

# UNDERSTANDING LEAKY GUT SYNDROME

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LEAKY GUT SYNDROME (LGS) describes a cascade of disorders that stem from small intestine colitis, allowing infiltration of microbial and metabolic toxins as well as undigested food into the blood stream. These include fatigue, immune deficiency, food allergies, asthma and eczema. Leaky Gut Syndrome may be a contributor to other modern illnesses such as insulin resistance, obesity, neurotransmitter disorders, and cancer, and in fact may account for 50% of chronic illness. LGS is a modern disease with its origins in excessive antibiotics or, in children, early vaccination. Combining the laboratory tests and nutritional medicines from Functional Medicine with herbal formulas from Traditional Chinese Medicine allows an effective course of treatment.

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For my 9 hr/CEU/PDA DVD course on Leaky Gut, see:

<http://drjakefratkin.com/products/dvds>

# LEAKY GUT SYNDROME

## I. INTESTINAL PHYSIOLOGY

### A. Healthy Gut Lining and Selective Permeability

1. Allows nutrients to be absorbed . . . .
  - a. Digested food
    1. Vitamins, oils and fats, amino acids, minerals, carbohydrates
2. . . . While blocking absorption of toxins
  - a. Metabolic wastes
    1. Cellular debris
    2. Hormones
    3. Chemical by-products
  - b. Microbial toxins (viruses, pathogenic bacteria, fungal, protozoa)
  - c. Environmental poisons
    1. Solvents, benzenes, styrenes, phthalates
    2. Heavy metals
    3. Pharmaceutical drug metabolites

### B. Intestinal Immune System

1. Accounts for 80% of immune system
  - a. Part of *wei qi*: consider it an “outside skin”
  - b. Compromise of intestinal immunity compromises immune system
2. Relies significantly on beneficial bacteria to neutralize, destroy, or detoxify microbial and metabolic toxins
3. This is why antibiotics dramatically impact systemic immunity

### C. Gut Defenses

1. The epithelial and mucosal lining
  - a. Immune agents
    1. Cell-mediated immunity
    2. Intestinal and salivary secretory IgA
    3. Intestinal IgA, IgM, IgG
    4. Phagocytes: macrophages, granulocytes
  - b. Physically tight junctions of epithelia

## 2. GALT: Gut-Associated Lymphoid Tissue

- a. Most complex and organized collection of immune cells in the body
  1.  $10^{10}$  lymphocytes per meter of bowel
  2. 60-65% of the immune system by weight
- b. Consists of:
  1. Lymphocytes in mucosal endothelium
  2. Peyer's Patches - aggregates of lymphoid follicles
  3. Lamina propria lymphoid cells
  4. Intra-epithelial lymphocytes
  5. Mesenteric lymph nodes
- c. GALT is activated by presence of:
  1. Food antigens
  2. Microbial antigens
  3. Chemicals and drugs: antibiotics, hormones, additives, preservatives, and factory farmed meats and dairy, etc.

## 3. Lumina

- a. Gastric acid
  1. Creates correct pH for various parts of GI tract
  2. Acidifies nutrients for absorption
  3. Creates terrain for beneficial bacteria
  4. Different pH at each section of small intestine to support different colonies of bacteria
- b. Bile acids
  1. Detoxifies certain metabolic wastes
  2. Caustic, and must be neutralized into bile salts by bacteria

## II. IMPORTANCE OF BENEFICIAL BACTERIA

### A. Human life is dependent on bacteria

1. In the normal gut there are 500 species
  - a. 30-40 species account for 99% of the total intestinal load
    1. Lactobacillus accounts for 5%
  - b. 100,000 billion viable microbes
  - c. More bacteria than human cells (10 x)
  - d. Makes up 60% of stool by weight

- e. Oral cavity has 200 species
  - f. Approximately 80-90% are facultative anaerobes, therefore difficult to culture and thus poorly understood
2. Beneficial bacteria:
- a. Acidifies guts, promoting beneficial bacteria
  - b. Destroy pathogenic microbes and prevents colonization of parasites
  - c. Detoxifies metabolic chemicals and hormones
  - d. Synthesizes vitamins
  - e. Digests foods, facilitate absorption
  - f. Synthesizes short chain fatty acids
  - g. Converts bile (caustic) to bile salts (inert)
  - h. Benefits immune response
    - 1) Drives development of humoral and cell mediated immune tolerance in newborns

