



## **Intestinal Permeability, Malabsorption and Nutritional Insufficiency – An Epidemic:**

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*In the United States of America some 60 to 70 million people are affected by overt diagnosable digestive diseases, yet tens of millions of others suffer from sub-clinical gastrointestinal health issues that alter their ability to absorb nutrients from their diet and supplements, ultimately undermining even the most proactive individual's attempt to truly take care of his or her health.<sup>1</sup>*

### **Poor gut function leads to 'dis-ease'**

Many natural health practitioners initially assess the gastrointestinal function of their patients at their first consultation due to the belief that poor gut health is at the root of many frequent presentations. The intestines, the small intestines in particular are the primary sites of nutrient absorption and thus any condition affecting the function or structure of this area may ultimately contribute to the development of a malabsorption process and consequently nutritional deficiency. As integrative nutritional practitioners, we understand that long term deficiencies in essential nutrients will have devastating impacts upon optimal health and lead to further complications in other body systems. This is why first and foremost, we must treat the cause of the 'dis-ease' as opposed to merely the symptoms alone in order to reach optimal health or homeostasis.

### **What is leaky gut?**

The small intestine has the paradoxical twofold function of being the major digestive/absorptive organ as well as a protective mucosal barrier to bacteria, endotoxins and other toxic metabolites. Numerous studies have demonstrated that an inflamed gut is more permeable to partially digested foods, endotoxins and bacterial fragments. For example lipid polysaccharides from bacterial breakdown, induce the excessive production of nitric oxide (NO) which then contributes to a reduction of ATP synthesis in the gut and enhanced peroxidation of cell membranes. Consequently, this increase in permeability ultimately results in an inflammatory cascade in various tissues and toxic insult to the liver. Depending on the individual and their ability to detoxify these hazardous metabolites, a number of symptoms may arise such as mood changes, memory loss, irritable bowel, cancer, fatigue, reduced immunity, malnutrition and arthritis to name but a few.

The epithelial cells of the mucosa are held together by tight junctions and the mucous layer of glycosaminoglycans which make up a protective intestinal barrier. The gut is also involved in providing immune support through secretory IgA which offers protection from bacterial pathogens. When the integrity of these protective mechanisms is compromised; permeability of the mucosal membrane may increase. This allows pathogens, antigens, proteins and toxins to pass through the intestinal wall and migrate to other parts of the body with detrimental effects.

There are numerous factors which may play a role in increasing the permeability of the gut such as;

- Dysbiotic pathogens disrupting the structure and function of tight junctions,
- Drugs such as some non-steroidal anti-inflammatory drugs (NSAIDs) may lead to uncoupling of mitochondrial oxidative phosphorylation thereby disrupting the integrity of the intestinal wall. Long term use will also lead to inflammation of the intestine.
- Chronic or persistent inflammation will eventually disrupt the integrity of the intestinal mucosal lining. Pro-inflammatory cytokines such as interferon gamma, TNF-alpha and interleukin 1-beta have been identified as causing NO-dependant and NO-independent changes in the expression and localization of several

tight junction proteins.<sup>2</sup>

- There is increasing evidence that damage to the intestinal wall plays a role in autoimmune diseases such as multiple sclerosis, ankylosing spondylitis, Behcet's syndrome, type 1 diabetes and rheumatoid arthritis.<sup>3-6</sup> In a response to the infiltration of particles through the intestinal wall, an immune response is initiated and the body manufactures specific antibodies to these antigens. In some people, their own tissues are mistaken to be an exogenous antigen and the tissue is attacked. Prolonged autoimmune activity against the gut wall has been identified as damaging the gut wall and hence the intestinal barrier leading to increased permeability.
- Increased, prolonged exposure to stress may lead to brain-gut interactions which may affect mucosal protective factors. High levels of norepinephrine are associated with stress and have also been associated with significantly low IgA concentrations.<sup>7</sup>
- Gastrointestinal surgery may also lead to increased intestinal permeability. One 2004 study demonstrated that urinary lactulose/mannitol ratio (pathology test to assess gut permeability) significantly increases in patients post operatively. It was found that a decreased lactulose/mannitol ratio was observed in the group supplemented with glutamine for seven days prior to surgery.<sup>8</sup> Glutamine is a semi-essential amino acid and is important for the maintenance of gastrointestinal mucosal integrity.

