

LE Magazine October 2000

REPORT

Lactoferrin:

The Bioactive Peptide that Fights Disease

by Will Brink

As regular readers of the Life Extension magazine are aware, whey protein appears to function as a natural food against cancer, HIV, overtraining syndrome in athletes and a host of pathologies. In particular, whey's effects on glutathione levels and immunity are well documented in many animal studies with a growing number of human studies confirming the results with animals. Whey is one of two major proteins found in milk (the other being casein). When we talk about whey we are actually referring to a complex protein made up of many smaller protein subfractions (peptides), including beta-lactoglobulin, alpha-lactalbumin, immunoglobulins (IgGs), glycomacropetides, bovine serum albumin (BSA), and minor peptides such as lactoperoxidases, lysozyme and lactoferrin. Each of the subfractions found in whey has its own unique biological properties. Up until quite recently, separating these subfractions on a large scale was either impossible or prohibitively expensive. Modern filtering technology has improved dramatically in the past few years allowing a handful of companies to separate some of the highly bioactive peptides from whey, such as lactoferrin. Many of these subfractions are only found in very minute amounts in cows milk, normally at less than 1%. For example, lactoferrin makes up approximately 0.5% - 1% or less of whey protein derived from cows milk (where as human mothers milk will contain up to 15% lactoferrin). Lactoferrin appears to be the subfraction of whey with documented anti-viral, anti-microbial, anti-cancer and immune modulating/enhancing effects. There is little doubt that lactoferrin could become the natural compound of choice in the treatment and prevention of a host of human ailments. To follow is a summary of what lactoferrin might have to offer.

Immunity

A minor fraction of whey, lactoferrin appears to have a wide variety of uses in biological systems and is considered a first line immune defense in the human body. Though a natural component of cows and human mothers milk, lactoferrin is found throughout the human body and occurs in all secretions that bathe mucous membranes such as saliva, tears, bronchial and nasal secretions, hepatic bile, pancreatic fluids, and is an essential factor in the immune response. Lactoferrin is concentrated in oral cavities where it will come in direct contact with pathogens (i.e. viruses, bacteria, etc.) and kills or greatly suppresses these pathogens through a variety of different mechanisms. Exactly how lactoferrin exerts all of its immune modulating or immune enhancing functions is not entirely clear, but it is known to enhance the immune response both directly and indirectly (passively) in response to a wide range of immune challenges. Specific receptors for lactoferrin are found on many key immune cells such as lymphocytes, monocytes and macrophages, and is known to be directly involved in the upregulation of natural killer (NK) cell activity. Most research points to lactoferrin as being more of an immune modulator rather than a simple immune stimulant.



Found in human mothers milk, lactoferrin appears to have a wide variety of uses in biological systems and is considered a first line immune defense in the human body.

Published studies that have examined the use of lactoferrin as a supplement and its effects on immunity have been quite promising. Research using various animals models (i.e., rats, sheep, pigs and cats, as well as others) has found the ingestion of lactoferrin to have direct protective effects on the regulation and modulation of the immune system.

For example, one study that examined the immune response to an endotoxin (lipopolysaccharide) known to cause severe septic shock found that feeding lactoferrin to mice dramatically reduced the lethality of this endotoxin while improving immune response parameters.(1) Another study with baby pigs found only 17% of the pigs died when fed lactoferrin and injected with the endotoxin escherichia coli as opposed to 74% of the pigs that died without the lactoferrin!(2) This could be a major finding, as septic shock is

the most frequent cause of death for intensive care patients and the 13th leading cause of death in the United States. Two studies using healthy human volunteers found the ingestion of lactoferrin derived from cows milk had positive immunoregulatory effects that were specific to the individual. That is, depending on the initial profile of the immune system of each person, lactoferrin ingestion augmented the immune response, leading the researchers to conclude “. . .the data suggests that bovine (cows) lactoferrin may be applied in the clinic to improve the immune status of the patients.”(3) A similar human study using ten people who ingested lactoferrin concluded “these results suggest that lactoferrin administration may influence the primary activation of the host defense system.”(4)

Lactoferrin appears to be particularly important in the health and function of the intestinal tract and has been found to greatly reduce systemic and intestinal inflammation in such conditions as inflammatory bowel disease and others. Animals subjected to a variety of pathogens known to cause both systemic and intestinal inflammation and damage show much greater resistance and reduced inflammation when fed lactoferrin. The gastrointestinal tract must be viewed as an ecologic system in which a balance between both good and bad bacterial flora (micro flora) exists. An overgrowth of bad bacteria in the intestinal tract is known to cause a wide range of severe problems that cause a myriad of pro-inflammatory mediators to be released, causing disruptions throughout the entire body.

