

Global Application of Probiotics on Immune Health

By James B. LaValle, R.Ph., CCN

Probiotics, also known as beneficial flora, have long been known to be present in the human gut, but for years our knowledge of why they are there was limited. We knew that they helped our body produce some of its own B vitamins, as well as vitamin K, but not much was known beyond that. As a result, the beneficial flora did not get a lot of attention despite the fact that these two functions alone should have been enough for us to highly value and protect our beneficial flora. B vitamins play a huge role in human health from energy production to production of important neurotransmitters that help fight stress. Vitamin K is crucial for helping us utilize calcium in our bones, and that proper utilization dramatically impacts heart health by keeping the calcium from building plaque in our arteries.



Later we learned that beneficial flora also support overall intestinal health by fermenting fibers and producing something called short chain fatty acids, which are the fuel that intestinal cells use for their various activities. So I have long been an advocate for the use of probiotics for human health, and for reasons beyond even the nutritional ones – the immune health reasons. For example, it was known that probiotics seemed to be protective against the development of allergies. This came from observations in studies of children with allergies which found that children who developed allergies had taken several rounds of antibiotics in young childhood compared with children with no allergies. So we knew that probiotics played some kind of role in immunity, but the exact mechanisms by which it did that were not known until more recently.

What we've learned during the last 10-15 years of research is that probiotics play a central role in directing the vast immune system present in our gastrointestinal tract. What is it that our beneficial bacteria do? One of the key things is they promote the production of something called tight junction proteins. These are minute amounts of glue-like substances that reside in the very tiny gaps between

intestinal cells. When beneficial bacteria sense the presence of pathogenic bacteria, they temporarily halt the production of tight junction proteins so that the immune cells, known as dendritic cells, can reach through the cellular gaps and grab onto those bacteria and present them to immune antibodies that are in the sub layers of the intestinal wall. The antibodies then produce inflammatory cytokines that will break down the cell's walls of those bacteria and kill them.

It is through the control of tight junction proteins that probiotics teach the immune system what to react to and what not to react to. When we have adequate amounts of tight junction proteins, normal substances like proteins in foods and pollens will not come into contact with the immune system cells in the sub mucosal layers of the intestinal tissue, and therefore will not cause immune reactions. Conversely, if the tight junction proteins are missing because our beneficial bacteria are not present in adequate numbers, the immune system can start reacting to allergens in foods and environmental allergens, thus allergic reactions develop. This is known as a change in gut permeability and it increases the exposure of allergenic material to antigen presenting cells (APC's), including dendritic cells, an undesirable process.

As it turns out, this process of allergic immune activation is more than just annoying – it actually compromises our overall health by being a source of chronic internal inflammation (a contributor to many chronic illnesses like diabetes, heart disease and cancer). In addition, when gut immunity is upregulated over time, it can develop and progress into various autoimmune disorders, in which the immune system becomes over active and where immune cells can't tell they are attacking our own tissue. This is described as the immune system not knowing "self" from "non-self."

Probiotics also help promote the production of a type protective antibody known as secretory IgA. This antibody in effect tells the other antibodies, "No need to react to this; it's just food!" So as you can see, probiotics play a critical role in directing and managing immune system function – primarily by preventing us from starting to react to non-harmful substances like food and pollen.

Now, how does this affect our ability to fight colds, flu bugs and viruses? When allergies and autoimmunity are present, this upregulation of gut immunity is the side of our immune system known as TH2 immunity. It consists mostly of antibodies, which are also known as B cells. The other side

of immunity, TH1, is the side that resides more in the blood stream and other tissues of the body that consist of T helper cells, macrophages and natural killer cells. Natural killer cells attack virus infected cells and cancer cells. Macrophages engulf and break down cellular debris, microbes and also cancer cells.

One problem that can occur when TH2, gut immunity, is increased (due to lack of tight junction proteins) is that the TH1 side of immunity can become underactive. This happens because all the immune cells coming from the thymus gland start as immature T cells. They will get matured into whatever type of immune cells the body is calling for based on the various signals it sends. So when TH2 becomes very active, TH1 becomes underactive, because in effect there are only so many immune cells to go around.

Remember, TH1 immunity is the side of immunity that produces anti-viral natural killer cells. So, probiotics are absolutely CRUCIAL for keeping gut immune antibodies under control, and therefore, preserving immature T cells for natural killer cells and other macrophage activity as needed, and this is how probiotics play an important role in helping us fight viral illness like colds and viral flu.

And there is another important way probiotics influence our immune system. They help balance the types of microorganisms that make up our microbiome. One of the microorganisms that is a natural part of gut flora is candida albicans, a type of yeast. It is natural to have a small amount; however, when candida organisms overpopulate they produce toxins that can become systemic and are metabolically disruptive. The mycotoxins can also damage our macrophages and T cells by activating something called glial cells, thus compromising that TH1 virus-fighting side of immunity as well.

It is well known that probiotics help control the yeast population in the gut, and that conversely when probiotics are wiped out by medications like antibiotics and /or chemo drugs, etc., these yeast organisms overgrow and can cause a condition called thrush, or other types of yeast infections like vaginal infections, urinary tract infections or sinus infections.

The effects on regulation of yeast organisms are just one potential organism that probiotics control. Studies show they also help reduce pathogenic bacteria like clostridium difficile, staphylococcus, and

E. coli, so they have been shown to help reduce diarrhea of different types, like traveler's diarrhea and antibiotic induced diarrhea, as well as conditions related to allergies like atopic dermatitis. In addition, they are known to help prevent urinary tract infections.

Looking closely at the studies, in one study when people were given "The Friendly Trio" of probiotics strains, they had markedly reduced allergy symptoms (during peak allergy season) and reduced levels of the inflammatory cytokines that go with it, compared to people taking the placebo. These are very positive changes, and the outcomes we would expect to see. For patients it means a much improved quality of life. The 3 strains, L. gasseri KS-13, B. bifidum G9-1, and B. longum MM-2, were given at dosages of two 1.5 B CFU capsules per day, and led to improved nasal symptoms, better ability to be out and active, and markedly reduced constipation.

Other studies show direct benefits for reduced incidence and severity of colds and flu. A 2008 study of five different strains of probiotics used together looked at 250 people and found that in those taking the probiotics over a 90 day-period, the people taking the probiotics got 35% fewer colds, and there were 22% fewer total days of people having upper respiratory infections. In those who did catch colds, they had 39% shorter duration of coughing and 22% reduction in how long the cold lasted. Another 2005 study using the "The Friendly Trio" of probiotics, such as what's found in Kyo-Dophilus Probiotics, looked at people ages 18 – 67 and found similar results, but also noted that the probiotic group had significantly enhanced regulatory T cells, and enhanced T helper cells, again showing desirable changes for the TH1/TH2 balance.

So, the evidence base is strong that maintaining good probiotic gut flora will help us shift away from an allergic and autoimmune predominant immunity to stronger TH1 immunity, and therefore can also strengthen our ability to fight viral illnesses. One important caveat on probiotics is that the probiotics need to be human strain and manufacturers need to do studies showing that the bacteria in their products survive the extreme acidity in the stomach and therefore actually make it to the large intestine where the majority of beneficial flora resides. For more information and research on the benefits of probiotics, visit www.probiotics.com where I serve as a scientific adviser. ●

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