### **Clinical conditions associated with increased intestinal permeability**

A large amount of research has found a close link with many other commonly presented conditions and the degree of permeability of the intestinal lining and that by repairing this tissue, improvements in the presenting condition have been observed. Some of these conditions are listed below.

- Inflammatory bowel disease
- Malnutrition / malabsorption
- Autism
- Inflammatory joint disease
- Food allergy
- Intestinal infection and dysbiosis
- Some autoimmune disorders
- Chemotherapy
- Post gastrointestinal surgery
- NSAID enteropathy
- Dermatological disorders such as eczema, psoriasis and acne etc
- Mood disorders

### **Fixing the holes in the boat**

Often greater than expected improvements and more expedient results will be noted if the health of the digestive tract and permeability of the gut are addressed as part of the overall treatment program rather than just treating the various diseases or symptoms that result from the injured gut. Specific supplements, taken together, can deliver critical building blocks for daily repair of the GI tract and also help reduce inflammation, heal the mucosal lining and soothe the irritation that arises from innate colonic function.

#### **Glutamine**

Glutamine is a precursor for nucleotide synthesis, serves as a substrate for hepatic gluconeogenesis, and is an important nutrient for the renal handling of ammonia. It is also a vital fuel source for cells that rapidly turn over, including GI epithelia, lymphocytes, fibroblasts and reticulocytes.<sup>9</sup> As such it is the most abundant free amino acid in the body and the GIT has the largest demand.<sup>10, 11</sup> Though it is classified as a non-essential amino acid, glutamine is absolutely essential for maintaining intestinal structure. Insufficient glutamine can present with atrophy, ulceration, and necrosis of the colon lining.<sup>12</sup>

#### **DGL**

Most of the research on deglycyrrhizinated licorice (DGL) has been focused on upper gut health, including ulcer healing. The health of the lower intestinal tract is directly dependent upon the proper functioning of the entire gastrointestinal system. DGL utility is not limited to upper GI health, in the clinical setting it has demonstrated great utility in lessening intestinal irritation and related symptoms.

#### **N-Acetyl-Glucosamine**

N-acetyl glucosamine is the acetylated derivative of the amino sugar glucosamine. In inflammatory bowel disease (IBD), N-acetylation of glucosamine is relatively deficient, possibly reducing the synthesis of the gastric and intestinal mucosa's protective glycoprotein cover.<sup>13</sup>

## Slippery Elm

The inner bark of slippery elm contains mucilage constituents that are demulcent and emollient. When used internally, slippery elm preparations trigger gentle stimulation of nerve endings in the GI tract, leading to mucous secretion which coats and protects the delicate lining of the intestines from ulcers, excess acidity, ingested irritants and toxins.<sup>14, 15</sup>

## Probiotics

Probiotics represent the quintessential functional food and have been used for centuries for their health-promoting effects. Probiotics are defined as live micro-organisms in fermented foods or supplements that promote good health through establishing an improved balance in intestinal microflora.<sup>16</sup> The principal purported health-promoting effect of probiotics is their enhancement of mucosal immune defenses. In addition, general mechanisms for probiotics have been ascribed to their protective effects against pathologic microbial colonization and translocation. These mechanisms include competition for receptor sites on the intestinal surface, production of antibiotic substances, enhancement of host immune defenses (adjuvant effect, increased polymeric IgA production and cytokine stimulus), competition with pathogens for intraluminal nutrients and strengthening intestinal tight junctions.<sup>9</sup>

## Summary

Maintaining healthy gut function is foundational to all other health pursuits. Even those fortunate enough not to suffer from dysfunction of the GIT should take steps to protect healthy functioning of this important system as it is critical for sustained healthy ageing. Clinical practice and testing clearly demonstrate it is the rare individual who has a totally pristine gastrointestinal tract. Optimal absorption of nutrients from foods and supplements consumed depend upon optimal gastrointestinal health. Use of specific nutrients to protect, soothe and support the colon is the first step toward health optimization for the entire body.

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## References

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