When fed to adult animals and human infants, lactoferrin showed a dramatic increase in good micro flora—such as bifidus—and a decrease in bad bacteria, such as E. coli, streptococcus, clostridium and others. The result was desirable intestinal flora, which is known to be essential for optimal health, immunity and resistance to disease. An extensive review that examined the role of lactoferrin in inflammation and the health of the intestinal tract stated, “The possibility that lactoferrin limits the autodestructive inflammatory response presents a new alternative for the future management of systemic inflammation.”(5) Some research also suggests that lactoferrin is able to stimulate intestinal cell growth and may lead to better digestive functions, in addition to its ability to enhance the growth of “good” microflora in the intestine. There is little doubt that in addition to its immunomodulating effects, this natural peptide derived from whey has powerful pro-biotic properties.

Anti-viral effects

Lactoferrin has been found to both directly and indirectly inhibit several viruses that cause disease in humans. It directly inhibits viruses by binding to viral receptor sites, thus preventing the virus from infecting healthy cells. For example, in vitro studies have found that lactoferrin strongly binds to the V3 loop of the gp120 receptor on HIV-1 and HIV-2, resulting in inhibition of virus-cell fusion and entry of the virus into cells.¹⁰ In addition, lactoferrin indirectly kills or inhibits viruses by augmenting the systemic immune response to a viral invasion. It's interesting to note that there is a systemic deficiency of lactoferrin in people with HIV infection. One study that examined 22 asymptomatic and 45 symptomatic patients with HIV compared to 30 healthy controls found that “levels of plasma lactoferrin are decreased in HIV-1 infected patients in relation to the progression of the disease.”(6) Another study found that the lack of lactoferrin (and secretory Iga) found in the oral cavities of people with HIV correlated strongly with the frequent infections in those areas often seen with patients with AIDS.⁽¹¹⁾ Lactoferrin was also found to have “potent” anti-viral effects against the replication of both human HIV and cytomegalovirus (CMV) virus in several in vitro studies with no cytopathic effects on healthy cells.

In addition to HIV and CMV, additional studies have found that lactoferrin inhibits herpes simplex type 1 infection of healthy cells. The latter likely occurs by preventing viral attachment to healthy cells via the blocking of viral proteins and direct immune interactions with natural killer cells, lymphocytes and phagocytes.^(7,8,9,10)

The importance of lactoferrin in viral infections warrants a great deal of further research and use by clinicians. There is little doubt that lactoferrin is a key molecule for the body and the immune system in the fight against viruses and other microbes, and could be an effective supplement for people with viral infections.

Anti-cancer effects

Perhaps one of the most promising uses for lactoferrin may be in its potential as a nontoxic adjuvant cancer treatment agent. Extensive in-vitro (test tube) and in-vivo research with animals has shown lactoferrin to be a powerful anti-cancer agent.

Two studies using healthy human volunteers found the ingestion of lactoferrin derived from cow's milk had positive immunoregulatory effects.

Multiple studies using both rats and mice exposed to a toxic chemical (azoxymethane) known to cause tumors throughout the

How to Obtain Lactoferrin

Lactoferrin is a natural constituent of whey protein found in milk. High quality whey protein supplements contain about 0.5% lactoferrin. That means a 20 gram scoop of high quality whey protein isolate provides about 100mg of lactoferrin.

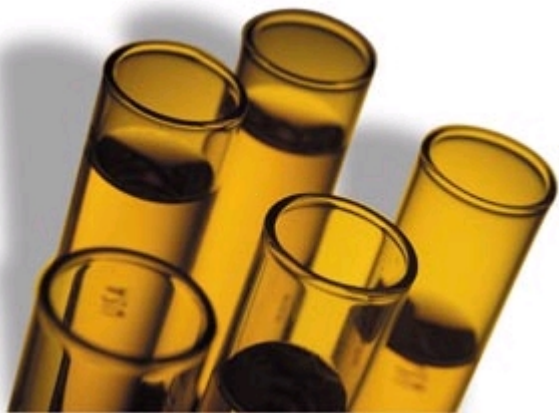
An adequate and cost effective dose of lactoferrin for the adjunctive treatment of disease is estimated to be 300 mg a day. There are dietary supplements that provide potent doses of lactoferrin extracted from whey. When using these supplements, it is important to use a form of lactoferrin called “apolactoferrin” that is depleted of iron. The apolactoferrin form has been shown in studies to provide the benefits of lactoferrin as an antioxidant, and studies show the “apo” form may have additional benefits over that of other forms of lactoferrin.

