

Disorders of Digestion, Absorption, and Metabolism

Disorders of Digestion – Food Allergy vs Intolerance vs Sensitivities

FOOD ALLERGY- Only affects 2-5% of the population.

- IgE antibodies react to a protein component of a food as if it were a pathogen
- Reaction starts to occur within maximum 20 minutes of consuming the food so usually easy to identify culprit
- Symptoms can include: tingling or itching in the mouth, swelling of lips, face, tongue or throat, abdominal pain, diarrhea or vomiting, dizziness, hives, itching or eczema
- Can progress to **ANAPHYLAXIS** – severe dyspnea, rapid pulse, shock
- Most common food triggers in children: peanuts, soy, tree nuts, eggs, cow's milk (whey or casein or other protein), wheat
 - In adults: peanuts, tree nuts, shellfish, fish
 - Children may out grow their allergies

Food Allergies cont.

How are food allergies diagnosed? Skin prick test is the most common method. Skin is

Scratched & allergens are

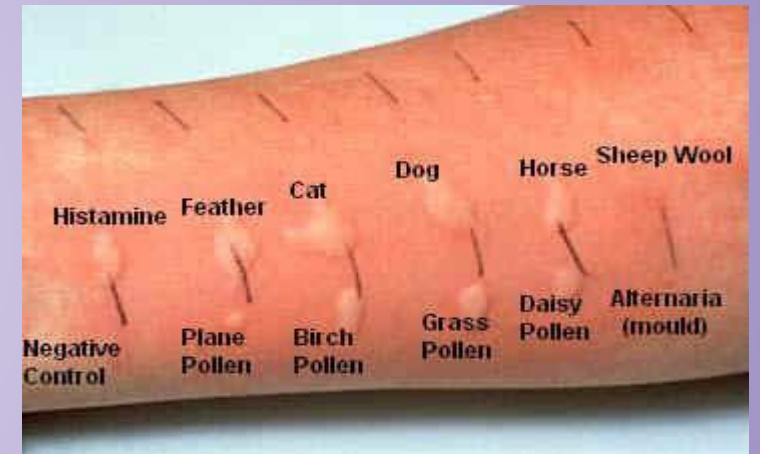
Placed on the open skin.

Or allergens may be

injected just under the

skin. A red, swollen reaction confirms allergy.

Treatments: antihistamines, EpiPen, allergy shots (small amounts of allergen in hopes of desensitizing – used more in environmental allergies), most often life-long food allergen avoidance



Oral Allergy Syndrome or Pollen-Food Allergy

Proteins in certain fruits, vegetables, nuts & spices are similar to proteins in pollens that are commonly involved in allergies.

Ragweed pollen- bananas, cucumber, melons, zucchini

Grasses- cucumber, kiwi, melons, orange, peanut, tomato, potato, zucchini

Birch- almond, apple, apricot, carrot, celery, cherry, stone fruits, potato, soy, many spices

Mugwort- apples, peppers, garlic, onion, broccoli, cabbage, some spices

Symptoms are similar to food allergy & often involve tingling, swelling, itching of the mouth.

Cooking these foods tends to reduce symptoms by denaturing the proteins.

Food Intolerances

More common than true food allergy, intolerances affect 15-20% of the population.

NOT an immune system reaction, intolerances involve trouble digesting foods for various reasons. Eg. A deficiency of an enzyme, a structural digestive problem such as diverticulosis etc.

Often associated with functional GI disease such as IBS

Symptoms: bloating, excessive gas, stomach pain/heartburn, headache/migraine, chronic runny nose/sinusitis

Common intolerances are: lactose, gluten, Food colourings/preservatives, sulfites, salicylates, Histamine & FODMAPS

Food Intolerances

- Complex Carbohydrate intolerance
- Trouble digesting beans, cereals, nuts & seeds
 - Symptoms:
 - Diarrhea, flatulence, abdominal cramps
 - Mechanism
 - Increased number of particles in the intestine draws water into the intestine which activates the peristaltic (wave-like) motion of the intestine and induces frequent passing of watery stools
 - Bacteria in the colon ferment undigested carbohydrates to short chain fatty acids, gases, and irritating compounds
 - Treatment: avoidance and or supplemental digestive enzymes such as bromelain, papain, amylase, Beano

Food Intolerances

- **Lactose Intolerance** – deficiency of the enzyme lactase, which breaks down the disaccharide lactose
- https://youtu.be/_i2ccIGYPx0
- Age and genetics (lactase persistence in Northern European ancestry & some others)
- Primary cause of lactose intolerance is low lactase activity after weaning.
- Secondary cause are diseases that affect the villi and brush border of the intestine and inflammation or infection of the GI tract
- Rarely can be congenital & baby will have trouble digesting breast milk or cows milk formulas
- Can supplement with the lactase enzyme, eat no/low lactose dairy products, or eat plant-based dairy substitutes such as almond milk, cashew cheese etc.