## **B. Negative aspects of pathogenic bacteria**

- 1. Deactivates trypsin, chymotrypsin (digestive enzymes)
- 2. Consumes B12
- 3. Produces ammonia, increases pH (> more alkaline)
  - a. Alkaline pH promotes fungal growth
- 4. Deactivates epithelial enzymes
- 5. Prevents breakdown of bile acids, estrogens, allowing reabsorption
- 6. Activates carcinogens
- 7. Absorption of pathogenic microbes (in Leaky Gut) leads to antibody-antigen complexes leading to autoimmune diseases
  - a. Bacteria
    - 1. Klebsiella > Ankylosing spondylitis, rheumatoid arthritis
    - 2. Citrobacter, Proteus > Rheumatoid arthritis
  - b. Virus
    - 1. MMR live vaccine viral fragments > autoimmune response > eczema, asthma, autism
    - 2. < 5% of those receiving vaccinations

### III. LEAKY GUT SYNDROME

#### A. What it is

1. Increased epithelial permeability of small intestine
2. Allows absorption of substances not normally absorbed:
  - a. Metabolic wastes, including cellular chemicals and hormones
  - b. Pathogens, including virus, bacteria and fungus
  - c. Foods before they are fully digested
    - 1) Cause of most food allergies

#### B. What initiates it

1. Usually starts with antibiotics
  - a. Antibiotics kill beneficial gut bacteria
    - 2) Allows alkalinization of guts
    - 3) Dysbiosis = the proliferation of bad bacteria and fungus
  - b) Antibiotics accumulate through medications or food chain (diary, meat, eggs, fish, etc)
3. Pathogenic microbes cause irritation and inflammation to SI epithelial lining
4. Foods allergens keep irritation going
5. In infants, measles vaccine can implant live measles viral fragments in epithelium, creating antibody-antigen complex
  - a) Creates autoimmune response
  - b) Can cause severe eczema, asthma, autism
6. Aggravated by:
  - a) Preexisting adrenal stress
    - 1) Poor immune function at epithelial wall
  - b) Heavy metals
  - c) NSAID use, including Ibuprophen
  - d) Hormones encourage Candida growth
    - 1) BC pills, steroids

#### C. Consequences

1. Over absorption of toxins (chemical and microbial) overwhelm liver detox pathways
  - a. Reabsorbed estrogens deposit in estrogen-sensitive tissue

- b. Reabsorbed cholesterol goes back in blood or collects as gallstones
- 2. Depletes immune system as it fights toxins and infections at epithelial mucosa
  - a. Formally neutralized by beneficial bacteria
- 3. Leads directly to adrenal stress syndrome

#### **D. Illnesses directly resulting:**

- 1. Gastrointestinal disorders
  - a. Celiac disease
  - b. Chronic diarrhea or constipation
  - c. Irritable Bowel Syndrome
  - d. Malabsorption syndromes
  - e. Gastritis
  - f. Hepatic dysfunction
- 2. Allergy Syndromes
  - a. Food Allergies
  - b. Sinus allergy
  - c. Asthma
  - d. Urticaria
  - e. Chemical sensitivities
- 3. Skin conditions
  - a. Psoriasis, eczema, urticaria, acne
  - b. Small intestine epithelial inflammation causing skin inflammation
- 4. Pain disorders
  - a. Fibromyalgia
  - b. Joint pains, arthritis
  - c. Headache, migraine
- 5. Hormone disorders
  - a. Adrenal Stress Disorder
  - b. Menstrual disorders
    - 1. Reabsorption of unconjugated estrogen and progesterone
    - 2. Menopausal disorder
  - c. Osteoporosis
- 6. Immune disorders
  - a. Recurrent infections

- b. Recurrent ear infections
  - c. Chronic Fatigue Syndrome
  - d. Chronic yeast infections
7. Autoimmune Disorders
- a. Absorption of Klebsiella or Proteus antibody-antigen complexes
  - b. Ankylosing spondylitis
  - c. Rheumatoid arthritis
  - d. Crohn's Disease - Ulcerative Colitis
8. Neurotransmitter Disorders
- a. Childhood hyperactivity
  - b. Depression, anxiety
  - c. Insomnia
  - d. Memory disorders

