

by Linda Milo Ohr

Building a Better Defense System

Immune health encompasses not only reducing the occurrence of colds and flu, but also alleviating symptoms, reducing risk of infections, and improving overall wellness. Antioxidants and probiotics get most of the attention in this area, but research is mounting in support of the immunity benefits of other nutraceutical ingredients.

Probiotics

Most commonly associated with yogurt and yogurt-based beverages, probiotics can also deliver immune health benefits in commercially produced cheese products, according to Ibrahim et al. (2010). Thirty-one healthy elderly subjects were involved in three consecutive phases of monitored cheese consumption. In the first phase, they ate 15g of a control cheese for two weeks. In phase two, they consumed 15g of a similar cheese containing *Lactobacillus rhamnosus* HN001 (HOWARU® *Rhamnosus* from Danisco USA Inc.) and *Lactobacillus acidophilus* NCFM (HOWARU® *Dophilus*) (10⁹ CFU/dose), also from Danisco, Madison, Wis. (phone 800-255-6837, www.danisco.com), for the next four weeks. In phase three, the subjects switched back to consuming the control cheese for four weeks. The cheese enhanced with probiotics was shown to significantly improve immunity defense indicators (enhanced phagocytic and natural killer cell activity) in the subjects' blood.

In a separate study, Leyer et al. (2009) showed that daily dietary probiotic supplementation for six months was a safe, effective way to reduce the inci-



combination probiotic supplements reduced their fever incidence by 53% and 72.7%, respectively. Their coughing was reduced by 41.4% and 62.1%, and their runny noses were lessened as well.

Lactobacillus reuteri *Protectis* (formerly *L. reuteri* ATCC 55730) from BioGaia, Sweden (phone 919 782 33 12, www.biogaia.com), exerts direct effects on pathogens and affects the immune system via the gastrointestinal epithelium. *L. reuteri* is a natural colonizer in humans and is even found in the milk of breastfeeding mothers. Most recently, Romeo et al. (2011) showed that *L. reuteri* *Protectis* reduced gas-

Yogurt has, for some time, been linked to probiotic health benefits.

Photo courtesy of Danisco

Cheese enhanced with probiotics was shown to significantly improve immunity defense indicators in the subjects' blood.

dence and severity of cold and flu symptoms in children. For six months, 326 children, ages 3 to 5, were given supplements twice a day. One group received a single strain of Danisco's *L. acidophilus* NCFM. One group received a combination of NCFM and *Bifidobacterium lactis* Bi-07. The third group received a placebo. When compared to the placebo group, the groups that received the single and

trointestinal symptoms and hospital stays in premature newborns. In the study, 249 premature newborns were consecutively assigned to either supplementation of *L. reuteri* *Protectis* (10⁸ CFU/day), supplementation of *L. rhamnosus* (LGG, 6x10⁹ CFU/day), or no supplementation. The probiotic supplementation started within 72 hours of admittance to the neonatal intensive care unit and continued for

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A research project found that cheese enhanced with probiotics improved indicators of immunity defense. Photo courtesy of Danisco

six weeks or until the baby was discharged. Apart from positive results on gastrointestinal symptoms and hospital stay, supplementation of *L. reuteri* *Protectis* also led to a significant reduction in number of days of antibiotic treatment compared to the LGG and control groups.

Kimmel et al. (2010) showed that a regimen of one capsule per day containing 500 million CFU of *Bacillus coagulans* GBI-30, 6086 (*GanedenBC30™*) from Ganeden Biotech Inc., Mayfield Heights, Ohio (phone 440-229-5200, www.ganedenlabs.com), may be a safe and effective option for enhancing the immunological response to common viral respiratory tract infections. In addition, Jensen et al. (2010) suggested that consumption of *GanedenBC30* may introduce both cell wall components and metabolites that modulate inflammatory processes in the gut, supporting a healthy immune system.

At last year's SupplySide West Expo, Chr. Hansen, Milwaukee, Wis. (phone 800-558-0802, www.chr-hansen.com/probiotics), announced a relaunch of its probiotic offerings for the dietary supplement, infant formula, and pharmaceutical industries. The company offers *Probio-Tec®* strains for gastrointestinal, immune, women's, and infant health. Cox et al. (2010) demonstrated that

L. fermentum VRI-003 reduced total number of days of respiratory illness symptoms in a study of 20 highly trained distance runners. Hojsak et al. (2010) demonstrated that *Lactobacillus* GG (LGG®) reduced risk of upper respiratory tract infections in children attending daycare centers. During the three-month intervention, children received 1 billion CFU/day in fermented milk.

