**WHAT IS BROMELAIN?**

Bromelain, a group of pineapple enzymes, was introduced as a therapeutic agent thirty years ago. Since that time over 200 scientific papers on its therapeutic applications have appeared in the medical literature. In many of these studies, bromelain has been shown to be effective in treating a wide variety of conditions including pancreatitis, trauma (sports injuries, surgery, etc.): respiratory tract infections: angina: arthritis: painful menstruation, scleroderma and phlebitis.

**WHAT IS QUERCETIN?**

Quercetin is a bioflavonoid that typically displays the highest degree of activity of any flavonoid compound in experimental studies. Flavonoids in general, have been suggested to be 'natural biological response modifiers' in such conditions as allergy, asthma, eczema, arthritis, and other inflammatory conditions. This relates to their effects on so many enzyme systems, particularly those involved in allergic inflammatory responses.

**HOW DOES QUERCETIN EXHIBIT ANTI-ALLERGY/ANTI-INFLAMMATORY ACTION?**

Quercetin has been shown to inhibit the release of histamine and other inflammatory mediators from mast cells. These cells are widely distributed throughout the body, but are found in highest concentrations in the lining of the respiratory and gastrointestinal tract. The skin, the lining of joints, and the conjunctiva of the eye. These tissues are the usual sites of allergic/inflammatory processes. Mast cells play a major role in the inflammatory response characteristic of rheumatoid arthritis, asthma, eczema, hay fever, and other allergies. By inhibiting the release of histamine and other inflammatory compounds from mast cells, quercetin greatly reduces the allergic/inflammatory response.

Quercetin has further anti-allergy/anti-inflammatory action due to its potent anti-oxidant activity and its ability to inhibit the formation of inflammatory compounds like leukotrienes. These compounds are produced from arachidonic acid. The leukotrienes have been linked to asthma, gout, atopic dermatitis (eczema), psoriasis, ulcerative colitis, and possibly cancer. Quercetin significantly reduces leukotriene synthesis by inhibiting both phospholipase A2 and lipoxygenase. The leukotrienes produced from arachidonic acid are 1,000 times more potent in stimulating inflammatory processes than histamine.

Excessive leukotriene formation has been linked to asthma, gout, atopic dermatitis (eczema), psoriasis, ulcerative colitis, and possibly cancer. Quercetin significantly reduces leukotriene synthesis by inhibiting both phospholipase A2 and lipoxygenase and therefore may be beneficial in those conditions caused by excessive leukotriene synthesis.

**QUALITY AND ACTIVITY OF COMMERCIAL BROMELAIN**

All bromelain is not equal in activity and effectiveness. The activity and therapeutic effect of bromelain is dependent on several factors. First of all, there are different grades of bromelain. Most often bromelain activity is expressed in milk clotting units (m.c.u.). The higher the m.c.u. the higher the grade of bromelain. If other units of measurement are used to describe a product, the manufacturer is probably trying to disguise a lower grade of bromelain being used in the product. Generally speaking, an activity of 1,800 m.c.u. or greater is considered very high quality bromelain.

Other factors that contribute to the therapeutic success of bromelain are the presence of activating and deactivating factors. If the therapeutic goal is other than as...
an improvement of digestion. Bromelain should be supplemented between meals. This increases both the absorption and activity of bromelain. In addition, certain metallic compounds are known to inactivate bromelain in ingesting lead, mercury, cadmium, copper, and iron. Commercial bromelain products should not be combined with copper and iron in the same tablet or capsule. In contrast, addition of magnesium and cysteine (bromelain activators) to the bromelain supplement would enhance its therapeutic effect.

The most beneficial bromelain supplement is, therefore, one that contains high quality bromelain (as expressed in m.c.u.) combined with cysteine and magnesium. Unless bromelain containing products are being taken as a digestive aid, supplementation should be as far between meals as possible.

Failure of a therapeutic effect was demonstrated in several early studies on bromelain. In these studies, lower grade bromelain was used at doses much lower than currently recommended therapeutic doses. In addition, the product used in these studies was an enteric-coated tablet which may have decreased the bio-availability of the bromelain.

**BROMELAIN AS ANTI-INFLAMMATORY AGENT**

Bromelain has demonstrated remarkable anti-inflammatory activity in clinical studies and experimental models. Its mechanism of action appears to be by increasing the breakdown of fibrin, and the depletion/inhibition of pro-inflammatory compounds. Fibrin's role in the promotion of inflammation is to form a wall around the area of inflammation which results in the blockage of blood and lymph vessels which leads to swelling. Some of the inflammatory compounds inhibited by bromelain include kinins and prostaglandins. These compounds increase vascular permeability causing swelling and pain. By inhibiting the production of kinins and prostaglandins a significant reduction of the inflammatory response occurs.

**BROMELAIN AND FLAVONOIDS IN ME TREATMENT OF SPORTS INJURIES AND OTHER TRAUMA**

Bromelain's ability to reduce the amount of swelling, bruising, healing time, and pain has been demonstrated in several clinical studies. Although effective in all kinds of physical trauma, bromelain is most typically used in the treatment of sports related injuries and surgical trauma including dental procedures. Pre- and post surgical administration yielded the best results. flavonoids have also been used to

reduce the swelling of sports related injuries due to their ability to decrease capillary permeability.

**BROMELAIN IN THE TREATMENT OF RESPIRATORY TRACT INFECTIONS**

Bromelain's ability to make fluid and improve respiratory tract secretions appears to be responsible for its effectiveness in the treatment of respiratory tract infections (sinusitis, rhinitis, bronchitis, pneumonia, etc.). Although bromelain has been shown to be as effective as antibiotics in the treatment of a wide variety of infectious processes. Best results were attained with combination therapy (bromelain and an antibiotic administered together). This is probably related to bromelain's ability to increase serum and tissue levels of antibiotics. Bromelain's ability to increase serum and tissue levels of antibiotics was demonstrated in several early studies on bromelain. In these studies, lower grade bromelain was used at doses much lower than currently recommended therapeutic doses. In addition, the product used in these studies was an enteric-coated tablet which may have decreased the bio-availability of the bromelain.

**WHY BROMELAIN AND QUERCETIN IN COMBINATION?**

Quercetin appears to have a very strong affinity for mast cells as demonstrated in experimental studies in animals. Quercetin is not absorbed well unless it is in combination with a compound like bromelain which has been shown to increase the absorption and tissue concentrations of a variety of compounds. Without the aid of bromelain, quercetin would pass through the gastrointestinal tract mostly unabsorbed or it would be changed to an inactive form by gut bacteria.

Although bromelain and quercetin demonstrate remarkable effects on their own, using them in combination as directed greatly increases their therapeutic activity.

**SUMMARY**

The combination of bromelain and quercetin, along with several synergistic factors, offers considerable benefit in allergic and inflammatory conditions. I would recommend the following formula: Bromelain (minimum 1.800 m.c.u.) 125 mg. Quercetin 125 mg. Vitamin C 100 mg. Mixed flavonoids 100 mg. L-Cysteine 75 mg. Magnesium 25 mg.

**REFERENCES**

6. Haysteen B: Flavonoids, a class of natural products of high pharmaceutical potency. Biochemistry and Clinical Immunology 32:1141-8, 1983