

Food Allergies & Adverse Reactions to Foods

Which Foods to Include & Which Replace

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Classifications of Adverse Reactions to Foods

- Allergy
 - Oral Allergy Syndrome
(Pollen-Food Syndrome)
- Intolerance

1. Allergy = abnormal reaction to substances which are ordinarily harmless; happens on a second or subsequent occasion

A *true* food allergy should be left to a condition in which an individual, formally unreactive, reacts with the appearance of antibodies

(=immunoglobulins) after exposure to an antigenic substance

8 MOST COMMON FOOD ALLERGIES



PEANUTS



TREE NUTS



MILK



EGG



WHEAT



SOY



FISH



SHELLFISH

**WITH MORE THAN 170 FOODS KNOWN TO
CAUSE ALLERGIC REACTIONS**

Foods With Significant Allergic Activity

A. Cod fish allergen M in codfish

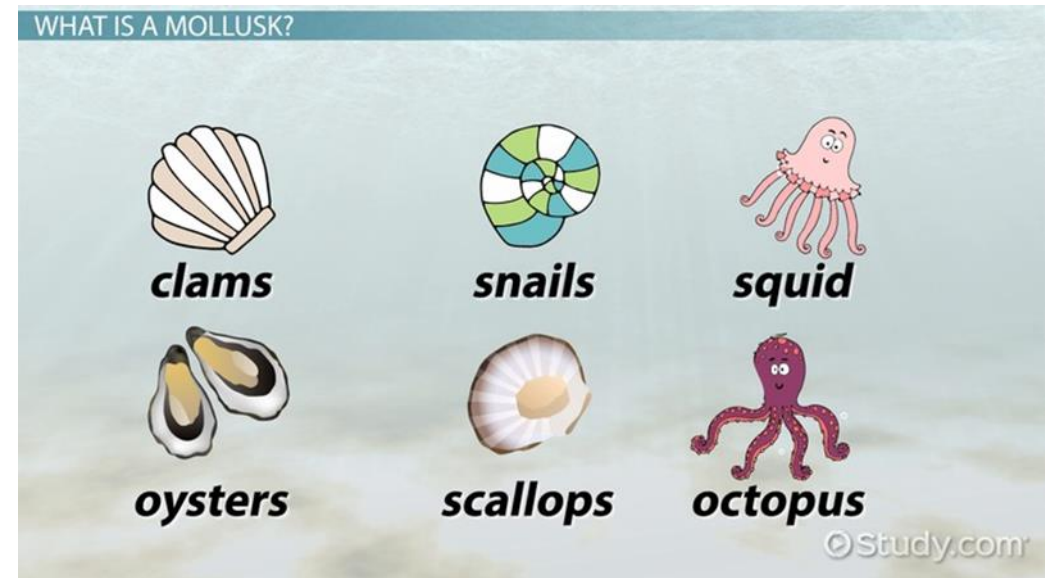
B. Crustaceans

1. shrimp antigen II (not heat labile) in cooked

2. crawfish & lobster

C. Other Fish major allergen responsible for fish allergy
is found in all fresh & saltwater fish species;
most fish-allergic individuals can tolerate
canned tuna

- **Crustaceans:** Characterized by hard outer shells and segmented limbs, examples of commonly enjoyed crustaceans are shrimp, crab and lobster.
- **Mollusks:** Defined as soft-bodied invertebrates with calcium carbonate shells, examples of commonly enjoyed mollusks are clams, mussels, scallops and oysters.



Foods with Significant Allergic Activity

D. 🖐️ Cows Milk caseins & beta lactoglobulin

E. 🖐️ Eggs

1. white = ovalbumin, ovomucoid & conalbumin
2. yolk = ovomucoid (heat stable)



F. Legumes

1. peanuts - alpha arachin & conarachin I (notably in cold pressed peanut oil)
2. soybeans - several globulins
3. peas - albumin

