PLEASE NOTE
PSNLifestyle Digest-E Plus focusses predominantly on supporting optimal digestion and bio-availability of nutrients. It does not eliminate food allergies. Digest-E PLUS rather focusses on alleviating symptoms caused by food sensitivities by improving digestion and absorption, maintaining a healthy gastrointestinal (GIT) lining and by promoting balanced immune and anti-inflammatory protection. Individuals with food allergies, celiac disease and other serious inflammatory digestive disorders should at all cost avoid consumption of the diagnosed food triggers as advised by your physician. Using digestive enzymes support your digestion, but on its own might not be sufficient to protect you against chronic systemic inflammation and severe disease pathologies associated with your condition. Please only use on consent from your physician if you are currently suffering from a chronic degenerative digestive illness.

DIGESTIVE HEALTH
Digestive health is at the mercy of multiple physiological factors including a healthy and active, allergy free, drug- and toxin-free diet and lifestyle, absent pathological intestinal infections and illnesses, and emotional wellbeing. Healthy digestive function is maintained by an intricate synergy of optimal levels of nutrients, digestive enzymes, probiotics, hormones, neuromuscular function, lymphoid immune protection and a healthy gastro-intestinal lining.

The GIT lining is a complex multi-layer system. It is a very efficient barrier and first line defence against various pathological conditions. It maintains water and electrolyte balance and digests and absorbs essential nutrients to sustain life. Unfortunately, our lifestyles expose us to agents and conditions that promote gastrointestinal irritation and inflammation. Factors that damage the intestinal lining and increase intestinal permeability include:

- Infectious agents (parasites, yeasts, bacteria, viruses)
- Toxic molecules (environmental chemicals, pesticides, herbicides, mycotoxins)
- Medications (antibiotics, non-steroidal anti-inflammatories, corticosteroids, oral contraceptives)
- Unhealthy diets (food sensitivities and allergies, fast foods, sugar rich foods and drinks, excessive alcohol consumption, caffeine, peroxidised fats, preservatives, additives)
- Smoking
- Environmental allergens
- Severe emotional or physical stress
- Obesity and metabolic syndrome
- Enzyme deficiencies and alterations in gut flora

These agents or conditions directly impact the digestive system and reduce immunoglobulin IgA immune protection, compromise the integrity of digestive lining, reduce nutrient absorption, disrupt the absorptive area between the cells of the intestinal lining called tight junctions and increase intestinal permeability. Consequently, unregulated passage of pathological agents is allowed from the digestive tract into the blood stream. The immune system perceives these agents as a threat and subsequently an inflammatory immune reaction is launched. Pathological conditions like inflammatory bowel diseases (celiac disease, Crohn's disease, ulcerative colitis, diverticulosis and other pathologies) as well as functional bowel syndromes like irritable bowel syndrome (IBS) are associated with increased permeability of the GIT lining. Long term increased intestinal inflammation and increased permeability can lead to chronic systemic disease conditions like auto-immunity, allergies, asthma, eczema, autism, chronic fatigue, fibromyalgia, poor mental function,
psychological imbalances like depression and anxiety, headaches, infertility, cancer and many more. (1)

**IRRITABLE BOWEL SYNDROME (IBS)**

IBS is characterised by unexplainable gastrointestinal symptoms like cramps, pain, bloating and stool inconsistency. Research proposes various mechanisms which may induce IBS like serotonin dysregulation, bacterial overgrowth, central nervous system dysregulation like anxiety and depression, and genetic inheritance of intestinal hypersensitivity (2).

**FOOD SENSITIVES AND ALLERGIES**

For the purpose of providing more insight into the difference between food intolerance and food allergy, we will focus primarily on the two major food groups triggers: dairy and gluten/wheat.

The GIT is protected by a sophisticated immune system, which with digestive enzymes, helps to protect against allergic reactions to food proteins. However, following disturbances in the homeostasis of the bietwork of enzymes and probiotics or inflammatory insult on the digestive lining, generally harmless food proteins can induce an allergic or other immune mediated reactions.

**Food allergy definition:** A food allergy is a hyper-responsive immune mediated reaction to specific foods with the subsequent release of histamine and other inflammatory agents. This leads to inflammation and allergic symptoms like urticaria, swelling, GIT symptoms like nausea, vomiting, pain, diarrhoea, and respiratory symptoms like wheezing, asthma and runny nose. In severe cases, life threatening anaphylaxis can occur. Symptoms may manifest within a few minutes or hours and persist for two to three days.

