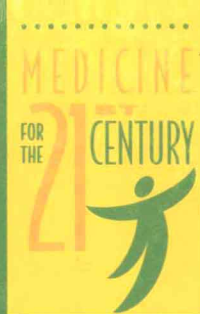


A Keats Good Health Guide



\$3.95

Bromelain

The active enzyme
that helps us make the
most of what we eat

Anthony J. Cichoke, D.C.

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health practitioners, researchers and expert reporters.

THE HEALTH-GIVING ENZYME FROM THE TROPICAL FORESTS

As we age, our bodies produce fewer digestive enzymes and nutrient absorption is impaired. Since consumption of food typically declines with age, the compounded nutrient shortfall can be catastrophic. Bromelain—a pineapple-derived enzyme, is one of the most efficient aids to breaking down proteins, promoting their absorption and relieving indigestion. It also has pain-relieving properties, speeds healing from burns and surgery, improves the absorption of nutrients and drugs, and recently has even been found to prevent clumping of blood platelets (a primary cause of stroke, thrombosis and heart attack) and the growth and spread of cancer cells. Read on to discover how you can improve your digestion and health with the power of bromelain.

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藏书章

ABOUT THE AUTHOR

Anthony J. Cichoke, D.C., known also as "Dr. Enzyme," is an internationally known writer, physician, researcher and lecturer. For his research and writings in systemic enzyme therapy, he has been appointed to the prestigious Medizinische Enzym-Forschungsgesellschaft e.V. (Medical Enzyme Research Society) and was appointed Chairman of the Enzyme Committee for the Natural Products Quality Assurance Alliance. He is listed in the *International Who's Who in Medicine*, *Who's Who in Colleges and Universities*, *Who's Who in Chiropractic International*, *Who's Who in the West* and *Who's Who in the World*. Dr. Cichoke has published over 300 articles and papers in scientific and lay journals and is the author of over ten books, many on the subject of enzymes including, *Enzymes: Nature's Energizers* (Keats Publishing); *Enzymes and Enzyme Therapy: How to Jump Start Your Way to Lifelong Good Health* (Keats Publishing); *Introduction to Chiropractic Health* (Keats Publishing); *Nutrition to Give Your Athlete the Winning Edge*; *Acute Trauma and Systemic Therapy*; *A New Look at Enzyme Therapy*; *AIDS and Metabolic Therapy* and *New Hope for AIDS*.

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Bromelain is not intended as medical advice. Its intention is solely informational and educational. Please consult a medical or health professional should the need for one be indicated.

BROMELAIN

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INTRODUCTION

In today's fast-paced society, we don't usually die from a caveman-type club to the head. Instead, we become ill, age and die because of chronic, degenerative disorders, such as heart disease, stroke or cancer. Our lifestyle, pollutants, food additives and preservatives, enzyme-dead fast foods, empty calories and stress wear down the body's resistance and kill us like a vicious thief in the night. These modern problems have literally sapped our bodies of needed enzymes and have caused modern diseases which are killing us before our time.

One way to improve health is by improving digestion. Eating fewer cooked foods and more enzyme-rich fresh fruits and vegetables can help your body to function better and give you increased energy.

Unfortunately, improving your diet might not be enough. Supplemental enzymes, such as bromelain, might be necessary.

This Good Health Guide will explain how bromelain, the enzyme found in pineapple, can improve your health by serving:

1. As a digestive aid to improve digestion and absorption of food nutrients;
2. As a systemic enzyme, working at the organ and cellular levels to fight inflammation and chronic disorders;
3. To improve absorption of medications, vitamins and other natural supplements;
4. Topically, to improve skin tone and also to debride devitalized tissue from burn injuries.

WHAT ARE ENZYMES?

As mentioned, bromelain is an enzyme. Enzymes are catalysts that occur naturally in all living things. Every plant, microbe and animal must have enzymes. As catalysts, enzymes can speed up a reaction or help a reaction take place. All life processes consist (in part) of a complex series of reactions called metabolism. Enzymes produced naturally by the body are critical for metabolism, in fact, for all aspects of life. Without enzymes, life could not exist.

Enzymes are essential for the body to function. During digestion, enzymes are necessary in breaking down the proteins, carbohydrates and fats in our foods into smaller molecules for absorption. Other enzymes in the body are responsible for different functions, including respiration, growth, reproduction, vision, and the storage and release of energy. To date, about 3,000 enzymes have been identified in the human body.

