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REPORT

Optimizing Digestive Health (And Why Most Probiotics Fail to Work)

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Many of the health complaints that plague aging adults—from impaired immunity to digestive distress and nutritional deficiencies—can be traced to a key underlying factor: *poor digestive health*.

One common cause of impaired digestive health is an age-related decline in the digestive enzymes needed to extract essential nutrients from the foods we eat. Without these crucial enzymes, food passes through the gastrointestinal tract without yielding its beneficial constituents. The result is poor nutritional status, which can contribute to numerous disease processes.

Digestive health can be further impaired by an imbalance between beneficial and pathogenic bacteria in the gastrointestinal tract, which can contribute to symptoms of gas and bloating as well as poor utilization of nutrients.

Fortunately, advanced enzyme supplements, along with specially encased probiotics, can help restore balance to the digestive system, allowing for the optimal utilization of precious nutrients. The benefits of a healthy gastrointestinal system include digestive comfort, improved immune health, and decreased inflammation.



AGE-RELATED DIGESTIVE DECLINE

Although you may be consuming the healthiest, freshest, most nutrient-rich diet possible, you could still wind up chronically ill from diseases related to malnutrition. How could this be possible?

It could happen if your digestive system is functioning less than optimally, an increasingly common occurrence as people grow older.^{1,2}

Among the most frequent age-related digestive deficiencies is a decline in digestive enzymes, including pepsin (released by cells in the stomach lining), along with protease, amylase, and lipase that are secreted by the pancreas in response to food ingestion.



The healthy, youthful gastrointestinal (GI) system uses these enzymes to break down ingested food into peptides, proteins, fatty acids, and other vital nutrients, which the body can easily process and distribute. In addition, “friendly” bacteria, which inhabit the lower gastrointestinal tract (below the stomach), are essential for healthy bowel function as well as vitamin production and absorption. With advancing age, however, these probiotic microorganisms (beneficial bacteria that help prevent disease) may be crowded out by opportunistic pathogenic “bugs” that have no digestive function and may release dangerous endotoxins into the circulation.

As healthy enzymes and probiotic microorganisms decline with age, some foods may not be completely digested, leading to symptoms like gas, bloating, inflammatory conditions, and even various forms of vitamin deficiency and malnutrition.³⁻⁸ These events may contribute to a vicious cycle of failing immunity and escalating diseases, especially in the elderly.^{9,10}

Fortunately, advanced enzyme supplement formulations are available that can make up for common age-related deficiencies. In addition to digestive enzymes, supplements containing strains of probiotic bacteria, especially *Bacillus coagulans*, have been found to be significantly superior to common ordinary probiotics

(such as those found in yogurt and other traditional probiotics). Whereas only a small percentage of the bacteria in the leading yogurt-based probiotics survive the harsh, acidic gastric environment, the majority of *B. coagulans* survives to colonize the gut.^{11,12} And that's just the beginning of the benefits of this remarkable microorganism. When taken with meals, these supplement formulations enhance digestive health, thus helping prevent gastric distress and malnutrition, while protecting against ailments related to poor digestion.

THE INS AND OUTS OF DIGESTION

Digestion is a highly complex, well-coordinated process. The body breaks down ingested food by both mechanical and chemical actions, so that food's stored up energy and nutrients can be extracted, absorbed into the bloodstream, and distributed to every cell in the body for the myriad processes involved in keeping us alive.

Chewing initiates the digestive process by mechanically breaking food into small, manageable pieces that facilitate swallowing and further digestion. Simultaneously, glands in the mouth secrete saliva, which moistens the food (making it easier to swallow) and adds the enzymes amylase, which begins the breakdown of carbohydrates, and lipase, which starts breaking down fats. (See Table 1 below.)

| Table 1. | Key Digestive Enzymes and Their Functions |
|----------------------|---|
| Pepsin | Secreted by cells in the stomach lining; in combination with stomach acid, it helps break down proteins into peptides in the stomach |
| Trypsin | Originating in the pancreas and the intestinal lining, trypsin is secreted into the duodenum (the upper portion of the small intestine), where it breaks down peptides formed in the stomach into amino acids |
| Chymotrypsin | A digestive enzyme originating in the pancreas and the intestinal lining, it is activated by the action of trypsin and helps break down protein |
| Proteases | Secreted by the pancreas, they facilitate the breakdown of proteins into amino acids |
| Amylase | Present in saliva, and also secreted by the pancreas, it cleaves complex carbohydrate molecules into manageable sugars |
| Lipase | Present in saliva, and also secreted by the pancreas, it facilitates breakdown of lipids (fats) into useable components |
| Lactase | Secreted by cells lining the small intestine, it helps break down lactose (milk sugar) |
| Papain (from papaya) | Supplements help protein digestion |
| Cellulase | Produced by "friendly" bacteria in the gut, it helps digest cellulose and other plant constituents |