**Food intolerance/sensitivity definition:** A food intolerance or sensitivity is not easily diagnosed. It is not an immune mediated reaction and is less severe than food allergies. It manifests in symptoms like poor concentration, depression, anxiety, diarrhoea, bloating, constipation, IBS, skin problems, headaches and joint pain. Symptoms are delayed and may persist for hours to several days.

**WHEAT AND GLUTEN**

Non celiac gluten sensitivity or intolerance (NCGS) is a non-allergenic, non-autoimmune reaction to gluten. It is characterised by GIT- and systemic symptoms related to ingestion of foods containing gluten or other components of wheat, rye, barley and oats. When exposed to gluten, NCGS symptoms most frequently overlap with IBS symptoms including bloating, diarrhoea or constipation, abdominal pain, headache, poor concentration, depression, tiredness, joint and muscle pain, eczema and anaemia. Gluten sensitivity should not however be confused with celiac disease or wheat allergy which are serious immune mediated disorders with different pathophysiologies. NCGS causes mild inflammation of the intestinal lining whereas wheat allergy and celiac disease cause marked inflammation and degeneration of the intestinal lining and subsequently malabsorption. NCGS is diagnosed by eliminating the probability of celiac disease or wheat allergy by appropriate blood- and biopsy tests. If these tests are negative and gluten or wheat sensitivity persists following exposure, NCGS or related IBS is more likely.

**Celiac disease** is a chronic inflammatory, autoimmune-mediated condition triggered by exposure to gluten, the main structural component of wheat, and its related peptides. It occurs in genetically predisposed individuals with antibodies against tissue transglutaminase 2, gliadin and endomysium. Its symptoms manifest as chronic gastrointestinal symptoms, diarrhoea, malnutrition, weight loss, neurological disorders and organ dysfunctions.

**Wheat allergy** is an adverse IgE immune mediated allergic reaction to wheat proteins. Symptoms following ingestion of wheat are typical allergic reactions including urticaria, swelling, bronchial obstruction, nausea, abdominal pain and in most severe cases, anaphylaxis. A wheat or gluten-free diet is the only accepted effective treatment of celiac disease and wheat allergy. (3)

**DAIRY**

Lactose intolerance is related to lactase deficiency and lactose malabsorption. Lactase is the enzyme responsible for digesting milk sugar namely lactose. Lactose intolerance can be classified in various categories. It can have a very rare congenital origin where children are born with lactase deficiency. Decreased lactase synthesis, which may be referred to as primary
lactose intolerance, can occur in individuals who are weaning from milk. Decreased lactase activity, which is referred to as secondary lactose intolerance, can be caused by intestinal infections, inflammatory digestive disease, abdominal surgery and other conditions. Symptoms of lactose intolerance, induced by dairy or lactose, include abdominal pain, bloating, flatulence, diarrhoea and borborygmic (gurgling abdominal sounds). These symptoms can also be accompanied by less frequent incidences of nausea, constipation, headaches, fatigue, poor concentration, muscle and joint pain and mouth ulcers. Lactose intolerance commonly occurs in association with IBS and demonstrates increased immune activity at the digestive lining as well as inflammatory insult. Its severity is influenced by the dose of lactose, concentration of lactase enzyme, balance of intestinal probiotics, motility of the digestive tract, small intestinal bacterial overgrowth (SIBO), sensitivity of the digestive system and fermentation caused by improper digestion. Lactose intolerance can effectively be treated by avoiding dairy and dairy containing foods or by supplementing with lactase enzymes like Tolerase™L. (4)

**Dairy allergy** involves an allergic IgE-mediated immune response to milk proteins from casein and whey constituents. The prevalence of dairy allergy is reported to occur in 0.6-2.5% of pre-schoolers, 0.3% of older children and less than 0.5% adults. (5) Dairy allergy can be acquired by genetic allergic predisposition, early introduction to cow’s milk and other factors associated with the intestinal ecology (6). The allergic immune response to cow’s milk involves immediate and IgE-mediated mechanisms, appearing 1-2 hours after ingestion. The symptoms include urticaria, swelling, itching, rashes, flushing, wheezing, coughing, asthma, swelling of the larynx, abdominal pain, nausea, vomiting, diarrhea and oral itching.

