



## Depletion of Good Bacteria – The Smoking Gun?

Probiotics can be used as tools for treating many diseases including: gastroenteritis, cancers, food allergies and inflammatory bowel disease (IBD). As we learn more about these amazing organisms, the list of conditions that can be affected by a disturbance of our intestinal ecology grows. Could this be the smoking gun for so many health issues that have become increasingly more prevalent over the last 40 years? For humans, the process for colonizing

our intestines begins during the birth process and the amount the baby receives is directly related to the amount present in the mother's birth canal. Breast feeding further encourages the growth of bifidobacteria, while formula-fed infants have more complex microflora (2,4). The process to growing a full complement of good bacteria is a gradual process that is largely determined by contact with one's surroundings. Tampering with this natural process at an early age can pre-

dispose newborns and infants to health issues. Each individual must develop environmentally - acquired species of the gut flora that will be unique to them (4). The use of antibiotics, immunosuppressive therapy and irradiation may cause alterations in both the composition and effect of the flora (5). Evidence now shows insufficient good bacteria is involved in the development of many gastrointestinal diseases from inflammation to cancer (4).

## Promoting the Health of Good Bacteria

Prebiotics are dietary carbohydrates that remain undigested in the upper portion of the gastrointestinal tract and alter the bacterial composition of the gut by feeding the existing microbial population (5). Examples of prebiotics include: fructo-oligosaccharides (FOS), gluco-oligosaccharides, and inulin (5). Food sources of FOS include fruits and vegetables such as bananas, onions, chic-



ory root, garlic, asparagus, barley, wheat, jícama, tomatoes, and leeks. The Jerusalem artichoke and its relative, yacón have been found to have very high concentrations of FOS in cultured plants. Many of these same foods are also a food source of inulin, a type of soluble fibre. Major food sources of gluco-oligosaccharides are the

stems and leaves of vegetables and coverings of seeds and grains. Another method of maintaining a healthy gut flora is by consuming a variety of traditionally fermented foods. Yogurt is just the beginning. Traditional diets included more than one type of fermented food to give a complement of different strains to keep flora levels in the gut high. Kefir, specifically Russian style kefir made from kefir grains contains 32 synergistic strains of good bacteria and yeast.

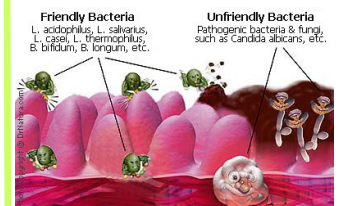
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### Issue 1

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## Is it the Food or You? Allergies, Inflammation and Probiotics

As far back as 1989 allergies and exposure to germs have been linked by something referred to as the "hygiene hypothesis". This theory states that a lowered exposure of infants and children to infections and germs could explain the rising prevalence of allergies in the children of developed countries (6). Reducing exposure to germs and infectious agents, in addition to changes in the levels and types of intestinal microbes during infancy, may be responsible for this increase in allergies we have seen over the last 20 years (6). Intestinal bacteria profoundly influence host metabolic and immunological pathways and play an active role in the health and disease state of their human host (4).

Evidence suggests that intestinal flora contributes to immune function within as well as outside of the gastrointestinal tract (4). Many probiotic effects are via immune regulation, most notably through control of pro-inflammatory and anti-inflammatory pathways (7). Probiotics have the potential to reduce inflammation in healthy adults as shown by decreases in serum CRP levels and reductions in bacteria-induced production of pro-inflammatory cytokines (e.g. CRP, IL-10, IgA, total IgE) as well as act as immunomodulators with stimulation of the TH2-type response (8,9). However, in hosts with allergies or at high risk for developing allergies, probiotics seem to elicit small increases in serum CRP to a low-grade inflammation level needed to activate the immune system

(8). In fact, increased plasma CRP levels at the age of 6 months were associated with a decreased risk of eczema at age 2 (9). The release of cytokines is induced up or down to regulate the immune responses and maintain intestinal homeostasis (3). Thus, probiotics enhance immune responses and promote the intestine's immunological barrier (7). Probiotics can alleviate intestinal inflammation, normalize gut mucosal dysfunction and down-regulate hypersensitivity reactions (7). Since the lumen of the gastrointestinal tract is the largest immunological organ in the body (10), the gut microflora play an important part in the intestinal defence barrier.

