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**Chapter 6
LEAKY GUT SYNDROME: THE SYSTEMIC CONSEQUENCES OF FAULTY
DIGESTION**

"The gut is a major, potential portal of entry into the body for foreign antigens. Only its intact mucosal barrier protects the body from foreign antigen entry and systemic exposure."

--Russell Jaffe, M. D., ELISA/ACT Clinical Update 2, No. 1 (January 1992).

Leaky gut syndrome is really a nickname for the more formal term increased intestinal permeability, which underlies an enormous variety of illnesses and symptoms. It's not a disease or an illness itself. The list of health conditions associated with increased intestinal permeability grows each year as we increase our knowledge of the synergy between digestion and the immune system. If you do a Pubmed search on "intestinal permeability," you'll find it linked with nearly 5000 research articles.

A healthy intestinal lining allows only properly digested fats, proteins, and starches to pass through so they can be assimilated. At the same time it also provides a barrier to keep out bacterial products, foreign substances, and large undigested molecules. This is called the "barrier function" of the gastrointestinal mucosal lining. This surface is often called the "brush border," because under a microscope its villi and microvilli look like bristles on a brush.

The intestinal lining lets substances move across this barrier in several ways. The process of "diffusion" is a simple one: it equalizes the concentrations inside and outside the cells. Diffusion is the way ions of chloride, magnesium, potassium, sodium, and free fatty acids pass into the cells. Most nutrients are moved through the brush borders via a process called "active transport." Carrier molecules, all of low molecular weight, transport nutrients like molecular taxis. Amino acids, fatty acids, glucose, minerals, and vitamins cross cell membranes through active transport.

In-between cells are junctions called "desmosomes." Normally, desmosomes form tight junctions and do not permit large molecules to pass through. But when the area is irritated and inflamed, these junctions loosen up, allowing larger molecules to pass through. The substances that pass through the intracellular junctions are seen by our immune system as foreign, stimulating an antibody reaction. When the intestinal lining is damaged, larger substances of particle size are allowed to pass directly, again triggering an antibody reaction.

When the intestinal lining is damaged even more, substances larger than particle size--disease-causing bacteria, potentially toxic molecules, and

undigested food particles--are allowed to pass directly through the weakened cell membranes. They go directly into the bloodstream, activating antibodies and alarm substances called cytokines. The cytokines alert our lymphocytes (white blood cells) to battle the particles. Oxidants are produced in the battle, causing irritation and inflammation far from the digestive system. That is the basis for a condition called increased intestinal permeability or leaky gut syndrome.

Intestinal mucus normally blocks bacteria from moving to other parts of the body. But when the cells are leaking, bacteria passes into the bloodstream and throughout the body. When intestinal bacteria colonize in other parts of the body, we call it bacterial translocation, and it is often found in people with leaky gut syndrome. For example, *Blastocystis hominis*, a bacteria that causes GI problems, has been found in the synovial fluid in the knee of an arthritis patient. Surgery or tube feeding in hospitals can also cause bacterial translocation.

Here's how leaky gut syndrome works. Imagine that your cells need a kernel of corn. They are screaming out, "Hey, send me a kernel of corn." The blood stream replies, "I have a can of corn, but I don't have a can opener." So the can goes around and around while the cells starve for corn. Finally, our immune system reacts by making antibodies against the can of corn, treating the corn as if it were a foreign invader. Your immune system has mobilized to finish the job of incomplete digestion, but this puts unneeded stress on it. The next time you eat corn, your body already has antibodies to react against it, which triggers the immune system, and so on. As time goes on, people with leaky gut syndrome tend to become more and more sensitive to a wider variety of foods and environmental contaminants.

Depending on our own susceptibilities, we may develop a wide variety of signs, symptoms, and health problems. Leaky gut syndrome is associated with the following medical problems: allergies, celiac disease, Crohn's disease, HIV, and malabsorption syndromes. It is also linked to autoimmune diseases like AIDS, ankylosing spondylitis, asthma, atopy, bronchitis, eczema, food and environmental sensitivities, other allergic disorders, psoriasis, Reiter's syndrome, rheumatoid arthritis, Sjogren's syndrome, and skin irritations.