gastrointestinal tract, administered concomitantly with lactoferrin, showed a large reduction in intestinal polyp development.(12,13) Just as important, there were no toxic effects to intestinal epithelial tissues. Another study found the addition of lactoferrin to cancer prone mice subjected to cancer causing chemicals reduced the number of tumors and suppressed angiogenesis (the production of new blood vessels), which tumors need to survive. This study also found lactoferrin “significantly inhibited” liver and lung metastasis of cancer cells in these animals.(14) In addition to what appears to be direct cancer inhibiting properties of lactoferrin, additional studies have found it increased natural killer (NK) cell toxicity to several cancer cell lines at low concentrations. This shows lactoferrin plays a systemic role in improving immune cell effectiveness to cancer cells, as well as a direct effect through mechanisms that are not fully clear at this time.

Yet another study found lactoferrin to be very effective at suppressing the growth of human pancreatic cancer cells. So much so the researchers concluded that lactoferrin “ .might become one of the new drugs of choice for the adjuvant therapy against pancreatic cancer.”(15) Additional published studies have found both direct cancer suppressing activities of lactoferrin as well as systemic immune improvements in animals fed lactoferrin with chemical induced cancers. One study that examined lactoferrin’s effects on chemically induced colon cancer found that “no effects indicative of toxicity were noted [from the use of lactoferrin], but significant reductions in both incidence and number of adenocarcinomas (tumors) of the large intestine were observed in almost all treatments.”(12)

Anti-microbial effects

Probably lactoferrin’s best known role is as an iron binding protein. It’s referred to as hololactoferrin in its iron bound form and apolactoferrin in its iron depleted form. Studies have found it’s the apolactoferrin form that has the most powerful effects as an anti-microbial agent. Directly related to lactoferrin’s previously mentioned ability to suppress certain health degrading bacteria in the intestine, lactoferrin is a powerful anti-microbial that inhibits a wide range of pathogenic bacteria and other microbes. The mechanism appears to lie with lactoferrin’s ability to bind iron, as it is known to have an extremely high affinity for this metal. Many pathogenic bacteria need a supply of free iron to multiply—in the presence of lactoferrin, they are strongly inhibited or killed.



Extensive in-vitro (test tube) and in-vivo research with animals has shown lactoferrin to be a powerful anti-cancer agent.

all been found to be strongly or partially inhibited in the presence of lactoferrin.(19,20) (It should be noted not every microbe that is pathogenic to humans is suppressed by lactoferrin).

Maybe most promising and interesting, there is research that points to lactoferrin being able to improve the efficiency of antibiotic treatments in the fight against pathogenic microbes. Considering the out of control use of antibiotics and the rise in antibiotic resistant strains of “bad bugs,” this is very good news. Would the combination of lactoferrin and antibiotics be the knockout punch to certain bacteria that are not being killed by antibiotic treatments alone? More research is needed, but the evidence is very compelling.

Lactoferrin as an antioxidant

Finally, lactoferrin is an antioxidant that scavenges free iron, helping to prevent uncontrolled iron based free radical reactions, thus protecting certain cells from peroxidation. Though lactoferrin is both an iron scavenger and donor (depending on the cellular environment), it has been found to scavenge or donate iron at the appropriate times when the body is in need of the reaction. At normal physiological PH, lactoferrin binds iron tightly thus diminishing oxidative stress to tissues (from free radical production of iron). As would be expected, apolactoferrin, but not hololactoferrin, has been shown to prevent lipid peroxidation. However, there are times in fact when iron is needed as part of a controlled oxygen radical generating system by certain immune cells to kill microorganisms. Lactoferrin has been found to be an iron donor to this system under reduced PH conditions.

