microbiome would be pathogen-specific to address inflammatory pathogens without disturbing beneficial microbes. An excerpt in the *Journal Antibiotics* explains pathogen-specificity's value, saying that development of "a targeted spectrum agent, most likely in combination with a rapid and robust diagnostic test, is a commendable goal with significant healthcare benefits" (16). IgY Max®'s ability to target dysbiotic pathogens while leaving beneficial microbes intact meets that goal.

# About IgY therapies

Other antibodies, including the popular IgG mammalian antibodies, are often used in passive immunity therapies. While there are similarities between IgY and IgG antibodies, it is widely understood that IgY antibodies offer several advantages over mammalian IgG antibodies. Most notably, IgY antibodies have higher immunogenicity, contain more antibodies per unit, and do not stimulate the human immune system. These benefits make IgY a safer, less inflammatory, and more efficient and economical option than IgG antibodies.

IgY antibodies have three to five times higher immunogenicity than IgG antibodies (17). Higher immunogenicity makes it feasible to produce antibodies against highly conserved proteins and reduces the number of antibodies required to spark an efficient immune response, making IgY a more efficient option than IgG. IgY also confers the benefit of a high concentration per unit. Eggs contain 20 times more immunoglobulins per unit than serum-derived IgG, making chickens a more economical and sustainable source of large quantities of specific antibodies (19). In addition, extracting antibodies from egg yolk is a non-invasive collection procedure, while IgG must be extracted from animal plasma.

IgY antibodies do not bind with human Fc or IgM receptors, complement factors protein A or G, or with rheumatoid factors. They do not stimulate the human complement system or inflammatory cytokines. Thus, IgY does not create nonspecific inflammation, which may occur with supplementation of mammalian antibodies (20, 21).

# Current Applications of IgY Therapies

IgY antibodies' long history of use in humans confirms their safety. Doctors have been enhancing immune responses through artificial passive immunity for decades, using either mammalian antibodies from milk (colostrum), blood serum (IgG), or avian antibodies from egg yolks (IgY) (17). IgY is used in antivenom medications, diagnostic procedures, and pediatric norovirus medication (22, 23, 24, 25). IgY antibodies have been studied for application to HIV-induced cachexia, cystic fibrosis, and fibromyalgia. Science's well-versed history with IgY solidifies the safety profile of IgY antibodies. Below is a brief survey of studies of IgY applications.

## Rotavirus

Published in Science Magazine, Rahman et al.'s "Randomized placebo-controlled clinical trial of immunoglobulin Y as an adjunct to standard supportive therapy for rotavirus-associated diarrhea among pediatric patients" found that using rotavirus-targeted IgY in "rotavirus-infected children... appears to be a promising, safe and effective adjunct to the management of acute diarrhea in pediatric patients" (28). A group that used IgY to end a diarrhea epidemic in India won a Bill and Melinda Gates Foundation award for their success (29).

## Fibromyalgia

Adalsteinsson et al.'s "A Pilot Study of the Effects of Hyperimmune Egg in Treating Patients with Fibromyalgia

Syndrome" examined IgY antibodies' effects on fibromyalgia patients (26). It found that "among 30 enrolled patients, all clinical assessments showed some improvement from baseline to end-of-study. Improvements in pain and the number of TePs (tender trigger points) were statistically significant." These results demonstrate that regulation of the microbiome through IgY antibodies can be applied to a wide variety of conditions."

## Arthritis

Greenblatt et al.'s "Administration to Arthritis Patients of a Dietary Supplement Containing Immune Egg: An Open-Label Pilot Study" examined IgY antibodies' effects on arthritic patients (27). The study found that "daily administration of immune egg may provide a safe and effective complementary regimen for amelioration of arthritic symptoms." These results demonstrate that regulation of the

microbiome through IgY antibodies  
can have far-reaching implications,  
such as the promotion of joint health.

# Studies of IgY Max®

Over the last 22 years, IgY Max® has been studied in renowned universities, hospitals, and research centers for application to dysbiosis, gut barrier integrity, immunity, sports performance, muscle soreness and repair, cardiovascular health, and more. The following is a survey of the outcomes of many of the IgY Max® studies.

## IgY Max® and gut health

As part of IgY Nutrition's ongoing commitment to research, an open-label pilot study was conducted to explore the effects of eight weeks of IgY Max® supplementation on microbial diversity and on biomarkers of gut wall integrity in subjects reporting mild to moderate GI complaints.