**THE EFFECT OF INTENSIVE PHYSICAL ACTIVITY/STRESS ON DIGESTION**

During physical activity, blood flow is mostly redirected from the digestive tract to the active muscles and lungs, affecting gastrointestinal movement, absorption and secretion. Regular mild to moderate intensity exercise may benefit digestive health and decrease the risk of colon cancer, diverticular disease, cholelithiasis and constipation. Rigorous endurance training however, is commonly associated with gastrointestinal discomfort comprising symptoms of nausea, heartburn, diarrhea, reflux, bloating, cramping, reduced absorption, increased intestinal transit duration and even bleeding. Gastrointestinal stress induced by chronic vigorous exercise damages the GIT lining, increasing its permeability, weakens immune protection and may compromise physical performance and recovery (7).

**DIGESTIVE ENZYMES**

Digestive enzymes are proteins which facilitate the breakdown of foods like protein, carbohydrates and fats. They are critical for efficient absorption and assimilation of nutrients to maintain optimum physiological performance. Digestive enzymes are produced in the saliva glands of the mouth, in the stomach, the pancreas, small intestines and are abundant in raw foods. Unfortunately, the Western diet can generally be characterised by excessive consumption of overcooked, processed, nutrient- and enzyme deficient foods. Enzyme deficient foods like bread, pasta, pizza, burgers and processed meats replace nutritious, fresh and organic enzyme-rich fruits, vegetables, nuts and seeds. Consequently, we are becoming more devoid of essential enzymes. The endocrine system, including the pancreas, may be subjected to great stress trying to counteract digestive insufficiencies. This may subsequently drain our bodies from vital amino acids, vitamins and minerals to maintain digestive homeostasis. Chronic suboptimal digestive enzyme levels may result in increased stomach acid secretion and subsequently acid reflux, suboptimal digestion which increases fermentation and therefore bloating, wind, pain and inconsistent stool formation, damage to the GIT lining, dysfunctional absorption and nutrient deficiencies. Possible consequences include chronic physical and mental fatigue, emotional fluctuations, systemic inflammation, allergies, poor post-training recovery, weakened immunity and impaired performance.

Supplementation with digestive enzymes may provide great benefit as supportive treatment for disorders related to digestive dysfunction. They are currently used in clinical practice for the management of various digestive diseases. For example, proteolytic enzymes may alleviate symptoms associated with food allergies and sensitivities. It is proposed that allergies are triggered by partially digested proteins. Proteolytic enzymes have the ability to break
down these undigested protein particles into sizes too small to cause allergic reactions (8,9). Supplemental digestive enzymes can improve malabsorption of nutrients associated with inflammatory bowel diseases like Crohn’s disease (10). They also protect against pathogenic invasion of microbes like Candida and prevent its penetration into the intestinal lining (11,12).

Digestive enzymes may also benefit mental and physical performance by improving digestive function, optimising nutrient availability, enhancing immune function, increasing energy and providing anti-inflammatory support to enhance healing of exercise induced soft tissue trauma. Digestive enzymes are clinically applied to reduce pain and swelling associated with muscle or joint injuries (16,17), promoting faster recovery and optimising muscle morphology for sustained quality training and performance. A healthy and balanced diet, rich in organic fresh fruit and vegetables, high biologically available protein, high quality carbohydrates and anti-inflammatory fats, is vital to athletes. And it is imperative for athletes to ensure that these nutrients are maximally absorbed.

**PSNLifestyle Digest-E PLUS** provides significant enzymatic digestive support. It focusses on improving digestion and absorption of nutrients to support optimal performance, relieving symptoms of indigestion, and providing considerable protection against pathogenic invasion and inflammation of the gastrointestinal (GIT) lining. Subsequently it may reduce the risk of pathological development of inflammatory diseases associated with indigestion, nutrient deficiency and increased intestinal permeability.

**ENZYME MATRIX**

**PSNLifestyle Digest-E PLUS** provides six powerful, non-animal derived, digestive enzymes for advanced assimilation of protein, dairy, carbohydrates and fibre.