One study looked at lactoferrin as a “natural antibiotic” and found that lactoferrin both in-vitro and in-vivo strongly inhibited the toxic bacteria helicobacter pylori. They stated “It is concluded that bovine (cows) lactoferrin has significant antimicrobial activity against helicobacter species in-vitro and in-vivo.”(16) Another study using both in-vitro and in-vivo methods added lactoferrin to the drinking water of mice and subjected them to the toxic microbe staphylococcal. The study found that the mice getting the lactoferrin as 2% of calories reduced kidney infections by 40% to 60% and reduced bacterial counts 5- to 12-fold. They concluded “the results suggest a potential for the use of lactoferrin as natural anti-bacterial proteins for preventing bacterial infections.”(17) Interestingly, some studies have found lactoferrin from cows to be more effective than lactoferrin from humans for anti-bacterial properties(18) (though it’s well established that human mothers milk confers a great deal of protection to the newborn due to many factors, including a high lactoferrin content). Several studies have found lactoferrin to inhibit a wide range of gram positive and gram negative bacteria, yeasts and even certain intestinal parasites. Cholera, escherichia coli, shigella flexneri, staphylococcus epidermidis, pseudomonas aeruginosa, candida albicans and others have

Several studies suggest lactoferrin reduces oxidative stress. Diseases such as cancer, heart diseases and AIDS are all closely related to oxidative stress either as a causative factor or as a factor in progression of the disease. One study that examined the role of whey proteins, multifermented whey proteins and lactoferrin in oxidative stress made the bold statement, "We can conclude that whey protein, lactoferrin and multifermented whey are good candidates as dietary inhibitors of oxidative stress and should be considered as potential medicinal foods in various pathologies as HIV infection and cancer."(21) We couldn't have said it better ourselves!

Conclusion

There is little doubt that lactoferrin is a major find and a potential breakthrough as a natural nontoxic treatment in an array of human ailments. Though a handful of companies are able to produce lactoferrin at this time, there is only one company producing the apolactoferrin (iron depleted) form in large quantity. Studies suggest that the superior form to supplement with is apolactoferrin.

William D. Brink is a well known medical, fitness and health writer for a variety of publications. He graduated from Harvard University with a degree in the natural sciences, and is a regular guest on national radio shows and a speaker at various conventions around the U.S.

References

1. Zhang GH, Mann DM, Tsai CM. Neutralization of endotoxin in vitro and in vivo by a human lactoferrin-derived peptide. *Infect Immun* 1999 Mar;67(3):1353-8.
2. Lee WJ, Farmer JL, Hilty M, Kim YB. The Protective Effects of Lactoferrin Feeding against Endotoxin Lethal Shock in Germfree Piglets. *Infect Immun* Apr. 1999: Vol 66 No 4, 1421-1426.
3. Zimecki M, Wlaszczyk A, Cheneau P, Brunel AS, Mazurier J, Spik G, Kubler A. Immunoregulatory effects of a nutritional preparation containing bovine lactoferrin taken orally by healthy individuals. *Arch Immunol Ther Exp (Warsz)* 1998;46(4):231-40.
4. Yamauchi K, Wakabayashi H, Hashimoto S, Teraguchi S, Hayasawa H, Tomita M. Effects of orally administered bovine lactoferrin on the immune system of healthy volunteers. *Adv Exp Med Biol* 1998;443:261-5.
5. Kruzel ML, Harari Y, Chen CY, Castro GA. The gut. A key metabolic organ protected by lactoferrin during experimental systemic inflammation in mice. *Adv Exp Med Biol* 1998;443:167-73.
6. Defer MC, Dugas B, Picard O, Damais C. Impairment of circulating lactoferrin in HIV-1 infection. *Cell Mol Biol (Noisy-le-grand)* 1995 May;41(3):417-21.
7. Puddu P, Borghi P, Gessani S, Valenti P, Belardelli F, Seganti L. Antiviral effect of bovine lactoferrin saturated with metal ions on early steps of human immunodeficiency virus type 1 infection. *Int J Biochem Cell Biol* 1998 Sep;30(9):1055-62.
8. Superti F, Ammendolia MG, Valenti P, Seganti L. Antiviral activity of milk proteins: lactoferrin prevents rotavirus infection in the enterocyte-like cell line HT-29. *Med Microbiol Immunol (Berl)* 1997 Oct;186(2-3):83-91.
9. Harmsen MC, Swart PJ, de Bethune MP, Pauwels R, De Clercq E, The TH, Meijer DK. Antiviral effects of plasma and milk proteins: lactoferrin shows potent activity against both human immunodeficiency virus and human cytomegalovirus replication in vitro. *J Infect Dis* 1995 Aug;172(2):380-8.
10. Swart PJ, Kuipers EM, Smit C, Van Der Strate BW, Harmsen MC, Meijer DK. Lactoferrin. Antiviral activity of lactoferrin. *Adv Exp Med Biol* 1998;443:205-13.
11. Muller F, Holberg-Petersen M, Rollag H, Degre M, Brandtzaeg P, Froland SS. Nonspecific oral immunity in individuals with HIV infection. *J Acquir Immune Defic Syndr* 1992;5(1):46-51.
12. Tsuda H, Sekine K, Nakamura J, Ushida Y, Kuhara T, Takasuka N, Kim DJ, Asamoto M, Baba-Toriyama H, Moore MA, Nishino H, Kakizoe T. Inhibition of azoxymethane initiated colon tumor and aberrant crypt foci development by bovine lactoferrin administration in F344 rats. *Adv Exp Med Biol* 1998;443:273-84.
13. Ushida Y, Sekine K, Kuhara T, Takasuka N, Iigo M, Tsuda H. Inhibitory effects of bovine lactoferrin on intestinal polyposis in the Apc(Min) mouse. *Cancer Lett* 1998 Dec 25;134(2):141-5.
14. Yoo YC, Watanabe S, Watanabe R, Hata K, Shimazaki K, Azuma I. Bovine lactoferrin and lactoferricin, a peptide derived from bovine lactoferrin, inhibit tumor metastasis in mice. *Jpn J Cancer Res* 1997 Feb;88(2):184-90.
15. Sakamoto N. Antitumor effect of human lactoferrin against newly established human pancreatic cancer cell line SPA. *Gan To Kagaku Ryoho* 1998 Aug;25(10):1557-63.
16. Dial EJ, Hall LR, Serna H, Romero JJ, Fox JG, Lichtenberger LM. Antibiotic