Plants, too, use enzymes in their metabolism. To date, scientists aren't exactly sure of bromelain's role in the pineapple. It is possible that bromelain serves a protective role by interacting with other species, or it may defend against parasites or other pathogens. In his book, *Plant Proteolytic Enzymes*,¹ Michael Dalling states that proteases (such as bromelain) might serve to attract animals who would benefit the plant's reproduction. By eating the plants and seeds, the animals help disperse plant seeds over a wider area than would otherwise be possible.

BROMELAIN

Bromelain is a proteolytic enzyme. Proteolytic enzymes break up proteins into amino acids. Each enzyme functions at a specific position between two defined amino acids.

There are several types of proteolytic enzymes (proteases). Bromelain is a cysteine (sulfhydryl) protease, as are papain from papaya and ficin from figs.

PINEAPPLES

Bromelain is extracted from the pineapple plant. What do pineapples bring to mind? Hawaii? Sun-drenched beaches? A clear, blue sky? Actually pineapples are native to Central and South America. Christopher Columbus is generally credited with their "discovery." During his second voyage to the new world, Columbus landed a shore party on Guadeloupe (in the Caribbean) in 1493. The party promptly got lost but returned several days later with the delicacy we know as pineapple (called "na-na" [meaning fragrance] by the local Carib natives). Columbus sent pineapples back to Europe where its cultivation quickly spread to India, Africa and China. Spanish adventurer Francisco de Paula Marin introduced the fruit to the Sandwich Islands (Hawaii) by the late eighteenth century. But it wasn't until the 1890s that canneries began to preserve this succulent fruit, named because of its resemblance to the pine cone.

Pineapples are one of the most popular tropical fruits. Available year-round, you should consume them fresh, not canned. This is because the heat of canning inactivates the pineapple's enzymes. Have you ever made gelatin? Most packages of gelatin carry a warning to use only canned, not

fresh pineapple. The protein-digesting enzymes in the fresh pineapple will break down the gelatin's protein, and it will NEVER gel. Adding fresh pineapple to any food containing any type of protein (such as cottage cheese) will cause changes to occur. These changes, although not harmful, will alter the texture and taste of the finished product.

The pineapple plant grows to two to three feet in height and has sword-shaped, blue-green leaves. The pineapple fruit (at maturity) weighs between four and eight pounds and is supported by a thick stem. It is from this stem that most commercial bromelain is extracted. Although bromelain is present in the plant and the fruit, it is concentrated primarily in the stem before the development of new growth. To extract stem bromelain the outer tissues of the stem are removed and the inner white starchy material is then crushed. The resulting liquid is extracted, filtered, treated, centrifuged, dried and ground.

What is the difference between stem and fruit bromelain? According to research by Fumiko Yamada and colleagues, the two bromelains differ in several ways including molecular weight, isoelectric point, amino acid composition, carbohydrate content (fruit bromelain contains no carbohydrate while stem bromelain has approximately 2 percent), pH optima and specific activity toward protein.²

In addition to bromelain, the stem also contains other protease enzymes, including ananain and comosain. According to Takashi Murachi, nonproteolytic enzymes including phosphatase, peroxidase, cellulase and other glycosidases are also present in stem bromelain.³ Some authors have reported that up to six forms of enzymes can be obtained from stem bromelain.⁴

As a medicine, bromelain is not new. For centuries, fresh pineapple or its stem has been used by South and Central American natives as medicine. Various authors have reported pineapple's ability to improve digestion, quench thirst, act as a diuretic, destroy worms, and treat anorexia, edema, diarrhea and sunstroke. The natives knew pineapple worked wonders and had many healing qualities but they didn't know why. We now know the plant's enzymes are responsible for its varied health-giving activities.

THE POWER OF BROMELAIN

In numerous research studies, bromelain has been shown to:

- enhance and improve digestion;
- fight inflammation (an important factor in injuries, surgeries and numerous conditions);
- keep blood platelets from aggregating (a major cause of strokes, thromboses, heart attacks and other cardiovascular conditions);
- inhibit the growth and spread of cancer (and retard the development of skin cancer caused by exposure to ultraviolet light);
- prevent the attachment of intestinal bacteria infections;
- reduce stress;
- fight many of the effects of aging;
- speed healing from respiratory infections, including sinusitis;
- improve the absorption of drugs, including antibiotics;
- improve the absorption of nutrients, including vitamins;
- improve exfoliation of dead or damaged skin when used topically in cosmetics, facial creams, exfoliants and burn debridement ointments.