**Aminogen™** is a patented, plant based, proteolytic (protein digesting) enzyme, which increases the absorption rate of amino acids by 220-350%. Aminogen™ has scientifically been proven to dramatically raise levels of free amino acids by 100%, branched-chain amino acids (BCAAs) by 250%, and nitrogen retention by 32% more than whey without Aminogen™. The result is a pure protein with maximum biological value (13). Aminogen™ therefore significantly optimises the availability of essential amino acids as cellular substrates for progressive muscle hypertrophy, enhanced post-training recovery, proficient nervous system function and strengthened immunity.

**Carbogen™** is a blend of three enzyme groups comprising amylase, cellulase and hemicellulase. Amylase is responsible for the breakdown of starches and complex carbohydrates. Cellulase and hemicellulase break down plant cell walls or fiber which is not easily digestible. Undigested plant material is fermented in the digestive tract and is frequently responsible for symptoms like bloating, wind and abdominal discomfort following ingestion. Supplementation with Carbogen™ also promotes constant blood glucose levels, balanced insulin release, improved muscle glycogen storage and implementation of glucose for immediate energy instead of being stored as fat. According to research, Carbogen™ therefore demonstrates beneficial support during physical workouts for sustained energy release, improved endurance and recovery (14).

**Tolerase™ L** is a patented lactase enzyme, which is responsible for digestion of lactose milk sugar. It is particularly beneficial as a digestive aid for those with lactose intolerance which may hinder physical and emotional wellbeing. As mentioned before, lactose intolerance is characterised by symptoms like diarrhoea, abdominal cramps, flatulence and nausea which are associated with dairy consumption (15).

**Bromelain** is a proteolytic enzyme, and powerful phytomedical extract, obtained from the pineapple plant. It is a multi-functional enzyme, which does not only improve protein digestion, but is also easily absorbed into the blood stream to function systemically. Bromelain has significant anti-inflammatory, anti-ulcer, antibiotic, immune-modulating, antitumor and mucolytic (break down mucous) properties. It demonstrates clinical efficiency in various conditions like indigestion, pancreatic insufficiency, arthritis, athletic injuries, respiratory tract infections like pneumonia, bronchitis and sinusitis, water retention, menstrual cycle pain, cardiovascular disease and cancer. (16,17)
DIGESTIVE SUPPORT COMPLEX
PSNLifestyle Digest-E PLUS is fortified with revolutionary Bio-Curcumin® and Ginger root extract to relieve symptoms of indigestion and provide protection against pathogenic invasion and inflammation of the gastro-intestinal lining.

Ginger (Zingiber officinale): Ginger has been used for thousands of years for its exceptional value as a medicinal plant. Owing to its compelling anti-oxidant, anti-inflammatory, immune-stimulating and anti-cancer properties, ginger has remarkable medical potential in cancer protection, diabetes, cardiovascular diseases (hypertension and atherosclerosis) and GIT health (nausea, indigestion, constipation, ulcers).

It further possesses great anti-microbial properties. This renders it effective in treating various pathogenic infections, especially upper respiratory tract infections (URTIs) like bronchitis as well as in gastrointestinal infections induced by microbial agents like Helicobacter pylori bacteria.

Ginger’s antioxidant capacity is superior to most other natural antioxidants and is only exceeded by pomegranate and certain berries. It suppresses lipid peroxidation, protects the circulatory/vascular system, and increases antioxidant enzymes and glutathione. Glutathione is a powerful anti-oxidant and anti-inflammatory which is involved in detoxification pathways and offers integral tissue protection against environmental toxins like pollution, pesticides, industrial- and household chemicals, metabolic waste from exercise and ultraviolet light exposure. Research validates ginger’s antioxidant potential in protecting against degenerative neural diseases like Parkinson’s disease, kidney and liver disease.

Bio-Curcumin/BCM-95® extract (Turmeric extract: Curcuma longa) has a seven times greater bioavailability than ordinary 95% curcumin extract and 400mg is equivalent to 2772mg of the standard 95% curcumin extract. Curcumin is the main bio-active constituent of turmeric. It is a remarkable plant extract with superior immune modulatory, anti-inflammatory, antioxidant, anticancer, liver protective, hypoglycemic, anti-arthritis and antimicrobial actions. Turmeric has been used for thousands of years to protect the health of the skin, cardiovascular system, liver, kidney and digestive system, to treat respiratory diseases, viral, fungal and bacterial infections, as well as inflammatory conditions.
like rheumatoid arthritis. Turmeric has neuroprotective properties and demonstrates clinical benefit in Alzheimer’s disease, Parkinson’s disease, schizophrenia, drug addition, stroke, aluminum toxicity, epilepsy and diabetic neuropathy (38).