Further Reading

Arao S, Matsuura S, Nonomura M, Miki K, Kabasawa K, Nakanishi H. Measurement of urinary lactoferrin as a marker of urinary tract infection. *J Clin Microbiol* 1999 Mar;37(3):553-7.

Damiens E, Mazurier J, el Yazidi I, Masson M, Duthille I, Spik G, Boilly-Marer Y. Effects of human lactoferrin on NK cell cytotoxicity against haematopoietic and epithelial tumour cells. *Biochim Biophys Acta* 1998 Apr 24;1402(3):277-87.

Fillebeen C, Descamps L, Dehouck MP, Fenart L, Benaissa M, Spik G, Cecchelli R, Pierce A. Receptor-mediated transcytosis of lactoferrin through the blood-brain barrier. *J Biol Chem* 1999 Mar 12;274(11):7011-7.

Hammerschmidt S, Bethe G, H Remane P, Chhatwal GS. Identification of pneumococcal surface protein A as a lactoferrin-binding protein of streptococcus pneumoniae. *Infect Immun* 1999 Apr;67(4):1683-7.

Manev V, Maneva A, Sirakov L. Effect of lactoferrin on the phagocytic activity of polymorphonuclear leucocytes isolated from blood of patients with autoimmune diseases and Staphylococcus aureus allergy. *Adv Exp Med Biol* 1998;443:321-30.

Marchetti M, Longhi C, Conte MP, Pisani S, Valenti P, Seganti L. Lactoferrin inhibits herpes simplex virus type 1 adsorption to Vero cells. *Antiviral Res* 1996 Mar;29(2-3):221-31.

Portelli J, Gordon A, May JT. Effect of compounds with antibacterial activities in human milk on respiratory syncytial virus and cytomegalovirus in vitro. *J Med Microbiol* 1998 Nov;47

properties of bovine lactoferrin on *Helicobacter pylori*. Dig Dis Sci 1998 Dec;43 (12):2750-6.

17. Bhimani RS, Vendrov Y, Furmanski P. Influence of lactoferrin feeding and injection against systemic staphylococcal infections in mice. J Appl Microbiol 1999 Jan;86 (1):135-44.

18. Vorland LH, Ulvatne H, Andersen J, Haukland H, Rekdal O, Svendsen JS, Gutteberg TJ. Lactoferricin of bovine origin is more active than lactoferricins of human, murine and caprine origin. Scand J Infect Dis 1998;30(5):513-7.

19. Percival M. Intestinal Health. Clin. Nutri. Insights. 1997, Vol 5. No 5, 1-6.

20. Kuwata H, Yip TT, Tomita M, Hutchens TW. Direct evidence of the generation in human stomach of an antimicrobial peptide domain (lactoferricin) from ingested lactoferrin. Biochim Biophys Acta 1998 Dec 8;1429(1):129-41.

21. Stella V, Postaire E. Evaluation of the antiradical protector effect of multifermented milk serum with reiterated dosage in rats. C R Seances Soc Biol Fil 1995;189(6):1191-7.

(11):1015-8.