Histamine Intolerance

You naturally produce Histamine as well as DAO – the enzyme that breaks down histamine.

Eating a lot of histamine rich foods and/or a DAO deficiency can cause high Histamine levels and Histamine intolerance. Some things that can reduce DAO are: certain medications, inflammatory bowel disease, bacterial overgrowth, as well as chronic allergies.

Symptoms: digestive disturbances, hives/itching/flushed skin, headaches/dizziness, tachycardia

Treatment: Avoidance of high histamine foods including: alcohol, fermented foods, dried fruits, processed/smoked meats, shellfish & aged cheese.

<https://youtu.be/fbm3gZgxWGx>

FODMAPs

Monash University (Australia) discovered a connection between IBS and some types of carbohydrates – Fermentable oligosaccharides, disaccharides, monosaccharides & Polyols.

Symptoms after eating high FODMAP foods in some people are: cramping, diarrhea, constipation, bloating, gas

Treatment: Elimination – Challenge diet of the various categories of high FODMAP foods

HIGH FODMAP FOODS TO AVOID

Manage your IBS symptoms by limiting these foods in your diet



All Fody Foods products are Low FODMAP, providing excellent alternatives to many of your favorite High FODMAP foods listed here.

HIGH POLYOLS

VEGETABLES

Cauliflower, Sweet Corn, Mushrooms (shiitake, button, enoki), Snow Peas

FRUITS

Apples, Apricots, Blackberries, Nectarines, Pears, Yellow Peaches, Plums, Prunes, Watermelon

SWEETENERS

Sorbitol, Mannitol, Isomalt, Xylitol (Sugar-Free Gum, Mints, Cough Drops & Some Medications)

HIGH FRUCTANS / GOS

VEGETABLES & LEGUMES

Jerusalem Artichokes, Garlic, Red Kidney Beans, Baked Beans, Leek & Shallot Bulbs (the white parts), Onion, Onion & Garlic Salt, Black Beans, Hava Beans, Split Peas

FRUITS

Banana (ripe), Grapefruit, Currants, Dates, Figs (Dried), Nectarine, Persimmon, Plums, Prunes, White Peaches, Watermelon

GRAINS

Rye, Wheat, Barley

NUTS

Pistachios, Cashews

OTHER

Oolong Tea, Chamomile and Fennel Tea, Carob > 2 tsp, Inulin, Chicory Root Extract

EXCESS FRUCTOSE

VEGETABLES

Jerusalem Artichokes, Asparagus, Sugar Snap Peas, Sun-Dried Tomatoes

FRUITS

Apples, Boysenberry, Cherries, Fresh Figs, Mango, Pears, Tamarillo, Watermelon

SWEETENERS

Agave, Honey, High Fructose Corn Syrup

ALCOHOL

Rum

HIGH LACTOSE

DAIRY

Custard, Cottage Cheese, Cow, Sheep & Goat Milk, Ice Cream, Commercially Prepared Ricotta

References: Kate Scarlata & Monash University Low FODMAP App; USDA Nutrient Databank. This information is not intended to be a substitute for medical advice or to diagnose disease. Please consult your doctor.

Food Sensitivities/ Delayed Allergy

- Reactions to foods that do not develop within 20 mins. Thought to be mediated by IgG antibodies to the protein components of food.
- Diagnosis: Elimination- Reintroduction Diet, Blood test for IgG antibodies (some controversy over its usefulness)
- Symptoms seem to worsen with increased exposure – both dose & frequency
- Symptoms can include: headache/migraine, GI symptoms from GERD to diarrhea, IBS, obesity, autoimmune conditions, joint & muscle pains, skin conditions such as eczema, acne, chronic rash, chronic sinusitis, lowered immunity
- Most commonly reactive: Dairy, Gluten
& gluten-containing grains, egg, corn, soy, peanut, tree nuts, pea, Nightshade vegetables (tomato, potato, peppers)



Disorders of Absorption

- Intrinsic Factor Deficiency
- Irritable Bowel Syndrome
- Inflammatory Bowel Disease – Crohn's, Ulcerative Colitis
- Celiac Disease