HOW TO BUY BROMELAIN

Bromelain can be purchased in individual enzyme form, but is also found in combination with other enzymes (including papain, trypsin, chymotrypsin and pancreatin) to treat many of the above conditions. Bromelain is available without prescription at health food stores, drug and grocery stores, through mail order and multilevel marketing in a variety of forms including:

1. Pills;
2. Tablets;
3. Capsules;
4. Granules;
5. Creams, lotions, gels, ointments and other topical applications.

Be sure to take bromelain with plenty of water. Not only will it help you swallow the pill, tablet or capsule more easily, it also will put the enzyme into solution.

Other Enzymes Used In Health Care

In addition to bromelain, many other enzymes are used in health care. Enzymes derived from plants include papain from papaya and ficin from figs. Several enzymes are derived from animal sources (usually pork, beef or ox), including pancreatin, trypsin and chymotrypsin. Enzymes can also be derived from microbial (fungal and bacterial) sources, and include amylase, lactase, lipase, protease, cellulase, hemicellulase and invertase.

ACTIVITY

Bromelain usually is measured by its weight, in milligrams. Some supplemental bromelain may contain only a few milligrams of the enzyme while others may have as much as 1,200 to 1,500 mg or more. Unfortunately, this does not indicate the strength of the supplement because not all bromelain is the same. Different handling and processing methods may affect the enzyme's potency.

As with every enzyme, bromelain is affected by temperature. Enzyme activity is speeded by heat and slowed by cold. Increased temperatures—such as those used in normal cooking—destroy active enzymes. In fact, temperatures as low as 100°F may destroy some enzymes. Too much heat generated during the processing of bromelain may make the end product weaker than one prepared with less heat.

A good indication of your bromelain's "potency" is the activity level, measured in "units" which should be clearly stated on the label. Bromelain can be measured in many ways including G.D.U. (gelatin dissolving units), M.C.U. (milk clotting units), or F.I.P. (Federation Internationale du Pharmaceutiques) units. Manufacturers themselves sometimes establish their own activity units. For instance, Rhône-Poulenc Rorer Pharmaceuticals, Inc., measures bromelain in "Rorer" units. Unfortunately, these measurement methods are not comparable, nor are they interchangeable. They do offer an excellent way to compare products when the manufacturers use the same unit of measurement, however.

When choosing a bromelain supplement, look for a product that includes at least 600 G.D.U., 900 M.C.U. or 225 F.I.P. per milligram of bromelain.

IMPROVING DIGESTION

Bromelain is probably best known for its role in improving digestion, particularly of those foods containing protein. In fact, Columbus' men found that the natives drank pineapple juice to aid digestion (especially when eating meat) and as a bellyache cure.

Our body requires digestive enzymes to assist in breaking down and absorbing nutrients. Proteases digest proteins, amylases digest carbohydrates and lipases digest fats. Deficiencies in these enzymes can cause or lead to bloating, gas, indigestion, candida, food allergies, lethargy, nervous disorders, anemia, osteoporosis and deadly cancer.

The digestive tract is similar to an enclosed assembly line. As food passes through the system it is constantly sprayed and covered by various enzymes (proteases, amylases and lipases), breaking down the proteins, carbohydrates and fats (respectively) in our foods into usable, absorbable particles.

Digestion begins in the mouth as your teeth break up the food into smaller parts, mixing it with saliva. Enzymes in the saliva begin digesting any starches that you eat. To experience the action of saliva on starch, chew a piece of bread, holding it in your mouth for a short time. It will begin to taste sweet because the salivary amylase breaks starch down into maltose (a sugar).

Saliva serves a number of roles. Saliva begins the digestion on starchy foods (such as spaghetti, bread and macaroni), it helps lubricate food for swallowing, helps dissolve solid substances to stimulate the taste buds, cleanses the mouth and teeth (keeping them relatively free of food particles, foreign substances, and sloughed off tissue cells) and

helps moisten and lubricate the soft parts of the mouth and lips.

The longer food remains in the mouth, the longer enzymes in the mouth can break up any starches, even before they are swallowed. This is necessary for the breakdown and absorption of foodstuffs into nutrients the body can use.

After swallowing the food, it travels to the stomach where it is broken down into increasingly smaller particles and compounds by various chemical, enzymatic and mechanical means. Hydrochloric acid (HCL) in the stomach helps kill bacteria, improves the absorption of some minerals (such as calcium and iron), and stimulates hormone production. HCL also triggers the conversion of pepsinogen to the active enzyme, pepsin, important in protein digestion. In fact, insufficient hydrochloric acid production (as occurs in achlorhydria and hypochlorhydria) could inhibit the conversion of pepsin from pepsinogen, and protein digestion would suffer. The stomach also produces gastric lipase to split fats, and amylase enzymes to continue carbohydrate digestion. Rennin in the stomach helps release calcium, iron, phosphorus, potassium, and other minerals from milk and other dairy products.