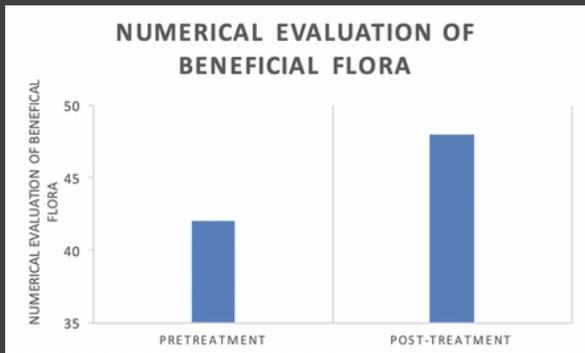
The study, titled "IgY 26; A Powerful Tool in Gut Based Inflammatory Conditions," measured subjects' counts of beneficial flora and markers of gut permeability, such as zonulin, DAO, and histamine, before and after the eight-week consumption period (32). Zonulin is a regulator of intestinal permeability and can therefore be a biomarker of impaired gut barrier function. Histamine, produced by mucosal mast cells, acts as a proinflammatory mediator in the intestine and modulates intestinal permeability. DAO, diamine oxidase, is the enzyme made by microvilli that

degrades histamine (33). Low levels of DAO and elevated levels of histamine have been implicated in chronic inflammatory and autoimmune disorders. Improvement of these markers is associated with improved GI function, intestinal wall integrity, and levels of inflammation (33).

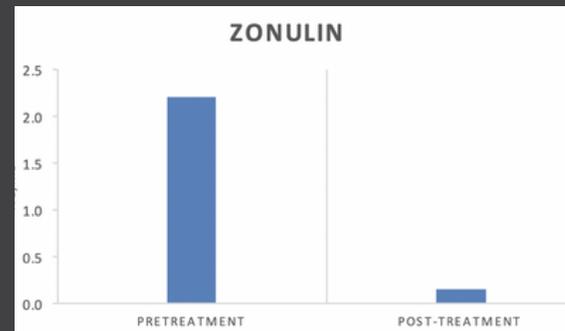
The study found that "IgY 26, given to subjects, resulted in improvement of markers of gut distress such as Zonulin, DAO and Histamine... beneficial flora including Bacteroides fragilis, Bifidobacterium species, E. coli, Lactobacillus, Enterococcus, Clostridium were tracked. When the quantitative value of the flora was summed, there was an increase overall." Besides the objective results, subjects also had improved quality of life measures and reported noticing a decrease in gas and bloating and feeling more energy.

See the next page for some facts and figures from the study.

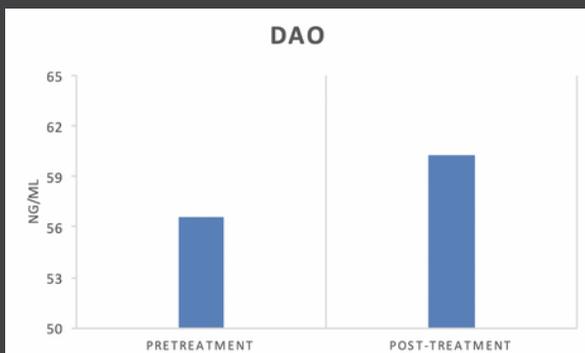
## Increase in probiotic populations



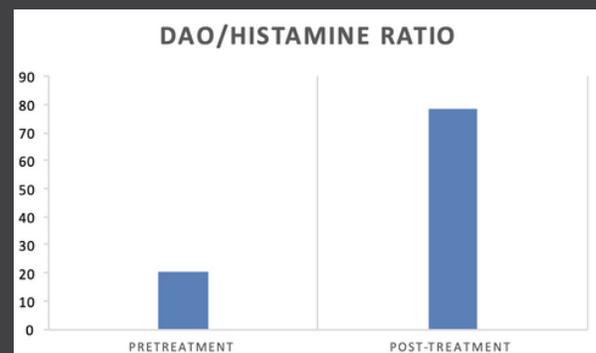
## Decrease in zonulin (measure of gut barrier weakness)