Prebiotics

Udani et al. (2010) demonstrated the ability of an all natural arabinogalactan-based immune ingredient (*ResistAid™*) from Lonza, Allendale, N.J. (phone 888-403-8772, www.lonza.com), to increase the antibody response of healthy volunteers to the 23-valent pneumococcal vaccine. *ResistAid* is a combination of larch arabinogalactan and bioactive flavonoids and provides both a humoral and cellular immune response. The study included 45 healthy adults who had not previously been vaccinated against *Streptococcus pneumoniae*. The volunteers began taking the study product or placebo (daily dosage 4.5 g) at the screening visit and continued over the entire 72-day study period. After 30 days, the subjects received the 23-valent pneumococcal vaccine. The study showed vaccinated volunteers who received *ResistAid* for 30 days prior to the vaccine and up until Day 72 demonstrated significantly higher pneumococcal IgG levels in two antibody subtypes than the group that received the placebo.

Vivinal® GOS is a dairy-derived, prebiotic galacto-oligosaccharide (GOS) from FrieslandCampina Domo, Paramus, N.J. (phone 201-655-7786, www.vivinalgos.com, www.domo.nl, www.frieslandcampina.com). It is selectively fermented by key probiotic bacteria, including *Bifidobacteria* and *Lactobacilli*. In addition, the presence of *Vivinal* GOS has been shown to deter adherence of various pathogenic bacteria to the colonic epithelial cell walls. The short-chain fatty acids (SCFA) produced from

fermentation of GOS help to lower colonic and fecal pH, thereby improving overall colonic health.

Another GOS, *Purimune™* from GTC Nutrition, Westchester, Ill. (phone 708-551-2700, www.gtcnutrition.com), is derived from lactose and contains a minimum of 90% GOS. *Purimune* passes intact through the mouth, stomach, and small intestine to the colon, where it is completely fermented by beneficial bacteria into SCFA. SCFA promote digestive and immune health and enhance mineral absorption. The prebiotic also promotes the growth of beneficial bacteria and inhibits colonization of pathogenic bacteria. The company also offers *NutraFlora®* short-chain fructo-oligosaccharides derived from beet or cane sugar. The prebiotic helps to maintain a strong immune system by building a healthy lower intestinal tract, which enhances the absorption of nutrients and helps to maintain proper digestion.

Synbiotics (combination of probiotics and prebiotics) have also been shown to benefit immune health. For example, van der Aa et al. (2011) concluded that a synbiotic mixture prevented asthma-like symptoms in infants with atopic dermatitis (AD). According to the researchers, infants with AD have a high risk of developing asthma. Ninety infants with AD, age < 7 mo, were randomized to receive an extensively hydrolyzed formula with *Bifidobacterium breve* M-16V and a galacto/fructo-oligosaccharide mixture (*Immunofortis®*) from Danone, France, or the same formula without synbiotics for 12 weeks. After one year, the prevalence of respiratory symptoms and asthma medication use was evaluated. The prevalence of "frequent wheezing" and "wheezing and/or noisy breathing apart from colds" was significantly lower in the group that received the formula with synbiotics than in the placebo group. Significantly fewer children in the synbiotic group than in the placebo group had started to use asthma medication after baseline. »»

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Another synbiotic preparation, *ProbioKid*[®], Institut Rosell-Lallemand, Montreal, Canada (www.lallemand.com), was shown to reduce the relative risks of any infectious event by 25% in children during winter, as compared to placebo (Lallemand, 2010). *ProbioKid*[®] contains a combination of three well documented probiotic strains from Institut

Rosell-Lallemand and a prebiotic (fructo-oligosaccharide). The study was conducted during the winter of 2006–2007 and involved 135 healthy, school-age children who had suffered from at least three episodes of ear-nose-throat, bronchopulmonary, or gastric disorder during the course of the previous winter. The study found that a three-month daily supplementation with *ProbioKid*[®] significantly reduced the risks of common infections in children.