Roosendaal C, Horst G, Pogany K, van Milligen de Wit AW, Kleibeuker JH, Haagsma EB, Limburg PC, Kallenberg CG. Prevalence and clinical significance of anti-lactoferrin auto-antibodies in inflammatory bowel diseases and primary sclerosing cholangitis. Adv Exp Med Biol 1998;443:313-9.

Swart PJ, Kuipers ME, Smit C, Pauwels R, deBethune MP, de Clercq E, Meijer DK, Huisman JG. Antiviral effects of milk proteins: acylation results in polyanionic compounds with potent activity

Lactoferrin
and other chemopreventive milk compounds

The latest report from the National Cancer Center Research Institute in Tokyo, Japan suggests that whey protein, particularly its major component bovine lactoferrin (bLF), may inhibit colon cancer [Mutat Res 2000 Apr;462(2-3):227-33]. Results from earlier research they had conducted in a rat model showed a lower incidence and number of adenocarcinomas in bLF-fed animals. After administering various doses of bLF for 36 weeks, in conjunction with three weekly injections of a carcinogen, results showed that the incidence of adenocarcinomas in rats receiving 2% and 0.2% bLF were 15% and 25%, respectively. In contrast, the control rats had an incidence rate of 57.5%. These results basically show bLF's ability to reduce colon cancer by about 50%.

Another study from the same center showed that bLF might also fight cancer in the esophagus and lungs [Jpn J Cancer Res 1999 Mar;90(3):262-67]. The researchers administered bLF at a dose of 2%, 0.2%, 0.02%, or 0.002% to rats with multi-organ cancer. At the 0.2% dose, they noted a reduction in the development of papillomas and the suppression of large-sized papillomas within the esophagus. Meanwhile, a dose of 0.02% sufficed to reduce the number of lung tumors compared to controls. The results suggest that the promise of bLF in a chemopreventive capacity may extend beyond the colon.

Besides bLF, a number of dairy components have been examined for their potential anti-carcinogenic properties. For example, research has been reporting cancer-fighting results with regards to conjugated linoleic acid (CLA), sphingomyelin, butyric acid and other milk fats [J Nutr 1997; 127(6):1055-60]. More specifically, recent news headlines about CLA announced that the natural fatty acid reduces breast cancer risk. The report stemmed from a study headed by Cornell University researchers [J Nutr 1999 Dec;129(12):2135-42], which demonstrated that high levels of CLA from sources such as cheese and butter from cow's milk reduced the incidence and number of breast tumors. In animal experiments, only 50% of rats feeding on CLA butter developed mammary tumors when administered high doses of carcinogens, while 93% of the rats on a standard diet developed the cancer growths. CLA was also shown to decrease the number of terminal end bud (TEB) cells, which are primary targets for attack by carcinogens, by 30%, and TEB cell proliferation by 30%.

Likewise, calcium has been receiving attention after showing the potential to cut colon cancer risk in recent human trials. It's believed to exert its anti-carcinogenic activity possibly by helping to bind both fatty acid and bile acid in the colon and keeping them from interacting with, and irritating, the colon lining. A recent study that tracked 70 patients at risk for colon cancer for a year had half of its participants consume their normal diet, while asking the other half to increase their calcium intake from low-fat dairy foods to about 1500 mg per day [JAMA 1998 Sep 23-30;280(12):1074-79]. The investigators report significant improvements in the risk biomarkers for men who followed the high-calcium diet.

As the data about the various components of milk and dairy products grows, so does the understanding that there is good and bad in most foods we consume. But in isolating the beneficial parts, we can use certain components of foods to ward off disease rather than promote it.

against human immunodeficiency virus types 1 and 2 in vitro. AIDS Res Hum Retroviruses 1996 Jun 10;12(9):769-75.

Yoo YC, Watanabe S, Watanabe R, Hata K, Shimazaki K, Azuma I. Bovine lactoferrin and Lactoferricin inhibit tumor metastasis in mice. Adv Exp Med Biol 1998;443:285-91.

[Back to the Magazine Forum](#)

These statements have not been evaluated by the FDA. These products are not intended to diagnose, treat, cure or prevent any disease. The information provided on this site is for informational purposes only and is not intended as a substitute for advice from your physician or other health care professional or any information contained on or in any product label or packaging. You should not use the information on this site for diagnosis or treatment of any health problem or for prescription of any medication or other treatment. You should consult with a healthcare professional before starting any diet, exercise or supplementation program, before taking any medication, or if you have or suspect you might have a health problem. You should not stop taking any medication without first consulting your physician.