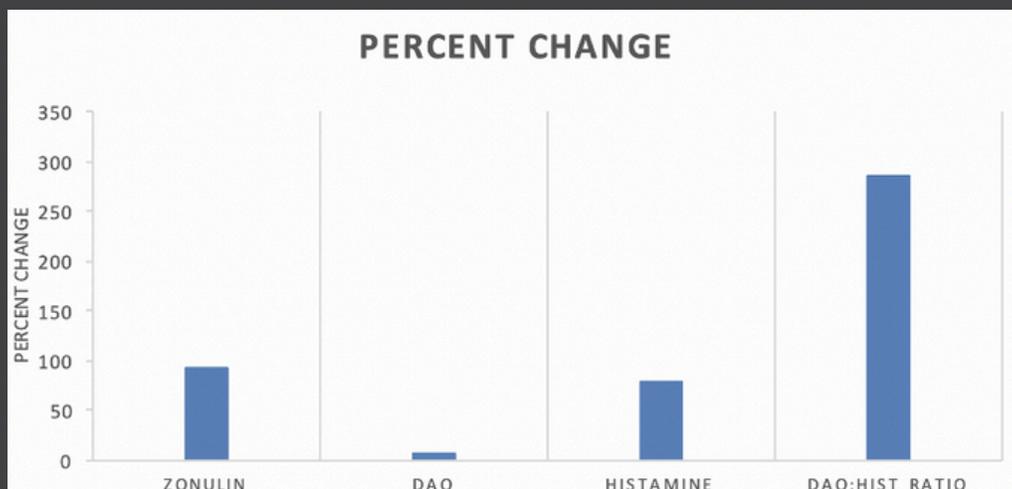
## Increase in DAO



## Increase in DAO:Histamine



Seeing as IgY Max® drastically improved these markers - the near 100% decrease in zonulin and near 300% increase in DAO-Histamine ratio being especially notable - these results suggest that the product is valuable for improving GI function, gut barrier integrity, and inflammation levels.



## **IgY Max® and cardiovascular health**

IgY Max® has also been shown to improve consumers' cardiovascular health. Dr. Karge et al. published a trial in the *Journal of Medicinal Food* titled "Pilot Study on the Effect of Hyperimmune Egg Protein on Elevated Cholesterol Levels and Cardiovascular Risk Factors." Participants were U.S. Army soldiers. Soldiers consuming IgY Max® showed stabilized cholesterol compared to a placebo group (34). The study concluded "that hyperimmune egg may beneficially modify the regulation of serum lipoprotein levels and thereby reduce the possibility of cardiovascular disease." This study strongly suggests that IgY Max® benefits cardiovascular health.

## **IgY Max® and inflammation**

A chart review by Lauren Miles MD titled "Effects of Hyperimmune Egg on Hs-CRP Levels" examined IgY Max®'s effects on consumers' inflammation (35). Dr. Miles specifically looked at high-sensitivity C-reactive protein, a measure of general levels of inflammation in the body. The trial found that "a statistically significant reduction in hs-CRP in all cases was noted at six weeks. The average

decrease in hs-CRP at three weeks was 1.66 and the average drop at six weeks was 2.52." This study suggests that IgY Max® may beneficially regulate inflammation levels. Other studies listed below corroborate this finding.

## **IgY Max® and exercise**

Doctors and scientists at the College of Charleston ran several trials of IgY Max®, examining the product's effects on participants' exercise-related markers, including muscle repair, soreness, and strength, endurance, stimulation of the GH → IGF-I axis, submaximal heart rate, and peak power.

The study "Effect of the Hyperimmune Egg Supplement on Anabolic Mediators of Muscle Repair" found "oral supplementation of hyperimmune egg protein for 10 days resulted in significant changes in hGH (human growth hormone) and FAI (free androgen index) and non-significant, yet promising alterations in IGF-I (insulin-like growth factor) (36). Supplementation with HIE (hyperimmune egg) protein appears to stimulate beneficial hormonal responses necessary for muscle repair during recovery after exercise." This study strongly suggests that IgY Max® may beneficially regulate muscle repair

and reduce inflammation.

The study “Hyperimmune Egg Protein Supplementation Stimulates the GH → IGF-I Axis,” found that “oral supplementation with hyperimmune egg for 10 days produced significant variations in GH (growth hormone) and IGFBP-3 (insulin-like growth factor binding protein 3) and non-significant but potentially meaningful alterations in IGF-I (insulin-like growth factor)” (37). They concluded “hyperimmune egg protein represents an effective protein-based supplement that enhances recovery through altering the GH → IGF-I axis.” This study strongly suggests that IgY Max® may beneficially regulate muscle repair in the body.

The group also examined IgY Max®’s effects on strength and endurance in “Increased Muscular Strength and Enhanced Muscle Repair with Hyperimmune Egg Protein Supplementation.” The trial found that “oral supplementation of HIE for 10 days resulted in a significant increase in bench press strength and endurance, decreased muscle soreness, and enhanced muscle repair during recovery.” Increased strength and endurance make IgY Max® an

attractive product for athletes (39).