Once swallowed, the food travels down the esophagus and into the stomach, where it is churned and ground into a mixture with potent gastric acid and pepsin, which degrade proteins into peptides. As the resulting slurry, known as "chyme," exits the stomach and enters the duodenum, it stimulates the secretion of the hormone secretin, which in turn, signals the pancreas to release trypsin, chymotrypsin, and pancreatin, a mixture of several enzymes, including proteases, amylase, and lipase (See Table 1 above.), which play important roles in extracting nutrients as they further break down proteins, carbohydrates, and fats. The stomach also secretes the compound "intrinsic factor," which travels through the small intestine and eventually enables the absorption of vitamin B12.

Bile, produced by the liver and stored in the gall bladder, is released in response to the presence of fats in the ingested food. By helping emulsify these fats, bile makes them more susceptible to enzymatic breakdown, facilitating the absorption of fat-soluble vitamins, including vitamins A, D, E, and K.

OVERCOMING DIGESTIVE ENZYME DEFICITS

Vital as digestive enzymes are, many older adults lack adequate amounts to break down ingested food efficiently. As noted earlier, the amount of enzymes produced by the stomach, pancreas, and small intestine tends to decline as people grow older.

Another source of natural digestive enzymes is raw fruits and vegetables, but most people either consume insufficient amounts of these important foods or inactivate their enzymes through cooking and processing.^{1,2} The resulting vitamin, mineral, and trace element deficits can adversely affect immune system function and overall health.^{10,13} One recent French study, for example, found a high prevalence of vitamin, mineral, and omega-3 fatty acid deficiencies in people aged 70 and above.¹⁴ Particularly common in this population is a deficiency in vitamin B12, a nutrient that is essential for normal brain and nervous system function, and for the formation of blood, among other activities.^{15,16}



Given the potentially devastating consequences of deficient nutrition in older adults, optimizing digestive health is essential. To achieve this objective, many health practitioners commonly recommend supplementing with digestive enzyme supplements that make up for deficient natural enzymes. High-quality enzyme supplements taken orally with meals have been found quite effective in optimizing digestion.

WHAT YOU NEED TO KNOW: DIGESTIVE ENZYMES AND PROBIOTICS

- As people age, their digestive system becomes less effective, due in part to a decline in digestive enzymes and beneficial probiotic microorganisms. As a result, food digestion is incomplete, leading to symptoms like gas, bloating, inflammatory conditions, vitamin deficiencies, and malnutrition.
- The age-related decline in enzymes produced by the stomach, pancreas, and intestines can lead to deficits in vitamins, minerals, and trace elements that can adversely affect immune system functioning and overall health.
- Taking high-quality enzyme supplements with meals has been found to be quite effective in averting these deficits and optimizing nutrition.
- Naturally occurring bacteria in the gut, such as *Lactobacillus* and *Bifidobacteria*, enhance the intestinal barrier function; compete with and suppress pathogenic bacteria, yeasts, molds, and viruses; and modulate and stimulate immune system activity.
- Our health depends to a large extent on maintaining a balance in favor of “friendly” microorganisms in the gut, because they improve digestive health, strengthen the immune system, and restore healthy bacterial balance following antibiotic use.
- Spore-producing *Bacillus coagulans* is a unique probiotic that has been found to be superior to other probiotics in terms of surviving the gastric environment, colonizing the intestines, and producing lactic acid.
- Emerging research suggests that *Bacillus coagulans* holds promise in boosting immunity and in averting conditions such as hyperlipidemia, irritable bowel syndrome, Crohn’s disease, osteoarthritis, and rheumatoid arthritis.