Common Clinical Conditions Associated with Intestinal Permeability	
Acne	Food allergies and food sensitivities
Aging	Giardia
Ankylosing spondylitis	Hives
Autism	HIV-positive
Behcet's syndrome	Inflammatory joint disease/arthritis
Burns (severe)	Intestinal infections
Celiac disease	Irritable bowel syndrome
Celiac disease	Liver dysfunction
Chemotherapy	Malnutrition
Childhood hyperactivity	Malnutrition
Chronic fatigue syndrome	Multiple chemical sensitivities
Cirrhosis	NSAIDs enteropathy
Alcoholism	Pancreatic insufficiency
Crohn's disease	Psoriasis
Cystic fibrosis	Schizophrenia
Eczema	Thermal injury
Endotoxemia	Trauma
Environmental illness	Ulcerative colitis

The conditions in the following chart can arise from a variety of causes, but leaky gut syndrome may underlie more classic diagnoses. If you have any of the common symptoms or disorders associated with leaky gut syndrome, ask your physician to order an intestinal permeability test to see if it is causing your problem.

In addition to clinical conditions, people with leaky gut syndrome display a wide variety of symptoms.

Symptoms Associated with Leaky Gut Syndrome	
Abdominal pain	Indigestion
Diarrhea	Bloating
Asthma	Mood swings
Bed wetting	Aggressive behavior
Chronic joint pain	Nervousness
Recurrent bladder infections	Anxiety
Chronic muscle pain	Poor exercise tolerance
Fevers of unknown origin	Primary biliary cirrhosis
Confusion	Poor immunity
Poor memory	Fatigue and malaise
Fuzzy thinking	Recurrent vaginal infections
Shortness of breath	Toxic feelings
Gas	Skin rashes
Constipation	

Leaky gut syndrome puts an extra burden on the liver. All foods pass directly from the bloodstream through the liver for filtration. The liver "humanizes"

the food and either lets it pass or changes it, breaking down or storing all toxic or foreign substances. Water-soluble toxins are easily excreted, but the breakdown of fat-soluble toxins is a two-stage process that requires more energy. When the liver is bombarded by inflammatory irritants from incomplete digestion, it has less energy to neutralize chemical substances. When overwhelmed, it stores these toxins in fat cells, much the same way that we put boxes in the garage or basement to deal with at a later date. If the liver has time later, it can deal with the stored toxins, but most commonly it is busy dealing with what is newly coming in and never catches up. These toxins provide a continued source of inflammation to the body. Increased intestinal permeability has been found to be a factor in liver diseases, such as cirrhosis.

What Causes Leaky Gut Syndrome?

There is no single cause of leaky gut syndrome, but some of the most common are chronic stress, dysbiosis, environmental contaminants, gastrointestinal disease, immune overload, overuse of alcoholic beverages, poor food choices, presence of pathogenic bacteria, parasites and yeasts, and prolonged use of NSAIDs. Let's discuss some of these one at a time.

Chronic Stress

Prolonged stress changes the immune system's ability to respond quickly and affects our ability to heal. It's like the story of "The Little Boy Who Cried Wolf." If we keep hollering that there's a wolf every time we're late for an appointment or we need to finish a project by a deadline, our bodies can't tell the difference between this type of stress and real stress--like meeting a vicious dog in the woods or a death in the family. Our body reacts to these stressors by producing less secretory IgA (one of the first lines of immune defense) and less DHEA (an anti-aging, anti-stress adrenal hormone) and by slowing down digestion and peristalsis, reducing blood flow to digestive organs, and producing toxic metabolites. Meditation, guided imagery, relaxation, and a good sense of humor can help us deal with daily stresses. We can learn to let small problems and traumas wash over us, not taking them too seriously.

Dysbiosis

The presence of dysbiosis contributes to leaky gut syndrome. Candida push their way into the lining of the intestinal wall and break down the brush borders. They must be evaluated when leaky gut syndrome is suspected. Blastocystis hominis, Giardia, Helicobacter, Salmonella, Shigella, Yersinia enterocolitica, amoebas, and other parasites also irritate the intestinal lining and cause gastrointestinal symptoms. People who have or have had digestive illness or liver problems have an increased tendency to leaky gut syndrome. Which came first: the chicken or the egg?