Next up, the group looked at submaximal heart rate and peak power in “Hyperimmune Egg Protein Decreases Submaximal Heart Rate and Increases Peak Power.” The study found “that oral supplementation of hyperimmune egg for 10 days resulted in a significantly lower submaximal HR and higher peak power,” another benefit for athletes (38).

Oklahoma State University studied inflammatory markers that affect muscle soreness in “Effect of Oral Immunoglobulin and Cytokines on Serum Creatine Kinase and Delayed Onset Muscular Soreness.” The study found that “IgY supplementation lessens muscle creatine kinase levels and perceived muscle soreness following exercise, possibly due to an anti-inflammatory effect (40). Such an effect may facilitate the continuation of training intensity, reinforcing the product’s value to athletes.

## Patents

In scientific literature, broad applications of IgY antibodies supported IgY Nutrition’s patent of IgY Max® for a wide variety of uses. Below is a partial list of IgY Max®’s patents.

IgY Max® is patented when combined with glucosamine for its ability to regulate joint inflammation. It is effective for osteoporosis and rheumatoid arthritis. IgY Max® is patented for its ability to prevent, counter, or reduce NSAID-induced gastrointestinal damage indicated by zonulin levels. Contact IgY Nutrition for a full list of patents.

## **IgY Max® Applications and Concepts**

In light of IgY Max®'s long list of patents and potential clinical benefits, IgY Max® is clearly a versatile ingredient. IgY Max® is a valuable addition to any supplement intended to mitigate the effects of dysbiosis. Combining IgY Max® with pre and probiotics is synergistic. IgY Max® makes room for probiotics to colonize the gut by creating a hostile environment for transient pathogens. This may enhance probiotics' effectiveness. Studies suggest that IgY Max® may also offer synergistic benefits when combined with glucosamine for joint health.

IgY Nutrition suggests incorporating IgY Max® into supplements that address the following conditions:

- Dysbiosis
- Small intestinal bacterial overgrowth (SIBO)
- Intestinal permeability
- Allergies / histamine levels
- Immune system
- Inflammation
- Fibromyalgia
- Obesity
- Cardiovascular conditions or those with elevated serum lipoproteins
- Nutrient deficiencies
- Cachexia
- Norovirus
- Mental health conditions of any kind
- Arthritis of any kind
- Hormone conditions of any kind
- Muscle repair and recovery
- Strength and endurance

IgY Max® can be consumed alone or formulated in powdered drinks, capsules, or chewable tablets. It tastes best when mixed with something sweet, such as orange juice. It can not be heated – the antibodies will denature if so.

# The Market

IgY Max® is a perfect-suited product for today's microbiome-oriented market. Several of the product's characteristics make the potential for profitability astronomical:

- **Microbiome manipulation:** IgY Max®'s effective manipulation of the microbiome satisfies the ballooning microbiome market's demands for dysbiosis-alleviating products.
- **Immune support:** IgY Max®'s immune system support fulfills consumers' desire for immunity supplements, a sector that grew by 25% in North America after the pandemic (41).
- **Natural ingredients:** IgY Max®'s organic, non-GMO, all-natural, additive-free ingredient profile matches consumers' preferences for clean-label products.
- **Pathogen-specific targets:** IgY Max®'s ability to target specific dysbiotic pathogens renders it more effective at rebalancing dysbiosis than any other microbiome product on the market, including broad-spectrum antibiotics and probiotics.
- **Cost effective:** IgY Max® has an affordable price point, allowing for high profit margins.
- **Zero competition:** There is no other OTC, enteric-use, pathogen-specific antibody product on the market.
- **Compliments but does not compete with pre and probiotics:** IgY Max® makes pre and probiotics most effective at rebalancing the microbiome because it addresses the pathogens that cause dysbiosis.

Equipped with the characteristics needed to make it the most effective microbiome product on the market, IgY Max® will add value to any gastrointestinal supplement.