#### **E. The Inflammatory Process**

1. Inflammation is the body's normal physiologic response to injury, but is a complex, highly orchestrated process
2. Acute inflammation is an adaptive process that consists of defend and repair functions
3. Many chronic illnesses have a ongoing inflammatory component
4. Antigens that trigger inflammatory response create vicious cycle
  - a. Inflammation, pain, oxidative stress
  - b. Trigger release of inflammatory mediators
    1. Cytokines, histamine, etc.
      - a. Warn other immune agents of impending danger
    - c. In the brain, microglial cells hear the message and produce inflammatory hydrogen peroxide and nitric acid (peroxynitrate) to destroy pathogenic antigens
      1. These are powerful oxidants which damage epithelial tissue
  - d. Persistent over-activation of the microglial immune cells leads to a marked increase in oxidative stress in the brain and can alter brain metabolism
    1. Can leads to neurotransmitter damage, affecting mood, behavior and sleep
    2. Contributes to Alzheimer's, Parkinson's disease, chronic fatigue, ADHD, ADD, etc.

5. Can cause Autoimmune disorders
  - a. Antigen stimulation causes release of inflammatory cytokines and antibodies
  - b. If over-active, can become confused and produce antibodies against itself
  - c. Includes hyperactive thyroid (Graves Disease), rheumatoid arthritis, multiple sclerosis

## **F. Sources of Barrier Stress**

1. Infectious exposure
  - a. Pathogenic microbes (bacteria, virus, fungi, protozoa)
  - b. Vaccinations
    1. Especially live virus: MMR (measles, mumps rubella)
2. Toxic Exposure
  - a. Enterotoxins/Endogenous toxins
  - b. Bile, if not re-conjugated by beneficial bacteria
  - c. Xenobiotics
    1. Solvents
    2. Phthalates (plastics)
    3. Pesticides
    4. Benzenes
  - d. Pharmaceutical agents
  - e. Ibuprofen, NSAIDs
3. Malnutrition
  - a. Deficiency of essential fatty acids (EFAs), vitamins, minerals
  - b. Excess carbohydrates and simple sugars
  - c. Poor antioxidant protection
  - d. Inadequate digestion, especially of proteins (hypochlorhydria)
4. Stress causes cortisol and epinephrine imbalances
  - a. Depletes HCL, enzyme & mucin secretion
  - b. Depletes SIgA
  - c. Depletes serotonin production (95% is produced in the GI)
  - d. Reduces phagocytosis, chemotaxis
  - e. Inability to inhibit inflammation

## 5. Sequence:

- a. Poor dietary choices, stress & emotions, Infection, toxic exposure  
> weakened adrenals/immune system, low stomach acid
- b. Dysbiosis, Altered Intestinal Permeability > Food Allergy,  
Malnutrition, Toxic Overload > Systemic Disease
- c. In TCM: weakened kidney fire leads to weakened stomach fire >  
weakened spleen qi and wei qi

## IV. RELATIONSHIP TO ILLNESS AND ORGAN HEALTH

### A. Intestinal Permeability and Food Sensitivities

1. Healthy GI epithelia have tight junctions to prevent absorption of bacteria, food antigens, and other mid and large molecules
2. In chronic inflammation, tight cell margins relax, and allow microbes and undigested food to be absorbed
3. Undigested foods are tagged as antigens, and antibodies form, causing inflammatory reaction each time the food is eaten
  - a. Triggers histamines, leukotrienes, prostanoids and prostaglandins
  - b. Creates vicious cycle by promoting inflammation and leaky gut

### B. Relationship to Adrenal Stress Syndrome

1. **Antigen response activates HPA axis** (hypothalamus-pituitary-adrenal)
  - a. Alarm stage: elevated cortisol
  - b. Resistance stage: Pregnenolone steal
    1. Pregnenolone is derived from cholesterol and is usually used to make DHEA and sex hormones
    2. In steal, pregnenolone is used to make cortisol instead
      - a. > elevated cortisol, lowered DHEA
  - c. Exhaustion stage: 3 patterns
    1. Cortisol normal, DHEA low
    2. Cortisol elevated or lowered, DHEA normal
    3. Low cortisol, low DHEA
2. **GALT stress is major cause of adrenal stress syndrome.**
  - a. Food sensitivities to gluten, dairy, soy and eggs may be without symptoms, but pose a constant stress to adrenals

- b. Dysbiosis (bacteria, fungi, virus and protozoa) stress adrenals
  - 1) Does this by depleting SIgA and other immune agents
  - 2) May not have any GI symptoms
- c. Impacts immune system: Lowered immunity, decreased WBC, atrophy of thymus gland, decreased SIgA
- d. Adrenal stress leads to Metabolic Syndrome
  - 1) Elevated glucose and insulin, increased LDL cholesterol, hypoglycemic symptoms
- e. Suppresses gut mucosa and epithelial regeneration
  - 1) Along with reduced SIgA, this creates vicious cycle
  - 2) Promotes and maintains dysbiosis