Yeast Extracts

Derived from a proprietary strain of yeast, *Wellmune WGP*[®] from Biothera, the Immune Health Company, Eagan, Minn. (phone 651-675-0400, www.biothera.com, www.wellmune.com), strengthens innate immune cells to more quickly find and kill foreign challenges. Research presented at last year's British Society for Immunology conference in Liverpool, UK, demonstrated that *Wellmune* significantly reduced the duration of upper-respiratory-tract infection (URTI) symptoms in a healthy population of medical students during the peak of the cold-flu season (Biothera, 2010). During the 90-day study involving 100 fourth-year medical students, there were 24 medically confirmed URTI cases, equally divided between the study groups. Participants taking *Wellmune* (250 mg daily) reported 43 fewer days of symptoms than their classmates who received a placebo. There was a significant reduction (18%) in the total number of days with self-reported URTI symptoms in the yeast extract group. Biothera and its research collaborators have previously conducted clinical studies involving individuals with high lifestyle stress.

A yeast-based fermentate, *EpiCor*[®] from Embria Health Sciences, Ankeny, Iowa (phone 877-362-7421, www.embriahealth.com), helps the body balance the immune system. The immune health ingredient contains protein, fiber, vitamins, minerals, amino acids, antioxidants, and other metabolites that deliver nutritional benefits and support immune health. Clinical studies have found *EpiCor*'s immune-balancing properties provide year-round support by helping the body boost or suppress immune response as needed, increasing the anti-inflammatory marker IL-10 and activating crucial defense cells (Natural Killer, T-, and B-cells). It is also a powerful antioxidant and possesses significant anti-inflammatory activity. According to the company, *EpiCor* works in a unique way to "educate" the immune system so that it works efficiently to provide the proper immune response at the right time. Too great an immune response can lead to allergies or inflammation. Alternatively, an immune system that is suppressed is not working optimally, increasing the chances that the body will succumb

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The immune health ingredient EpiCor has been found to help reduce symptoms of cold and flu. Photo courtesy of Embria Health Sciences



to infection, resulting in sickness.

Moyad et al. (2010) showed that *EpiCor* reduced cold and flu-like symptoms in non-vaccinated individuals. The study focused on 116 subjects with no recent history of seasonal influenza vaccination. Subjects were given either a once-daily 500 mg dose of *EpiCor* or a placebo for 12 weeks. The study found that those who were given *EpiCor* had a statistically significant reduction in cold/flu-like symptoms. Moyad et al. (2009) also demonstrated that *EpiCor* significantly reduced the severity of allergy symptoms. Over a 12-week period of the highest recorded concentrations of total pollen counts for the Midwest, 96 healthy test subjects with recent history of seasonal allergies and allergic rhinitis (AR) were given either a once-daily 500 mg dose of *EpiCor* or a placebo. The study found that *EpiCor* significantly reduced the severity of AR symptoms.

Vitamins

• **Vitamin D.** Ginde et al. (2009) demonstrated that vitamin D (serum 25(OH)D) levels were inversely associated with recent upper respiratory tract infections (URTI). This association may be stronger in those with respiratory tract diseases. Researchers performed a secondary analysis of the Third National Health and Nutrition Examination Survey, a probability survey of the U.S. population conducted between 1988 and

1994, and examined the association between 25(OH)D level and recent URTI in 18,883 participants 12 years and older. After adjusting for demographic and clinical characteristics, those with lower 25(OH)D levels were more likely to have a recent respiratory infection. The lowest average vitamin D blood levels were defined as less than 10 ng/mL of blood.

• **Vitamin E.** Ren et al. (2010) demonstrated that tocotrienols (vitamin E) enhanced T cell function in old mice. Immune function and the activity of T cells naturally declines with age, but daily supplements of a mixture of the four types of tocotrienol led to improvements in the T cell

function in old mice. Initial tests showed that the lymphocyte proliferation—the ability of immune cells to reproduce—was lower in older mice than their younger counterparts. After six weeks of supplementation, however, lymphocyte proliferation was significantly increased in the older mice who received the tocotrienols compared with older mice eating a normal diet. There were no differences observed between young mice groups, said the researchers. **FT**



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