## The microbiome market

IgY Max®'s focus on the microbiome echoes desires. The 2020 pandemic triggered consumers to make more health-conscious purchasing decisions. As consumers have learned more about digestive health's influence on immunity, cardiovascular function, brain health, stress, and other organ systems, they have learned of the value supplements targeting the microbiome have. Market trends demonstrate consumers' increased interest and understanding of gut health's relevance:

- Between 2014 and 2019, Google searches for microbiome rose by over 250% (42).
- Linkage Research & Consulting Inc. reported that 87% of Americans understand that digestion and health are connected (42).
- A May 2021 review by Lumina Intelligence showed that internet searches regarding probiotics and the gut-brain axis grew by 50% over the last year (42).
- Mintel found that new product launches with positioning or marketing using the word microbiome grew by 267% from 2019 to 2020 (42).
- ReportLinker data shows the microbiome market is estimated to grow with a compound annual growth rate (CAGR) of 23.6% from 2020 to 2027, potentially reaching \$1.873 billion by 2027, up from \$356 million in 2019 (42).
- Mintel found that 40% of consumers will try food and drinks that support their digestive health (42).
- Demand for supplements that support the immune system exploded across all channels, with an almost 100% increase in sales over 2019 (43).

- The market for gastrointestinal therapies was valued at \$53.5 billion in 2023 (13).

The skyrocketing gut health market offers microbiome supplement companies an immense opportunity. As an effective microbiome supplement, IgY Max® echoes the recent shift in consumer preferences precisely, upping its value significantly.

### Quality of ingredients

As consumers investigate the quality of and science behind their products, companies that provide consumers with effective supplements made with high-quality ingredients, like IgY Max®, will have an advantage. In addition, consumer preferences have shifted towards organic and non-GMO products that do not contain additives and are research-backed. According to research by Lonza, at least 50% of consumers look for naturally-sourced products that do not contain preservatives, artificial colors/flavors, allergens, are non-GMO, and are organic (44). IgY Max® is an all-natural supplement whose main ingredient is egg, satisfying the consumer demand for naturally-sourced products.

## Pathogen specificity

IgY Max®'s ability to target specific pathogens also ups its value.

According to a study published in *Frontiers in Microbiology*, current research and development efforts are focused on antimicrobial agents that can selectively interact with a target site or a specific pathogen, the front-running candidates being complex and expensive technologies like antimicrobial peptides and nanoparticles (45). IgY Max® possesses the ability to target a specific pathogen the authors describe - yet, unlike the contenders mentioned in the study, IgY Nutrition completed R&D long ago, and its chicken inoculation production platform evades the enormous production costs that other technologies require.

IgY Max® offers an affordable price point, increasing access for customers of various backgrounds. Adequate promotion of IgY Max® could beat out expensive endeavors and provide customers with an affordable option. Notably, IgY Max® is the only multivalent product on the market that contains IgY antibodies targeting numerous enteric pathogens. There is no other product on the market with

IgY Max®'s characteristics; there is no other multivalent hyperimmune egg in production.

## Pre and probiotics fall short

Pre and probiotics have shown modest promise for improving gastrointestinal symptoms and overall health - enough promise to fuel domination of the microbiome market. However, their effectiveness is limited; pre and probiotic needs vary with the composition of microbiomes (46). Pre and probiotics' limited effectiveness is apparent in patients whose microbiomes are dominated by persistent dysbiotic pathogens.

Pre and probiotics support beneficial microbes living in the gut microbiome. Simply supporting good bacteria with a pre or probiotic can help but does not address the root cause of dysbiosis: problematic pathogens. Overcoming dysbiosis requires significant removal of problematic microbes as well. Probiotics may compete with problematic microbes for residence in the microbiome and force some problematic microbes out. However, current research asserts that dysbiotic microbiomes require more intervention.

Neutralizing dysbiotic pathogens, IgY Max®'s primary function, is crucial for long-term microbiome balance.

IgY Max® allows probiotics to populate the microbiome by neutralizing dysbiotic pathogens that compete with beneficial microbes for space and nutrients in the microbiome. This amplifies pre and probiotics' efficacy.

## Conclusion

IgY Nutrition is eager to influence today's microbiome-oriented market and to alleviate the symptoms of those who suffer from digestive distress and other dysbiosis-related conditions. Demand for products that mitigate symptoms of dysbiosis-related conditions, like IBS, IBD, SIBO, allergies, fibromyalgia, cystic fibrosis, autoimmune diseases, metabolic diseases, obesity, CVD, cachexia, norovirus, mental health conditions, arthritis, and hormone conditions is exceedingly high. IgY Max®'s ability to support beneficial microbes while attacking dysbiotic microbes renders it a powerful candidate for managing these conditions. IgY Max®'s primary function of neutralizing dysbiotic pathogens is crucial for long-term microbiome balance.

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