Disorders of Absorption

- **Intrinsic Factor Deficiency**

- Intrinsic factor is secreted in the stomach and binds to vitamin B12
- IF is necessary to absorb vitamin B12
- Genetic deficiency can cause low levels of vitamin B12 in the body
- Low stomach acid (hypochlorhydria) also causes IF to decrease and subsequently causes low vitamin B12 levels.
- Symptoms of low B12:
 - Fatigue, depression, sore tongue, pins and needles sensation, diarrhea or constipation, rapid heart rate, panic attacks, paranoia, memory loss
- Symptoms of low stomach acid:
 - Feeling excessively full after eating, constipation, bloating, gas/flatulence, brittle nails, hypothyroidism, difficulty digesting protein
 - <https://youtu.be/aww5NiahRb8>

Disorders of Absorption

- **Irritable Bowel Syndrome**

- Symptoms: abdominal pain, bloating, gas, abnormal bowel movements (alternating constipation and diarrhea)
- IBS is usually a symptom of something else that has not been determined medically. It is known as a diagnosis of exclusion.
- One theory is that food sensitivities (such as a FODMAP sensitivity), especially to carbohydrate containing foods, may cause the symptoms of IBS.
- Caffeine, stress, medications, antibiotics, GI illness, lack of sleep, lack of rest, and lack of fluid intake worsen symptoms
- 10-20% of adults may have this syndrome

Disorders of Absorption

- **Inflammatory Bowel Disease** – Crohn's, Ulcerative Colitis
- Signs & Symptoms: diarrhea, bleeding in BM, general illness –fatigue, fever
 - Ulcerative Colitis – generally affects rectum & low colon
 - Crohn's disease – often affects ileocecal area, can be throughout the entire intestinal tract. Often presents with “skip lesions”. Affects more females.
- <https://youtu.be/iefghc2g91M>

Disorders of Absorption

- **Celiac Disease**

- Caused by an immune system response to the protein gliadin or gluten
- What is gluten? <https://youtu.be/zDEcvSc2UKA>
- Gluten is present in wheat, rye, barley, & other grains
- In celiac disease, Gluten must be avoided strictly for life
- The immune response destroys the small intestine villi
 - Leads to decreased surface area for nutrient absorption, reduced amount and activity of brush border enzymes, and reduced ability to absorb nutrients
- Symptoms:
 - May be symptom free
 - Significant GI distress, malabsorption and malnutrition

Disorders of Absorption

- **Celiac Disease**

- Symptoms continued:

- In children 3 months – 3 years: diarrhea, growth failure, vomiting, bloated abdomen, and abnormal stools, increased cavities, fatigue and mood disturbance
 - In adults: weight loss or gain, weakness and fatigue, malnutrition, anemia, low bone density (osteopenia), muscle weakness, peripheral neuropathy, joint pain, etc.
 - Why do so many people think they have a problem with gluten?
 - <https://youtu.be/uEM2iDT-VAk>

Disorders of Absorption

- **Cystic Fibrosis-** An inherited, life-threatening disease that affects many organs.
 - Glands that make sweat & mucus are affected
 - In the GI system, CF affects the pancreas. The secretions become too thick & can clog the ducts.
 - The person with CF can then have trouble absorbing proteins, fats & the fat-soluble vitamins.
 - Over time, the endocrine function of the pancreas can also become damaged, leading to CF Related Diabetes, which is a unique type of insulin dependent diabetes
 - Digestive Symptoms may include: greasy stool, bloody diarrhea, stomach pain & rectal prolapse
 - <https://youtu.be/GoLgsrbMbCQ>

Disorders of Eating

Anorexia nervosa- body dysmorphia leads to a significantly low body weight

- Results in multiple nutrient deficiencies over time
- one of the most serious & potentially fatal psychiatric disorders

Bulimia nervosa- recurrent binge-purge cycles results in imbalances of the electrolyte ions – sodium, potassium, magnesium, calcium etc. This leads to GI and Cardiovascular symptoms. Often present with edema.

Orthexia nervosa- An unhealthy focus on eating in a healthy way. Person imposes overly strict dietary rules. Can be related to OCD.