*Do you have a new study you would like to share with your fellow professionals?*

*Do you have a question about the results of a study or wish to know more about a specific topic?*

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*Laboratory study suggests that the prebiotic effect of yacon tuber, when fermented in the gut, enhanced the natural production of beta-glucans which act as non-specific immunostimulants .*

## Promoting the Health of the Good Bacteria

**CONTINUED FROM PG 1...** 1 tablespoon can contain bacteria levels up to 5 -10 billion, a wide range is typical for live sources found in food. Recommending 1/4 to 1/3 cup twice a day would provide a dose comparable to that of many professional supplements. Sauerkraut, kimchi,



**Kimchi**

and miso are all examples of fermented vegetables that can support intestinal health. Fermented beverages such as wine, kombucha and beet kvass have been used traditionally to help improve and maintain health.



*A probiotic supplement can be helpful for restoring intestinal flora. Try different ones to find the best one for the individual.*



## Is it the Food or You? Allergies, Inflammation and Probiotics

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This is shown by increased antigen transport across gut mucosa in the absence of intestinal microflora; intestinal flora allows for the persistence of systemic hypo-responsiveness to an antigen (7). With this new information, the practitioner should always consider restoring good bacteria as the first course of action for clients appearing to have issues with specific food. Can we use this information to help clients? While more data is needed, introducing clients to the concept of probiotics and fermented food and

helping them find the right mix for them is the beginning. Only time will tell if we have enough information to restore gut flora and improve symptoms and conditions. It is a numbers game and we never know what strains, how much or what the ideal unique balance is of any given client. A practitioner should be familiar with as many types of fermented foods and probiotic supplements as possible. Knowing that lack of probiotics has been linked to so many conditions means it must take the priority position in any protocol. Supplementation with probiotics for at least

three months has been shown to significantly shorten common cold episodes by almost two days and also reduces the severity of symptoms (11). In infants with a proven allergy to cow's milk, a significant improvement in the clinical course of atopic dermatitis followed a probiotic supplemented elimination diet (5). The benefits of probiotic supplementation include an increase in the number of IgA and other immunoglobulins secreting cells in the intestinal mucosa, which stimulate a local release of interferons and facilitates antigen transport to the underlying lymphoid cells, which serve to in-

## Benefits of Good Bacteria, Beyond the Intestinal Tract...

**Fatty Liver:** Interesting research on rats, showed that rats that were fed a high fat diet (71% fat) and probiotics had significantly lower levels of inflammatory indicators such as liver TNF  $\alpha$ , as well as MMP-2 and MMP-9 activities, and expression of iNOS and COX-2, all indicators for fatty liver disease compare with those not fed probiotics. Human studies

are set to start soon.

**Hypertension, Cholesterol and Diabetes** have recently been added to the list of conditions that also can benefit from probiotic therapy (39).

**Cancer:** In cancer patients, probiotics prevent or delay the development of a tumour through the binding of

lactobacilli to mutagenic compounds in the intestine which suppress the growth of bacteria that convert pro-carcinogens into carcinogens (37). Probiotics also decrease  $\beta$ -glucuronidase and other carcinogen levels (38).

**AIDS:** Probiotics have antibacterial effects and also play a role in the prevention and transmission of AIDS and STIs (3).

### What are Probiotics?

The term 'probiotics' is derived from the Greek word meaning "for life" (1). The European Concerted Action Program in conjunction with the International Life Sciences Institute recently defined probiotics as "a live microbial food ingredient that is beneficial to health" (2). There are certain criteria which qualify a specific strain of bacteria as a probiotic:

*It must be of human origin*

*It must be safe for human use (3).*

*It must be stable in acid and bile and adhere to the intestinal mucosa (2).*

*The bacteria should also be 'generally recognized as safe' (GRAS), resistant to bile and pancreatic juice, have anti-carcinogenic activity, stimulate the immune system, reduce intestinal permeability, produce lactic acid, and survive both the acidic condition of the stomach and alkaline condition of the duodenum (3).*