Environmental Contaminants

Daily exposure to hundreds of household and environmental chemicals puts stress on our immune defenses and the body's ability to repair. This leads to chronic delay of necessary routine repairs. Our immune systems can only pay attention to so many places at one time. Parts of the body far away from the digestive system are affected. Connective tissue begins to break down, and we lose trace minerals like calcium, potassium, and magnesium. Environmental chemicals deplete our reserves of buffering minerals, causing acidosis in the cells and tissue and cell swelling. This is known as leaky cells--like having major internal plumbing problems!

Overconsumption of Alcoholic Beverages

Alcoholic drinks contain few nutrients but take many nutrients to metabolize. The most noteworthy of these are the B-complex vitamins. In fact, alcoholic beverages contain substances that are toxic to our cells. When alcohol is metabolized in the liver, the toxins are either broken down or stored by the body. Alcohol abuse puts a strain on the liver which affects digestive competency and also damages the intestinal tract.

Poor Food Choices

Poor food choices contribute to an imbalance of probiotics and pH. An intestinal tract that is too alkaline promotes dysbiosis. Low-fiber diets cause an increase in transit time, allowing toxic by-products of digestion to concentrate and irritate the gut mucosa. Diets of highly processed foods injure our intestinal lining. Processed foods invariably are low in nutrients and fiber, with high levels of food additives, restructured fats, and sugar. These foods promote inflammation of the GI tract. In fact, even foods we normally think of as healthful can be irritating to the gut lining. Milk, an American staple, can be highly irritating to people with lactose intolerance.

Use of Medication

As was discussed more fully in chapter 5, NSAIDs damage brush borders, allowing microbes, partially digested food particles, and toxins to enter the bloodstream. Birth control pills and steroid drugs also create conditions that help feed fungi, which damage the lining. Chemotherapy drugs and radiation therapy can also significantly disrupt GI balance.

Restoring Gut Integrity

If you believe you suffer from leaky gut, it's best to work with a health professional who can help you determine the underlying factors. Fortunately, there are many ways to heal your gut. Some involve changing your habits, like chewing your food more completely; others involve taking specific supplements that will help your body repair itself. If you have food allergies or sensitivities, deal with them. Find out if you have dysbiosis or Candida and get appropriate treatment. Replenish your bacterial flora with probiotics and prebiotics such as FOS. You may need to support your digestive function with enzymes, bitters, or hydrochloric acid tablets.

Once the intestinal tract has been damaged, free radicals are often produced in quantities too large for the body to process. This causes inflammation and irritation, which exacerbate a leaky gut. Increasing use of antioxidant nutrients such as vitamin E, selenium, N-acetyl cysteine, superoxide dismutase, zinc, manganese, copper, Coenzyme Q10, lipoic acid, and vitamin C can help quench the free radical fire.

Supportive nutrients can help repair the mucosal lining directly. Glutamine is the preferred food of the cells of the small intestine. Dosages can range from 1 gram to 30 grams daily, depending on your needs. Zinc may be an essential nutrient for gut repair. Other nutrients and supplements that are helpful include: gamma-oryzanol, Seacure, vitamin A, vitamin C, panthothenic acid (vitamin B5), deglycyrrhized licorice, folic acid, concentrated whey immunoglobulin concentrates, schizandra, and aloe vera.

Food and Environmental Sensitivities

Food and environmental sensitivities are usually the result of leaky gut syndrome. The prevalence of these sensitivities is more widely recognized today than in the past; 24 percent of American adults claim they have food and environmental sensitivities. These sensitivities, also called delayed hypersensitivity reactions, differ from true food allergies, also called Type I or immediate hypersensitivity reactions.