In one double-blind study, for example, 18 healthy subjects took pancreatic enzyme supplements or placebo capsules after ingesting a high-calorie, high-fat meal. Symptoms were recorded for the following 15 to 17 hours. The researchers found that ingesting pancreatic enzyme supplements significantly reduced bloating, gas, and fullness and suggested that the enzymes might also be helpful in people with *irritable bowel syndrome* (IBS).¹⁷

Other studies have suggested that enzyme supplements could have immunomodulatory activity and might be useful in preventing or treating autoimmune diseases, such as rheumatoid arthritis, lupus erythematosus, and glomerulonephritis (a form of kidney disease).^{18,19} Enzymes may benefit these conditions by reducing inflammation and immune complexes that damage tissues.

BENEFITS OF PROBIOTICS

In addition to various digestive enzymes, stomach acid, bile, and countless other agents, a healthy digestive system depends on the presence of billions of bacteria, known in general as the GI flora, which live and work primarily in the intestines. Some of these microorganisms are friendly, while others are potentially harmful. Key friendly bacteria include those of the *Lactobacillus* and *Bifidobacteria* genera. Among their various functions, probiotics enhance the intestines' barrier function; compete with and suppress pathogenic bacteria (including Salmonella), yeasts, molds, and viruses; and modulate and stimulate immune system activity.²⁰



Our health depends on maintaining a balance in favor of the friendly organisms, also known as probiotics. Aging, exposure to antibiotics and other drugs, poor diet, stress, travel, and other factors can disrupt the normal healthy balance, decreasing the levels—and the influence—of beneficial bacteria. Maturing women are especially vulnerable to these types of GI problems, especially if they have used oral contraceptive pills.

It has long been known that consumption of live probiotic organisms, either in foods, such as yogurt, or in supplement capsules can help restore the normal GI balance. Such probiotic supplements serve to reduce the risk of disease by three principal mechanisms:

- Improving digestive health
- Strengthening the immune system
- Restoring healthy bacteria following antibiotic use.

Many studies of probiotics have demonstrated their effectiveness in preventing and managing common GI disorders, such as antibiotic-associated diarrhea,^{21,22} gastric ulcers,²³ irritable bowel syndrome,²⁴ inflammatory bowel diseases such as ulcerative colitis,²⁵ and colon cancer.²⁶

RESEARCH UPDATE: HUMAN STUDIES SUPPORT THE USE OF *BACILLUS COAGULANS*

Emerging research suggests a variety of promising roles for *Bacillus coagulans* in supporting human health.

- **Irritable Bowel Syndrome.** In an eight-week trial, subjects with irritable bowel syndrome (IBS) taking a probiotic preparation containing *Bacillus coagulans* had significant improvement in abdominal pain and bloating, whereas patients taking placebo did not experience notable improvement.³¹
- **Crohn's Disease.** Subjects with Crohn's disease taking a probiotic preparation containing *Bacillus coagulans* had a greater decrease in total Crohn's Disease Activity Index (CDAI, a scale evaluating disease activity) and a greater drop in the number of liquid-like stools at 30 and 60 days, compared with individuals taking placebo. Impressively, four out of five subjects in the probiotic group were able to stop taking anti-diarrheal medications, compared with only one out of six patients in the placebo group.³²
- **Immunity and Influenza.** A 30-day clinical trial in healthy adults demonstrated that supplementation with *Bacillus coagulans* produced a significant increase in immune response to both adenovirus and influenza A, compared with baseline values.³³
- **Arthritis.** Two 60-day arthritis trials, one for osteoarthritis and one for rheumatoid arthritis, showed decreased inflammation (as measured by reduced C-reactive protein), less pain, less stiffness, and improved mobility in *Bacillus coagulans*-supplemented patients compared with placebo subjects.^{34,35}

All these studies have been submitted and are pending acceptance for publication.

WHY MOST PROBIOTICS DON'T WORK

While probiotics are essential for optimal health, capturing their benefits from most conventionally available products can pose a technical challenge. The reason is that many of the living organisms these products are supposed to contain don't even survive the high heat and pressure common to the manufacturing process. All too often, the remaining live cells die quickly while sitting on the shelf; or they cannot survive exposure to stomach acid or bile in the gut so that they may go on to colonize the colon.

An advanced probiotic formulation containing strains of the bacterium *Bacillus coagulans* offers promise in sidestepping the difficulties and maximizing the benefits of probiotic supplementation. These microorganisms are each surrounded by a natural protective shield, which helps them survive the heat and pressure of manufacturing and the acids and bile of digestion, so they have a far better chance of arriving alive and well in the intestines, where they go to work.^{11,12} This provides *Bacillus coagulans* with a significant therapeutic advantage over conventional probiotics. *Bacillus coagulans* is unique compared with traditional probiotics for three important reasons: *survivability*, *colonization*, and *lactic acid production*.



