Lactoferrin is a protective glycoprotein secreted by many cells and tissues throughout the human body. The name lactoferrin derives from its original identification in milk (lacto) and its ability to bind iron (ferrin).1 Lactoferrin is richly concentrated in colostral and mature breast milk and can be found in lesser amounts in bile, pancreatic juice, plasma, intestinal secretions, and bronchial and vaginal mucus.1 Lactoferrin plays an important role in defending the body against invasion by pathogenic microbes, including bacteria, viruses, fungi, and parasites. By sequestering iron, lactoferrin significantly limits pathogen growth and the development of microbial biofilms.2-4 Lactoferrin also inhibits the ability of pathogens to adhere to mucosal surfaces5 and directly disrupts microbial cell membranes.6 Lactoferrin further augments host resistance by enhancing both innate and adaptive immune responses to infection. The antimicrobial and immune-enhancing effects of lactoferrin have been demonstrated under a variety of experimental conditions. In cell cultures, lactoferrin significantly inhibits the ability of pathogenic bacteria such as Group A streptococci,7 Listeria monocytogenes,8 and enteroinvasive Escherichia coli9 to penetrate and infect human (HeLa) and human-like (Caco-2) epithelial cells. In a continuous-culture-flow cell environment, lactoferrin has been shown to prevent biofilm formation by the bacterial pathogen Pseudomonas aeruginosa.4 Co-culturing of various candidal species, including Candida albicans, with lactoferrin results in significant dieoff of the fungal cells.10,11 Lactoferrin inhibits replication of viruses such as respiratory syncytial virus (RSV),12 and human immunodeficiency virus (HIV)13 in vitro. And physiological concentrations of lactoferrin have been shown to prevent intracellular growth of the human parasite Toxoplasma gondii.14 Lactoferrin not only exerts direct antimicrobial activity, but plays a key role in modulating host immunity. Lactoferrin receptors have been found on leukocytes that mediate both innate and acquired immune responses.15 In vitro, lactoferrin has been shown to enhance neutrophil phagocytic activity,16 natural killer (NK) cell cytolytic activity,17 cytotoxic T-cell activation,18 and maturation of dendritic cells.19 Experiments in immunocompromised animals show lactoferrin helps restore both T-lymphocyte-mediated cellular and B-lymphocyte-mediated humoral immune responses.20,21 In one animal experiment, administration of lactoferrin by injection or orally reduced the number of kidney infections by 30-50% and 40-60%, respectively, in mice systemically infected with Staphylococcus aureus.22 In another study, lactoferrin administration prior to inoculation with murine cytomegalovirus (CMV) completely protected mice from death by upregulating T-lymphocyte-mediated stimulation of NK cell activity.23 Human clinical trials confirm the anti-infective efficacy of lactoferrin. One double-blind, placebo-controlled, multicenter trial recently reported in the Journal of the American Medical Association found that administering 100 mg/day of lactoferrin to very low birth weight infants for 30-45 days significantly reduces the incidence of late-onset bacterial and fungal sepsis. Interestingly, in this study, coadministration of the immunopotentiating probiotic Lactobacillus rhamnosus reduced the occurrence of sepsis even further.24 In another blinded, controlled trial, 12 months supplementation of bottle-fed infants with a formula containing lactoferrin significantly lowered the number of respiratory tract illnesses compared to a lactoferrin-free formula. Infants receiving lactoferrin also had significantly higher hematocrit levels at 9 months indicating improved iron status.25 Enhancement of iron absorption by lactoferrin has been demonstrated in a number of other studies.26,27 Several clinical trials have examined the effects of lactoferrin in persons infected with Helicobacter pylori. While not all have shown positive results,28,29 one study found that administration of 400 mg/day of lactoferrin for 12 weeks effectively suppressed gastric H. pylori colonization in 30% of treated subjects compared with suppression in <4% of control subjects.30 Lactoferrin further augments host resistance by enhancing both innate and adaptive immune responses to infection. Two clinical trials have demonstrated the efficacy of lactoferrin as an adjuvant to standard triple therapy for eradication of H. pylori infection.31,32 Antifungal effects of lactoferrin have also been demonstrated in humans. Eight weeks supplementation of lactoferrin at 600 mg/day significantly reduced dermatological symptom scores in persons with moderate vesicular or interdigital tinea pedis. In this study, additional reductions in symptoms were not observed in a group taking 2,000 mg/day of lactoferrin suggesting large doses are not necessary to achieve clinical benefits.33 Supplemental lactoferrin is recommended for persons who wish to enhance their resistance to infection and optimize immune function. Individuals at higher risk of developing infections such as young children, the elderly, or immunocompromised persons may benefit most from taking lactoferrin. ProThera’s new Lactoferrin formula delivers 250 mg of lactoferrin per vegetarian capsule. Suggested use is two (2) capsules daily with food. For maximum immune support, Lactoferrin may be taken together with other immunopotentiating formulas such as Ther-Biotic® Complete multispecies probiotic formula, Galactomite™ or BiotaGen™ prebiotic formulas, and ImmunoThera™. For optimal protection against pathogenic biofilm formation, Lactoferrin may be taken with InterFase® or InterFase Plus®.

References