### C. Relationship to Hydrochloric Acid and Enzyme Deficiency

1. Chronic adrenal stress leads to diminished hydrochloric acid production
  - a. Low HCL leads to low pancreatic enzymes
  - b. In TCM, diminishing of *mingmen* fire leads to suppression of stomach fire
2. Low HCL and enzymes inhibit efficient digestion of foods
  - a. Creates more food antigens
  - b. Lack of HCL causes alkaline gut, promoting fungal growth
  - c. Promotes vicious cycle
3. Symptoms of low stomach acid
  - a. Bad breath
  - b. Dyspepsia after complex, protein meals
  - c. Food “sits in the stomach”
  - d. Frequent indigestion, heartburn, reflux
    1. Most acid reflux is actually HCL deficiency
      - a. Healthy HCL keeps esophageal sphincter closed
    2. HCL controls *Helicobacter pylori* levels
  - e. Abdominal gas after eating
  - f. Multiple food or pollen allergies
  - g. Nausea when taking supplements
  - h. B12, folic acid deficiency
  - i. Weak, peeling and cracked fingernails
  - j. Dry, brittle hair
  - k. Acne

#### **D. Impairs Hepatic Detoxification**

1. Liver detox is burdened by increased toxic infiltration in LGS
  - a. Metabolic wastes including hormones, cholesterol, cellular metabolites
  - b. Pathogens and pathogenic toxins
  - c. Inflammatory reaction agents
2. Pathogenic bacteria reduce P450 enzymes used in Phase I detoxification

#### **E. Cardiovascular disease**

1. GI inflammation aggravates cardiovascular disease
2. C-Reactive Protein (CRP) elevates with GI inflammation, and affects blood vessels
3. Bacterial infections can elevate homocysteine levels by reducing B12 and folic acid levels
4. Dysbiosis inhibits cholesterol elimination and leaky gut allows reabsorption of cholesterol
5. Stress response can lead to elevated blood pressure
6. Cortisol imbalance > elevated blood insulin (insulin resistance) > sticky blood, damage to epithelia of blood vessels, clotting, atherosclerosis

#### **F. Affects Endocrine system**

1. Can cause lowered T3 levels
  - a. T3 is inactive, but is activated in the gut mucosa by intestinal sulfatase
  - b. Sulfatase is dependent on healthy gut bacteria
  - c. Dysbiosis > lowered T3 levels, elevated TSH
2. Antigen stress > elevated cortisol production
  - a. Elevated cortisol inhibits T4 conversion to active T3
3. Promotes Estrogen dominance
  - a. Beneficial bacteria deconjugate estrogen before elimination
  - b. Dysbiosis and leaky gut allows estrogens to be reabsorbed and deposited in estrogen sensitive tissue
  - c. Healthy deconjugation requires beta glucuronidase, a GI enzyme
    1. This level can be measured (Genova Labs)

- d. Estrogen dominance can be helped by Indole-3-Carbinol, found in cruciferous vegetables (broccoli, cauliflower, kale, etc), or as supplement (Thorne)

## **G. Chronic Fatigue**

1. Affects of Leaky Gut:
  - a. Malabsorption of nutrients > malnourishment
  - b. Decreases conversion of inactive T3 to active T3
  - c. Chronic inflammation aggravates insulin resistance, adrenal stress, hypoglycemia
  - d. Short-circuits citric acid cycle (CAC) and electron transport chain, affecting ATP production
  - e. Hyper-activates immune system and places body in chronic stress

## **H. Neurotransmitter imbalances**

1. The enteric nervous system produces 99% of the body's serotonin levels
  - a. Brain only produces 1%
2. Serotonin production totally dependent on healthy gut biosis
3. Also, leaky gut can influence glucose absorption, and lead to mood disorders or hypoglycemia

## **I. Neurodegenerative patterns**

1. Intestinal inflammatory cytokines stimulates brain's glial cells to produce local inflammatory cytokines plus neurotoxic nitric acid
2. Can cause neuron death (apoptosis)
3. Can lead to Alzheimer's, multiple sclerosis, ischemia, edema, seizures, etc.