Survivability. Probiotic bacteria that are dead when they arrive in the GI tract are useless, regardless of their quantity. Not only does *Bacillus coagulans* survive the exposure to acid and bile it receives in the GI tract, it does so in massive numbers.

Colonization. Even if conventional probiotic bacteria manage to arrive alive and then survive gastric acidity, most do not go on to colonize (i.e., multiply and set up residence). By contrast, *Bacillus coagulans* is a prolific colonizer. Immediately upon arrival, *Bacillus coagulans* cells begin multiplying and colonizing the intestinal tract.

Lactic acid production. *Lactobacillus* and *Bifido*-bacteria are beneficial in part for their ability to produce lactic acid. Data from epidemiologic and experimental studies indicate that ingestion of these bacteria can help prevent chronic conditions, such as cardiovascular disease and cancer.^{26,27} Compared with these conventional probiotics, scientists believe that *Bacillus coagulans*, which produces the preferred form of lactic acid (technically termed the L+ optical isomer),²⁸ may be even more effective in supporting the digestive and immune systems.

SPORE FORMATION: WHY BACILLUS COAGULANS IS SO MUCH MORE EFFECTIVE

One important reason for the superiority of *Bacillus coagulans* is its ability to produce spores. Spore-forming bacteria are something like ordinary plant seeds. When left alone, seeds are dormant—not alive, but not dead either. Rather, they remain in their protective shield in a state of “readiness.” However, as soon as they encounter an environment with the right temperature and moisture content, they start to germinate, or grow.

Spore-forming bacteria, such as *Bacillus coagulans*, work in a very similar way. In the stomach, the spores are activated by the low pH, mechanical churning, and moisture. They absorb water and start to swell, which increases the bacteria’s metabolic rate. As the bacteria pass through the duodenum and into the small intestine, outgrowths begin to protrude from the spore-coats and the cells begin germinating and transforming into viable cells. Proliferation begins in earnest in the small intestine, where the bacteria multiply rapidly, gain motility by growing flagella, and begin colonizing and going to work producing lactic acid—which discourages the growth of harmful pathogens—and helping digest food. Germination usually begins about four hours after ingestion.



Typically spore-forming bacteria are something to avoid at all cost. For example, *Clostridium botulinum* (the organism that causes botulism) can cause food poisoning and death. But instead of damaging health, select health-promoting spore-forming bacteria like *Bacillus coagulans* can take advantage of their high survivability to quickly inoculate the GI tract with healthy flora.

In a published clinical trial, hyperlipidemic adults who supplemented with *Bacillus coagulans* for three months experienced reductions in total cholesterol and low-density lipoprotein (LDL), along with increases in beneficial high-density lipoprotein (HDL).²⁹ This promising finding suggests that *Bacillus coagulans* may also help promote healthy lipid profiles.

Recently, *Bacillus coagulans* has been recommended by Mehmet Oz, MD, and Michael Roizen, MD, in their book *YOU: The Owner’s Manual, Updated and Expanded Edition*.³⁰ Drs. Oz and Roizen outlined the importance of beneficial bacteria in the gut for maintaining digestive and immune health. Their probiotic of choice: a daily dose of 2 billion cells *Bacillus coagulans* (the amount found in a typical capsule).

The sidebar above (Research Update: Human Studies Support the Use of *Bacillus Coagulans*) reveals a number of human clinical studies showing significant clinical benefit in response to *Bacillus coagulans* supplementation.

SUMMARY

Intestinal health goes far beyond bowel irregularity, gas, stomach bloating, and other uncomfortable sensations. Poor GI health can undermine your quality of life, compromise your immune system, stress detoxification organs (such as the liver), and

accelerate aging-related disorders.

When taken orally before a meal, high-quality supplemental digestive enzymes can boost the body's natural ability to break down food into its life-giving and healthful constituents. When consumed between meals, digestive enzymes may help mitigate inflammatory and disease processes throughout the body, thus helping ensure continued good health.

In addition, using probiotics, such as the spore-forming bacterial probiotic *Bacillus coagulans*, helps accelerate the inoculation of healthy flora in the gut. This combination offers an innovative method for achieving GI balance and resulting good health.

If you have any questions on the scientific content of this article, please call a Life Extension Health Advisor at 1-800-226-2370.



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