## What is Lactic Acid Bacteria or LAB?

Essentially it is bacteria that secretes lactic acid. In doing so, it inhibits the growth of bad bacteria and yeasts by lowering the pH of the intestinal track just enough to make it a more suitable environment for LAB. Lactic acid bacteria produces metabolites like free fatty acids, hydrogen peroxide, bacteriocins, to prevent the growth of food borne pathogens in dairy products (12). Probiotics also use enzymatic mechanisms

to modify toxin receptors and block toxin mediated microflora maintains gut pathology (13), and also defences (16). Probiotic prevent the colonization of lactic acid bacteria can pathogens by competitive signal the immune system inhibition, meaning the through innate cell surface good bacteria crowd out pattern recognition the bad bacteria and other receptors or via direct lymphoid cell activation. In some cases, this action has been shown to be sufficient to modulate local- and systemic-level in vivo immune responses. Other suggested mechanisms include lowering the intestinal pH, releasing gut-protective metabolites, and the regulation of intestinal motility and mucus production (15). When intestinal flora decreases, antigen transport increases,



*Fermented Kombucha tea originated in the East, and found its way across Russia in the 1800s, becoming widely established as an effective folk medicine in many countries. It contains lactic acid bacteria. Toda et al. demonstrated that unfermented tea at high concentrations inhibited several pathogenic and undesirable organisms, including several strains of Staphylococcus, Salmonella, and Shigella. It has yet to be shown if drinkable levels of unfermented tea have*

## Healthy vs. Unhealthy Gut Environment

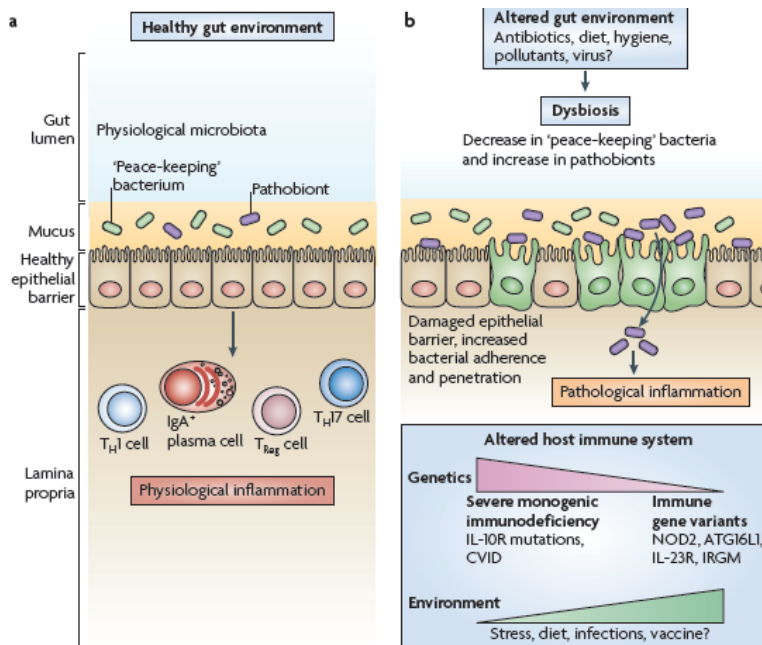


Figure b: This is a depiction of the gut lining during an infection. Once resolved the gut should return to the normal appearance as seen in Figure a.

For more explanation see page 6

Figure a: A depiction of a healthy gut lining, closed with tight junctions. Under a microscope, it appears inflamed but it is normal.



*Studies suggest that fermented cabbage may be even more beneficial to health than the raw vegetable, with increased levels of anti-cancer agents such as isothiocyanates.*



## Have you read...

...that consuming sugar suppresses the immune system for up to 2 hours? It is a commonly repeated statement and it is all based on a 1973 study from Loma Linda University (43). The study compared blood samples mixed with *Staphylococcus epidermidis* from subjects who had ingested glucose, sucrose, fructose, honey or orange juice or had not ingested anything. The bacteria were mixed with the blood after it had been drawn from the arms of the subjects. Although neutrophil levels were not decreased in any of the scenarios, the groups that ingested the simple carbohydrates displayed far less phagocytic activity than the neutrophils in the blood of the fasting group. Is this proof?

A New Zealand study from the University of Waikato (45), found the exact opposite. Rats that were fed for 52 weeks a diet that was sugar-free, 7.9 % sucrose or 10% honey (the different amount was due to water content of honey) saw higher or equal increase in the amount of neutrophil phagocytosis with sucrose and honey over the sugar-free diet. The percentage

of leukocytes that were lymphocytes differed significantly between all three treatments, the levels being highest in honey-fed rats (53% vs. 40.1% and 29.5% for sucrose and sugar-free fed rats).