True food allergies are rare occurrences. They affect 0.3 to 7.5 percent of children and 1 to 2 percent of adults. The foods that most often trigger these reactions are eggs, cows' milk, nuts, shellfish, soy, wheat, and white fish. Food allergies trigger reaction of type IgE antibodies which bind to the offending food antigens. The IgE antibodies attach to mast cells which stimulates the release of cytokines and histamines. This results in closing of the throat, fatigue, tearing, hives, itching, respiratory distress, watery or runny nose, skin rashes, itchy eyes or ears, and sometimes severe reactions of asthma and anaphylactic shock.

These symptoms occur within minutes after the food is eaten and people usually know what they are (hives or difficulty breathing). Physicians diagnose food allergies through the use of patch skin tests and RAST blood testing. These tests are great for testing for food allergies but do not accurately determine food sensitivities.

Sensitivity reactions, also called "delayed" or "hidden" hypersensitivities, occur when IgA, IgG, and IgM antibodies are triggered in response to foods, chemicals, and bacterial toxins. The most common antibody reactions are IgG to mold and foods; exposure to molds and foods is quite high compared to exposure to pollens. For example, in an entire hay-fever season we may inhale a teaspoon of pollen, but we take pounds of food inside us each day. It is estimated that 95 percent of all food allergy is of this delayed type. In the past, these delayed allergies were called "serum sickness." The sensitivities cause symptoms which are delayed, taking several hours to several days to appear. This makes tracking them down very difficult. Food and environmental sensitivities cause a wide number of symptoms typical of a leaky gut reaction. Food particles enter the bloodstream through damaged mucosal membranes, the body recognizes them as foreign substances (antigens), and triggers an immune reaction. Prolonged antibody response can overwhelm the liver's ability to eliminate these food antigens. Subsequently, the antigens enter the bloodstream and trigger delayed hypersensitivity response, inflammation, cell damage, and disease. Almost any food can cause a reaction, although the most common are beef, citrus, dairy products, egg, pork, and wheat. These foods provoke 80 percent of food sensitivity reactions.

Antibodies and antigens form what is known as immune complexes. If you have lots of antibodies and few antigens, you have a small immune complex. Conversely, if you have lots of antigens and only a few antibodies, you also have a small immune complex. The worst symptoms and cravings appear when you have moderate amounts of both antibodies and antigens--when you have a large immune complex. When you try to eliminate foods while in this state, you are left with enormous cravings for these foods, and symptoms often worsen before they improve. It can take seven to ten days to get through this stage. These large immune complexes can cause rashes in the skin and cheeks, as those seen in lupus.

Symptoms of Food and Environmental Sensitivity

The following symptoms occur because of many health conditions. Professional evaluation is necessary to uncover the source of these symptoms and to establish if food sensitivities are involved.

Head: Chronic headaches, migraines, difficulty sleeping, dizziness

Mouth and throat: Coughing, sore throat, hoarseness, swelling/pain, gagging, frequently clearing throat, sores on gums, lips, and tongue

Eyes, ears, nose: Runny or stuffy nose, postnasal drip, ringing in the ears,

blurred vision, sinus problems, watery and itchy eyes, ear infections, hearing loss, sneezing attacks, hay fever, excessive mucus formation, dark circles under eyes, swollen, red, or sticky eyelids

Hearts and Lungs: Irregular heartbeat (palpitations, arrhythmia), asthma, rapid heartbeat, chest pain and congestion, bronchitis, shortness of breath, difficulty breathing

Gastrointestinal: Nausea and vomiting, constipation, diarrhea, irritable bowel syndrome, indigestion, bloating, passing gas, stomach pain, cramping, heartburn

Skin: Hives, skin rashes, psoriasis, eczema, dry skin, excessive sweating, acne, hair loss, irritation around eyes

Muscles and joints: General weakness, muscle/joint aches and pains, arthritis, swelling, stiffness

Energy and activity: Fatigue, depression, mental dullness and memory lapses, difficulty getting your work done, apathy, hyperactivity, restlessness

Emotions and mind: Mood swings, anxiety and tension, fear, nervousness, anger, irritability, aggressive behavior, "binge" eating or drinking, food cravings, depression, confusion, poor comprehension, poor concentration, difficulty learning

Overall: Overweight, underweight, fluid retention, dizziness, insomnia, genital itch, frequent urination

Additional Signs of Food Sensitivities in Children

In addition to the symptoms listed above, children with food sensitivities may have:

Attention Deficit Disorder
Behavior problems
Learning problems
Reoccurring ear infections

These problems are often not recognized as being related to food sensitivities. Children with these problems will benefit from a food evaluation and environmental sensitivity testing.