Digestion in the stomach can continue for as long as an hour until food is combined with stomach secretions. This liquid is then emptied into the first part of the small intestine, called the duodenum. The small intestine is composed of three parts: the duodenum, jejunum and ileum. Each division is a vital part of digestion. In fact, the greatest amount of digestion and absorption takes place in the small intestine. In the small intestine, any food solids are reduced to a "paste" called *chyme*.

Triggered by hormones, the gall bladder and pancreas send enzymes necessary for digestion. In addition to its role in insulin and glucagon production, the pancreas also secretes digestive enzymes for all major food types (proteins, carbohydrates and fats). This secretion is rich in at least three proteases as well as amylase and lipase.

The remaining unusable bulk travels from the small to the large intestine (colon) where the job of digestion is completed. The colon contains large numbers of bacteria which

produce enzymes that act on the remaining food residues, fiber, cells and mucus discarded from the upper intestinal tract. In the colon, water is absorbed and waste excreted from the rectum as stool.

Enzymes play a decisive role in food breakdown and absorption from the gut to the bloodstream and are essential to the transport of nutrients. If enzyme production or activity is deficient, however, digestion will suffer.

Without adequate digestion good health is impossible. If the digestive system can't adequately break down food for bodily use, even the best dietary intake will be of little value. In addition, without proper breakdown, the body may absorb macromolecules (including whole bacteria). This could lead to infection, intestinal toxemia or irritation, and a number of diseases.

Because bromelain is a protease (that is, it breaks up protein), it can help digest foods containing protein. We need adequate protein in our diet for proper growth, repair, and for the production of antibodies, hormones and enzymes (which themselves are proteins, composed of amino acids).

Bromelain is very helpful in improving digestion because of its wide pH range. We measure acidity or alkalinity on a 15-step scale (0 to 14) known as pH (potential hydrogen). A pH of 7 (water and milk are good examples) is considered neutral (neither acidic nor alkaline), while a high figure (such as 14 for lye) is considered alkaline and a low one (battery acid at 0) is acidic. The mouth has a usual pH range between 6 and 8 (near neutrality).

Characteristically, each enzyme has an optimal pH range which may be broad or narrow. At this "optimum pH" the enzymatic reaction occurs most rapidly. In contrast to the body's digestive enzymes whose pH varies by type and location, bromelain is active through a very wide pH range (3.0 to 8.0) and throughout the entire gastrointestinal tract. Therefore, in those who have a deficiency of digestive enzymes, bromelain can help augment pepsin (an enzyme found in the stomach) and chymotrypsin and trypsin (enzymes in the small intestine).

Bromelain is widely available in digestive products either individually or in combination with other supplements, in-

cluding enzymes, vitamins, minerals, herbs and other nutrients. When used as a digestive aid, bromelain should be taken from thirty minutes, to just prior to eating a meal. As mentioned, bromelain activity varies; for dosage information follow label instructions. If you don't notice improvement, increase the dose until improved digestion occurs.

THE ISSUE OF ABSORPTION

When bromelain is used to improve digestion it is not necessary that it be absorbed and carried to the bloodstream. This is because all of its activity takes place in the stomach and small intestine. On the other hand, to effectively treat many health conditions it is important that the enzyme be absorbed in the small intestine.

Numerous studies have verified that bromelain (as well as many other enzymes) is absorbed in the small intestine and circulated throughout the body. Although there are several different absorption mechanisms, probably the most frequent mechanism for enzyme absorption is the pinocytotic transfer by the cells of the intestinal wall. *Pinocytosis* is the process by which whole molecules are engulfed and absorbed. After connection to a receptor in the intestinal wall, the enzymes are absorbed, guided through the intestinal cells in vesicles (small sacs), and released into the blood.

Pinocytosis can be compared to taking a hotel elevator from one floor to the next. You walk into the elevator in the lobby and are taken to the second floor. Your body is not broken down into smaller parts but remains intact (whole). Bromelain is transported in much this same way. Approximately 40 percent of bromelain is absorbed intact, thus preserving its enzyme characteristics.

A study by researchers Seifert, Ganser and Brendel measured the amount of bromelain absorbed in adult rats.⁵ The bromelain was radioactively labeled and placed directly into the small intestine. Blood and lymph samples were collected during the six-hour observation period and their radioactivity measured. Results show that adult rats can absorb bromelain up to 40 percent in a high molecular form. The researchers noted that this would explain the increased pro-