## **J. Weight loss**

1. Inability to lose weight despite diet and exercise
2. Release of inflammatory cytokines inhibits lipolysis (breakdown of fats) and increases lipogenesis (formation of fatty acids)
3. Increased cytokines release fats stored in liver, which end up as body fats

## V. TCM HERBAL PROTOCOLS

### A. Evaluate for and treat *zang-fu* in following sequence

1. Intestine Damp-Heat
2. Liver stagnation
3. Liver Overacting on Spleen or Stomach
4. Stagnation of Stomach *Qi*
5. Deficiency of Spleen *Qi*
6. Deficiency of Spleen *Yang*
7. Deficiency of *Wei Qi*

### B. Special Conditions in Leaky Gut

1. Skin eczema
2. Food Allergy

## VI. UNDERSTANDING FOOD ALLERGIES/SENSITIVITIES

### A. FOOD ALLERGIES/SENSITIVITIES ARE FOCUSED

1. **90% Of Food Allergies Belong To 5 Groups:**
  - a. Glutens (wheat, oats, rye, spelt, possibly corn)
  - b. Dairy, including goat, butter, yogurt
  - c. Soy and other beans
  - d. Eggs (usually due to MMR or flu vaccines)
  - e. Nuts and seeds
2. Other food allergies/sensitivities
  - a. Shellfish, oranges, strawberries
  - b. Some people are sensitive to nightshade plants: potatoes, tomatoes, pimentos, peppers, causing fibromyalgia pain
3. Other Reactants in Food
  - a. Pesticides
  - b. Additives: preservatives, hormones, antibiotics, enzymes, MSG
  - c. Processing: smoking, salting
  - d. Natural processes: aging, insects, fungi, fermentation
4. Non-allergenic foods:
  - a. Meats, most vegetables, most fruits, rice, millet

## **B. ALLERGY VS. HYPERSENSITIVITY VS. INTOLERANCE**

1. Traditional view of allergy: IgE mediated
  - a. Will show only as IgE skin reactions, or measurement of IgE in blood
  - b. Food allergies may only show as delayed IgG response
2. Expanded view: “Hypersensitivity”
  - a. Involves IgG, IgM, IgA, IgE, T-cells
    1. Blood tests can test food allergies through IgG and/or IgE
3. “Intolerance”: non-immunologic (no Ig) but poor digestion
  - a. Usually enzyme deficiency, eg. lactose intolerance
  - b. May be due to food additives, MSG, salicylates, etc.

## **C. FOOD REACTIONS AND SYMPTOMS**

1. Mouth: itching, swelling, choking
2. Gastrointestinal: Nausea, heartburn, regurgitation, pain (sharp, dull), vomiting, diarrhea, bleeding, etc.
3. Skin: hives, eczema, rash, acne
4. Lungs: Cough, asthma
5. Kidneys: Bleeding, loss of protein, hypertension
6. Muscles: Fatigue, wasting, soreness
7. Joints: Swelling, pain, limitation of motion
8. CNS: Migraines, epilepsy, depression, hyperactivity, cognitive changes
9. Heart: Arterial spasm, palpitations, arrhythmia

## **D. TESTING FOR FOOD ALLERGIES**

1. Elimination Diet
  - a. 3-week minimum of elimination diet
  - b. Reintroduce one food only at a time
  - c. Symptoms usually include malaise, joint or muscle aches and pains, changes in sleep patterns, headaches, constipation, diarrhea, or rash.
2. LEAP test is most accurate, but expensive (Signet Labs)
3. Most practical test is US Biotek’s 96 food panel, finger-prick blood

**E. OTHER NOTES CONCERNING FOOD ALLERGIES**

1. Keeps intestinal mucosa inflamed, prolonging absorption of toxins
2. Candida markers may be absent, but undiagnosed food allergies maintain leaky gut syndrome
3. Food antibodies will disappear in 2-6 months if the food is stopped
4. NAET and BIOSET can help clear antibodies from system more quickly
  - a. Contrary to claims, one cannot introduce the foods immediately or within 24 hours
  - b. The intestinal lining needs to heal for two months
  - c. Introduce foods one at a time and make sure they are clear, using electrodermal testing or muscle testing
  - d. Start with simplest foods first; introduce glutens and dairy last
5. Some foods are constitutional, esp. dairy and gluten
  - a. Get family history
  - b. Blood type O reportedly has more problems with glutens and dairy
  - c. Northern Europeans tolerate dairy the best
  - d. Worst for dairy: Asians, Africans (except NE pastoralists)
  - e. 50% intolerance: Jews, Mediterraneans