Blood testing for IgG or IgG4, IgM, and or IgA antibody reactions can help determine sensitivities to a variety of foods and environmental substances. You may want to screen for food allergies with IgE testing at the same time. Some labs do a test for another indicator of delayed hypersensitivity: white blood cell blastogenesis, where lymphocytes are stimulated and produce protein, DNA, and RNA at a rapid rate. Environmental screening panels measure antibody reaction to chemicals commonly found in our homes, yards, workplaces, and public places. People often test positive to household cleaning supplies and petroleum-based chemicals. Several laboratories perform antibody testing for foods, dusts, environmental chemicals, heavy metals, molds, and pollens. These labs are listed in the Resources section.

Lectins

Lectins that are incompatible with our genetics can also cause negative reactions to foods. We each have a blood type-A, B, AB, or O--which is genetically determined. Our blood types contain specific antibodies which helped our ancestors live successfully in their environment. We no longer stick to our ancestor's specific environment and are continually exposed to new substances. When we eat a food that contains lectins which are incompatible to our blood type, the lectins target an organ or tissue and begin to collect blood cells in clumps, called agglutination.

Peter D'Adamo has developed a hypothesis that states that if we eat foods containing lectins incompatible with our blood type, we will experience negative health reactions. If, for example, I have type A blood and eat milk, my body will begin to agglutinate and reject that milk. When I drink milk, the next morning I wake up with a clump of mucus in my throat. I know this and usually avoid dairy products. The lectins don't get digested and then cause reactions. According to D'Adamo, the lectin proteins settle somewhere in our bodies and have a magnetic effect on the cells there. The cells clump together and are targeted for destruction as if they were foreign invaders. This can appear to us as irritable bowel syndrome, arthritis, or nearly any inflammatory condition. Lectin reactions mimic food allergies. The digestive system and nervous system are especially sensitive to lectin reactions. The people whose arthritis responds to elimination of the nightshade family of foods (potatoes, eggplant, tomatoes, peppers) probably have lectin sensitivities. If you want to know much more about blood type diets and lectins, read [Eat Right for Your Type](#), by Peter D'Adamo.

Elimination Provocation Diet

If you wish to determine food and chemical sensitivities on your own, you can use the elimination provocation challenge. Only eat foods that you are unlikely to be sensitive to for a week and then add back the foods you normally eat to "challenge" your system. Removal of offending foods calms down symptoms, while careful addition of only one food each two days makes it easier to determine which foods caused the reaction. Although the elimination provocation challenge sounds simple, it can be tricky. People usually have no problem with the elimination part--a restricted food plan for a week is easy. Slowly adding foods back into your diet may be more difficult, because recipes and restaurant foods have many ingredients. Sometimes it's hard to determine which ingredient caused the distress. Reactions that are delayed for a day or two also complicate the situation. It then becomes necessary to remove all suspected foods for four days, and try them again one at a time. If you have the same reaction each time you add the food, you've found the culprit. Unfortunately, if you have sensitivities to one food, you are often sensitive to all foods in the same family. For example,

some people who are sensitive to wheat are sensitive to all grains in the grass family. It is common to be sensitive to more than one food or food family.

To cure food and environmental sensitivities, you'll do best with a holistic approach. Begin by avoiding substances you are sensitive to for a period of six months, and your body will gradually stop reacting to most of them. That will help detoxify the body, especially the liver (detoxification programs are discussed in chapter 9). A comprehensive program of nutritional supplements will help in the healing process. The Elisa Act Handbook reads: "Persons suffering from immune system dysfunction and overload due to delayed hypersensitivity reactions often have a need for even greater supplementation because of poor functioning of the body's normal biochemical pathways." Natural foods, organically grown and nutrient rich, also help repair the body. Exercise programs and use of stress management tools also play a part in recovery. With a holistic program you will find that over time you will become less and less sensitive to foods and the environment.