Which study should we believe? One involves observing blood after it has been removed by the body, where the body can no longer signal any response after subjects had ingested 100 g of glucose or sugar, which is an excessive amount. 900 ml or 32 oz. of cola would be an example of 100 g of carbohydrate.

The other study used rats who were fed a diet with an addition of sucrose or honey, not an excess of either,, ingested for a much longer period of time, (52 weeks). If the rats were humans, this would definitely be the better constructed study and much more conclusive. Even though it was conducted on rats, the immune system and the body were still involved in how the body responded to these substances. The problem with the Loma Linda study is that the sugar in the blood stays there, something that would not happen if the blood remained in the

body and insulin facilitated its movement from the blood into the cells. We do know that during times of stress, the fight or flight process suppresses the immune system function and the adrenal glands mobilize energy by increasing glucose in the blood. Could the Loma Linda study merely have shown that excess glucose in the blood shuts down the immune system temporarily as a flight or fight response. Did it demonstrate that excessive amount of carbohydrate delivered all at once makes the body think it is in fight or flight mode?

Remember that in the study, the subject ingested honey, sucrose, glucose or orange juice – all of these would have been merely glucose in the blood at the time of extraction from the participants.

No other study has confirmed these findings. However there are many studies, one on the benefits of honey for immune health another indicates that honey increases B and T cell mitosis There is also a study (44) which

**Continues Page 6...**



*Six studies from India, comparing honey vs. placebo, superficial and partial burns dressed with honey healed significantly faster and were less likely to be colonized with bacteria than those dressed in more conventional ways.*



*Wheat contributes 69% of the inulin and 71% of the FOS in the North American diet. While this food may be the most common source, it does not have the highest concentration. Jerusalem artichoke, dandelion, and chicory have the highest concentrations.*



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## Have you read...

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demonstrates that honey has the ability to help prevent febrile neutropenia, an immune complication experienced as a result of chemotherapy in humans.

As practitioners it is important that we are as credible as we can be. Making grand statements that cannot be substantiated

does not help us. So what can we say?

Researchers at Canada's University of Alberta found that high blood glucose causes a short-lived suppression of the attack mode of the immune system followed by a slow return while studying Type 1 Diabetes (47). So the most we can say is that an abnormally high blood

sugar may affect the immune response temporarily. That is good news for those who wish to promote whole food and whole sweetener consumption as there is constant new evidence about the various phytonutrients found in whole foods that stabilize blood sugar as well as their beneficial support for immune function.

## Orange Juice vs. Supplement:

Seven healthy test subjects were given each of three drinks, two weeks apart: blood-orange juice containing 150 milligrams of vitamin C, fortified water containing 150 milligrams of vitamin C, and a sugar and water solution con-

taining no vitamin C. Blood samples were exposed to hydrogen peroxide and free radical damage to DNA was evaluated at 3 and 24 hours. Only when orange juice was consumed was any protective effect seen. Studies with a



much larger amount of vitamin C supplement have shown results. This study shows lower dose is needed when using whole vitamin complex as found in food.

**Continued from Page 4 (diagram)...**

**Pathological Inflammation:** The balance that controls intestinal homeostasis is delicate but, in most individuals, sturdy enough to withstand the challenges of qualitative or quantitative changes of dietary and microbial antigens, and physiological intestinal inflammation is preserved. If an acute infection occurs, as in salmonellosis or shigellosis, physiological inflammation transforms into pathological inflammation, which, however, is self-limited and followed by complete resolution. In contrast, in individuals destined to develop inflammatory bowel disease (IBD), the transformation of physiological into pathological inflammation never results in complete resolution and overt chronic intestinal inflammation ensues,

**Physical Inflammation:** The combined defense systems, as reflected by the accumulation of an enormous amount of immune cells all along the intestinal wall lining of the gastrointestinal tract, can be either organized structures such Peyer's patches in the small bowel and lymphoid follicles in the colon or spread out such as intraepithelial lymphocytes are. When they are examined microscopically, the intestinal mucosa appears to be "inflamed" compared to other mucosal surfaces that are devoid of immune cells or sparsely populated by them. Hence, the term "physiological" intestinal inflammation has been coined.

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