Treatments involve counselling, nutrition/dietician support, nutritional supports such as supplements, IV nutrition

<https://youtu.be/2aWgUILtn7Q>

Disorders of Metabolism

- Disorders of Carbohydrate Metabolism
 - Diabetes
- Disorders of Lipid Metabolism
 - Cardiovascular Disease
 - Atherosclerosis
- Disorders of Protein
 - Marasmus
 - Kwashiorkor
 - Protein Excess

Disorders of Metabolism

Disorders of Blood Sugar Regulation – On the road to diabetes

- Postprandial (after eating) carbohydrate metabolism
 - Blood glucose levels rise after eating and the amount of increase reflects
 - The amount of CHO consumed
 - Rate of digestion and rate of glucose entry into the bloodstream
 - Rate of glucose uptake by the body's cells
 - Normal blood glucose levels: fasting or before meals 4.0 – 7.0 mmol/L
2 hours after a meal 5.0 – 10.0 mmol/L
 - Hemoglobin A1C: Normal < 5.7%, prediabetes 5.7 – 6.4%, diabetes >6.4%
 - <https://youtu.be/llyMmg5e2qi>

Disorders of Metabolism

- Glycemic effect of food
 - Extent to which foods elevate blood glucose compared to a glucose solution or white bread
 - Low glycemic number is best: legumes, peas, beans
 - High number: white bread, potatoes, juice, sugar
 - Factors that affect the G.I.:
 - Type of food (eg. An apple is lower than apple juice)
 - Cooking method (eg. A baked potato is lower than mashed)
 - How it is eaten (eg. Eaten alone or in combination with other foods)
 - Glycemic Index Chart

Disorders of Metabolism

- Glucose metabolism
 - Transported into cells via the hormone insulin. The exception to this being the brain, nerves, red blood cells which do not require insulin; glucose can enter all the time.
- Class Activity (10 min) What are the symptoms of low and high blood glucose levels?
- High:
- Low:

Disorders of Metabolism

- **Diabetes**

- Type 1 diabetes – less than 10% of diabetes is type 1
 - Auto-immune destruction of the pancreatic cells that release insulin
 - Insulin injections are required to make sure the body gets enough glucose into the cells for energy and proper functioning.
- Type 2 diabetes – 90% of cases
 - Risk factors include obesity, weight gain, genetics, smoking, high blood pressure, gestational diabetes, ethnic background
 - Pancreas produces lots of insulin but body cells respond poorly
 - Increase risk for CVD, Kidney disease, cataracts/blindness, amputations due to gangrene

Disorders of Metabolism

- Warning signs of pre-diabetes:
- Feeling weak, shaky or hangry when going without food for a few hours
- Developing many skin tags
- Development of areas of dark, velvety skin – *Acanthis Nigricans*
- Warning signs of diabetes:
 - Increased urine and thirst (excessive)
 - Glucose in the urine (can test with a urine dipstick)
 - Weight loss, nausea, weakness, irritability
 - Craving for food and sweets
 - Drowsiness
 - Vision disturbances
 - Frequent infections (skin and itching) and slow healing
 - Pain in legs, feet, or fingers

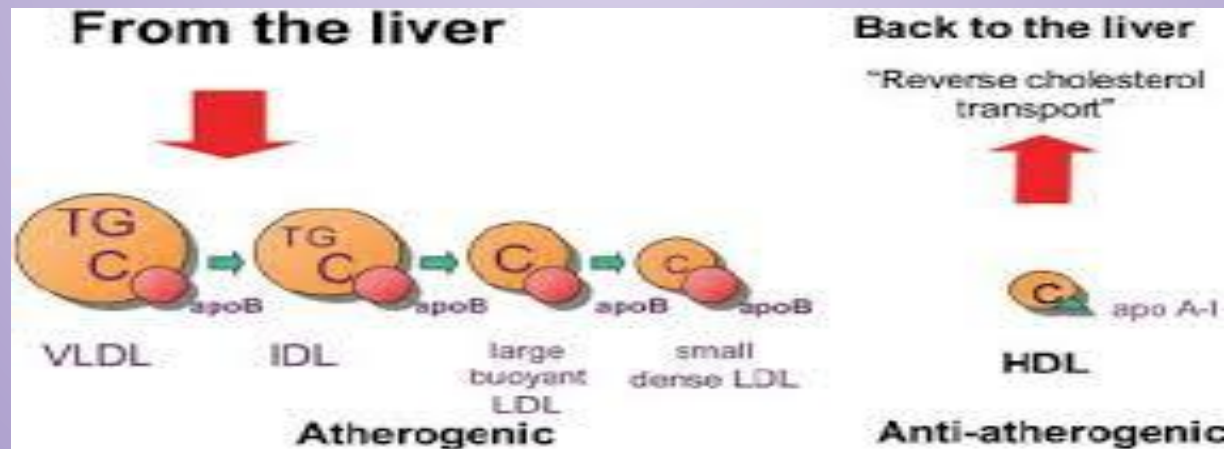
Disorders of Metabolism

- **Disorders of Lipid Metabolism**
 - Cardiovascular Disease and Atherosclerosis

Disorders of Metabolism

- **High Cholesterol**

- May increase risk for heart disease and cardiovascular disease and stroke
- Normal Blood levels:
 - Total cholesterol ideal is <5.2 mmol/L; high is > 6.2 mmol/L
 - HDL > 0.9 mmol/L is desired
 - LDL <3.5 mmol/L ideal; > 4.0 mmol/L is high
 - Triglycerides Normal < 1.7 , high is >2.2



Cholesterol continued

- How much of a risk factor for atherosclerosis is high blood cholesterol?
- <https://youtu.be/AuhW4e-Ych0>

- Lowering cholesterol through diet: **The Portfolio Diet**
- <https://www.albertahealthservices.ca/assets/info/nutrition/if-nfs-portfolio-eating-pattern-form.pdf>

HOW DOES IT WORK?