Curcumin’s medicinal qualities greatly benefits digestive health. It acts as a carminative and demonstrates clinical competence in the treatment of dyspepsia or indigestion (30). Curcumin functions as a digestive stimulant by promoting secretion of pancreatic lipase, amylase and chymotrypsin enzymes. It stimulates bile flow and bile acid secretion, improving the digestion of fats and metabolism of cholesterol. Turmeric also protects against pathogenic infections and effectively inhibits growth of histamine-producing bacteria, foodborne pathogens and ulcer-inducing H. pylori bacteria (31). Curcumin counteracts inflammation within the digestive tract by inhibiting production of inflammatory agents. It demonstrates significant effectiveness in inhibiting and healing inflammatory damage to the GIT lining related to inflammatory bowel disease (IBD) like ulcerative colitis and Crohn’s disease, irritable bowel syndrome (IBS) (32), stomach ulcers and intestinal ulcers (33). Another interesting mechanism by which Curcumin alleviates IBS symptoms, is by inhibiting transient receptor potential vanilloid type 1 (TRPV1). TRPV1 is a receptor which is distributed throughout the gastrointestinal tract and the gastrointestinal nervous system. It plays a critical role in somatic and visceral neural detection and transmission of pain impulses. It is implicated by research to play a role in IBS symptoms. Increased stimulation of TRPV1 signaling by inflammatory mediators may increase visceral hypersensitivity in IBS and also esophageal hypersensitivity which is prevalent in more than 50% of patients with non-erosive gastro-esophageal reflux disease. Individuals with a hypersensitive esophagus experiences reflux and functional heartburn to acid and non-acid triggers. These individuals respond better to treatment that act on TRPV1 like Curcumin, which has been found to inhibit these receptors and modulate their response to stimulants that might trigger hypersensitivity (34). It is clinically proven that Curcumin significantly alleviates the frequency of IBS attacks and its symptoms like abdominal pain and discomfort (35). Research also demonstrates that turmeric is effective in treating adenomatous polyposis (37).

As an immune modulatory plant, turmeric can also substantially ameliorate symptoms associated with food allergies by balancing the Th-1(inflammatory)/Th-2 (autoimmune/allergy) immune response. It enhances the Th-1 cytokine response while reducing Th-2 cytokines. Hence, it has great potential for the treatment of Th-2 immune mediated allergic disorders like allergic skin rashes, asthma and food allergies (36).

Curcumin is also well researched for its role in liver and gallbladder function and protection. It protects against fatty liver disease by improving fat metabolism, and therefore reduce deposition of triacylglycerol fats within the liver. Research also demonstrates that curcumin enhances antioxidant protection against fat peroxidation on the liver membrane, reduces formation of inflammatory mediators, suppresses toxin induced liver damage (46) and protects against formation of fibroids and subsequently liver fibrosis. It also increases bile production and secretion, reducing the risk of gallstone formation (44,45).

Curcumin exhibits multiple cancer protective actions like improving digestion, detoxifying cancer causing agents, inactivating free radicals and ROS, downregulating inflammatory responses and secretion of inflammatory agents like cytokines, COX2, INOS, lipoxygenase and NFKB (responsible for regulation of inflammation, cancer cell proliferation, transformation and tumour formation), inhibiting growth and spreading of cancer cells and destroying these cells (32). Curcumin clinically demonstrates marked anticancer activity against cancers like skin (39), breast (40), oral (42), colon (41) and stomach cancer (42,43).

Ginger and Turmeric/Curcumin are therefore well-researched plant extracts with multiple pharmacological attributes which make them very promising therapeutic options for alleviation of multiple gastrointestinal disorders.

**REFERENCES**

1. Rapin JR. and Wiernsperger N. Possible links between intestinal permeability and food processing: a potential therapeutic niche for


39. Azuine MA, Bhide SV. Protective effect of turmeric against stomach and skin tumors induced by chemical