The Portfolio diet is exactly as it sounds. It takes a few dietary patterns that have been shown to lower cholesterol and puts them together. To lower your cholesterol, you can "invest" in any one pattern, or some of them, or all of them.

NUTS, LEGUMES, CEREALS **FRUITS & VEGETABLES** **MEAT ALTERNATIVES**

WHAT DOES THE PORTFOLIO DIET LOOK LIKE?

1 NUTS 45g DAILY
All nuts are good for your heart and cholesterol and contrary to concerns do not contribute to weight gain. Add nuts as a snack between meals, adding to salads, cereals, or yogurt. Trying nut butter on your toast is an option. 45g is about a handful of nuts. If allergic to peanuts or tree nuts, try seeds.

2 PLANT PROTEIN 50g DAILY
This is the most challenging component of the Portfolio diet. Start by trying to get 25g daily. Consider replacing milk with soy milk, try tofu, soy nuts and beans.

3 VISCOUS (STICKY) FIBRE
Aim to eat 2 servings of oatmeal, beans, lentils, and chickpeas a day. Replace bread with rye or pumpernickel or oatcakes. Eat at least 5 servings of fruit and vegetables every day. Aim to eat 2 servings per day of oatmeal, barley, or cereals enriched with psyllium or oat bran. Replace white bread with whole grain oat breads. Put oat bran or psyllium into smoothies. Eat at least 5 servings per day of vegetables (eggplant, okra) and fruit (apples, oranges, berries) high in viscous fibre.

4 PLANT STEROLS 2g DAILY
These occur naturally (soyabean, corn, squash, etc.) but to get this amount of sterol you will require fortified foods such as spreads, juices, yogurt, milk and even supplements as part of a meal.

Expected LDL-Cholesterol lowering:

- 5 - 10%
- 5 - 10%
- 5 - 10%
- 5 - 10%

TOTAL: • ~30%

Statins, the most effective class of cholesterol-lowering medications, reduce cholesterol by 20-60%.

IT'S NOT ABOUT ONE BIG CHANGE. IT'S NOT ALL OR NOTHING. JUST START BY INTRODUCING ONE COMPONENT TO YOUR DIET AND BUILD FROM THERE.

THIS PORTFOLIO DIET IS FOR "REAL PEOPLE IN THE REAL WORLD"

— DR. DAVID JENKINS, CREATOR OF THE PORTFOLIO DIET

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Disorders of Metabolism

- **Atherosclerosis**
 - Most common form of heart disease
 - Plaque development in the artery walls leads to hardening and narrowing of the arteries
 - Narrowing leads to high blood pressure and increased risk for a blood clot to become trapped and cause a heart attack or stroke

Disorders of Metabolism

- **Disorders of Protein**
 - Marasmus
 - Kwashiorkor
 - Protein Excess

Disorders of Metabolism

- **Marasmus**
 - Less than 2 years of age
 - Total diet deficiency
 - Malabsorption
 - Slow, chronic progression
 - Severe weight loss
 - Muscle and fat loss
 - No edema
 - <60% weight for age normal
 - No fatty liver
 - Anxiety, apathy
 - Appetite high or low or normal
 - Hair, skin problems



Disorders of Metabolism

- **Kwashiorkor**

- 1-3 years of age
- Protein deficiency only
- Rapid onset, acute
- Some weight loss
- Some muscle loss
- 60-80% weight for age
- Edema
- Fatty liver
- Apathy, irritability
- Loss of appetite
- Hair, skin problems



Disorders of Metabolism

- **Protein Excess**

- Associated with obesity
- Leads to kidney and liver problems
- Can lead to bone mineral loss with high intake of purified protein (increased calcium lost in the urine) (not much evidence for meat protein causing low calcium levels)
- Kidney disease – due to increased work of the kidneys to excrete nitrogen wastes (recall ammonia and urea are wastes of protein metabolism in the body)
- OR DOES IT? <https://youtu.be/d94aU-LbH94>