Foods with Significant Allergic Activity

G. Oil Seeds

1. cottonseed
2. sesame seed
3. flax seed

H. Cereal Grains

1. wheat
2. corn



I. Vegetables

1. tomato
2. celery
3. carrots



J. Fruits

1. kiwi, melons, apples, strawberries, oranges
2. fruit skins

- **antigen** - anything that can trigger an immune response (e.g., a virus, fragment, bacteria, or parasite); essentially a *foreign protein* it is a specific target, usually a chemical located on the reaction causing virus, bacteria, or protein
- **allergen**- a kind of antigen; seemingly harmless
- **immunoglobulin** - an antibody; it binds to a specific antigen (or allergen)

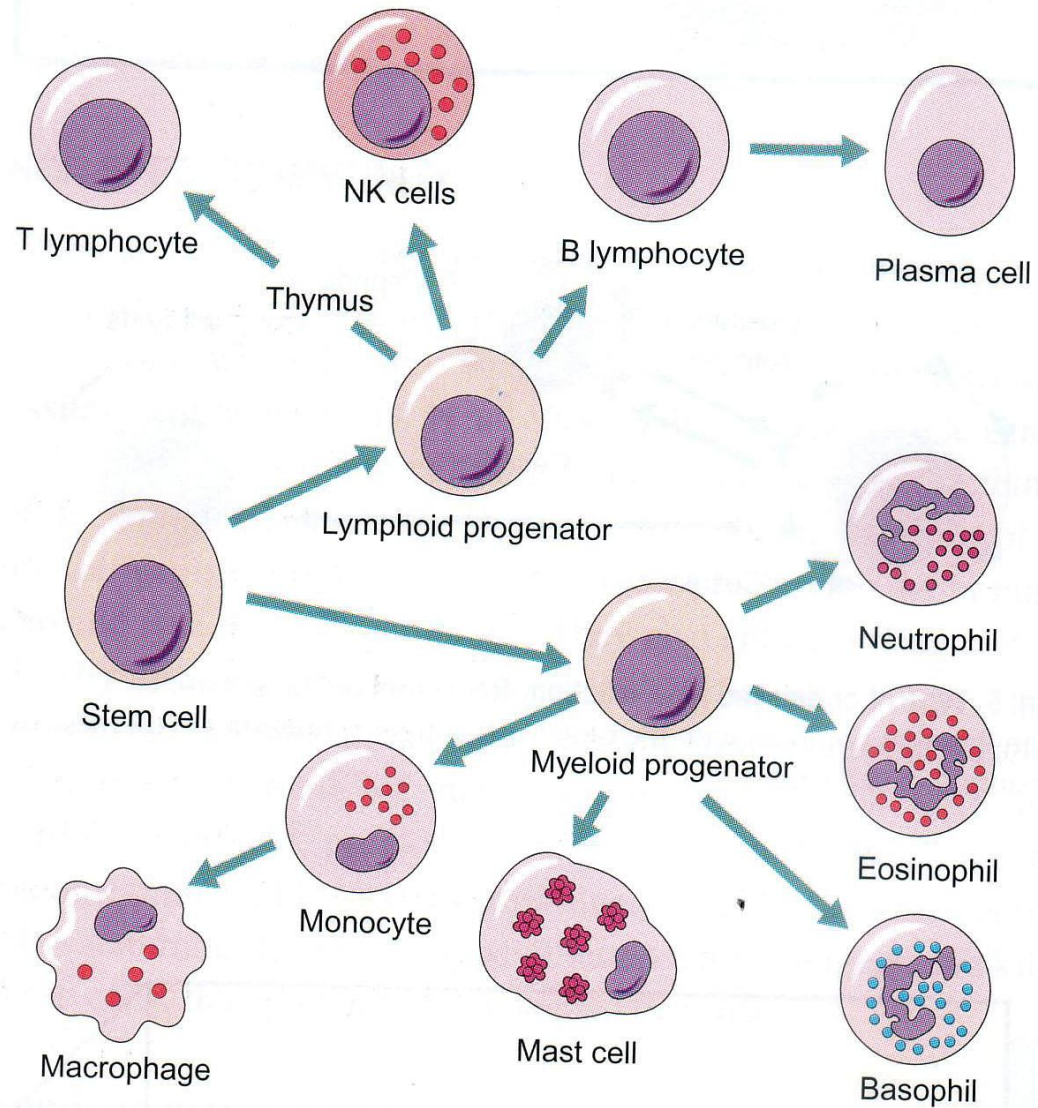
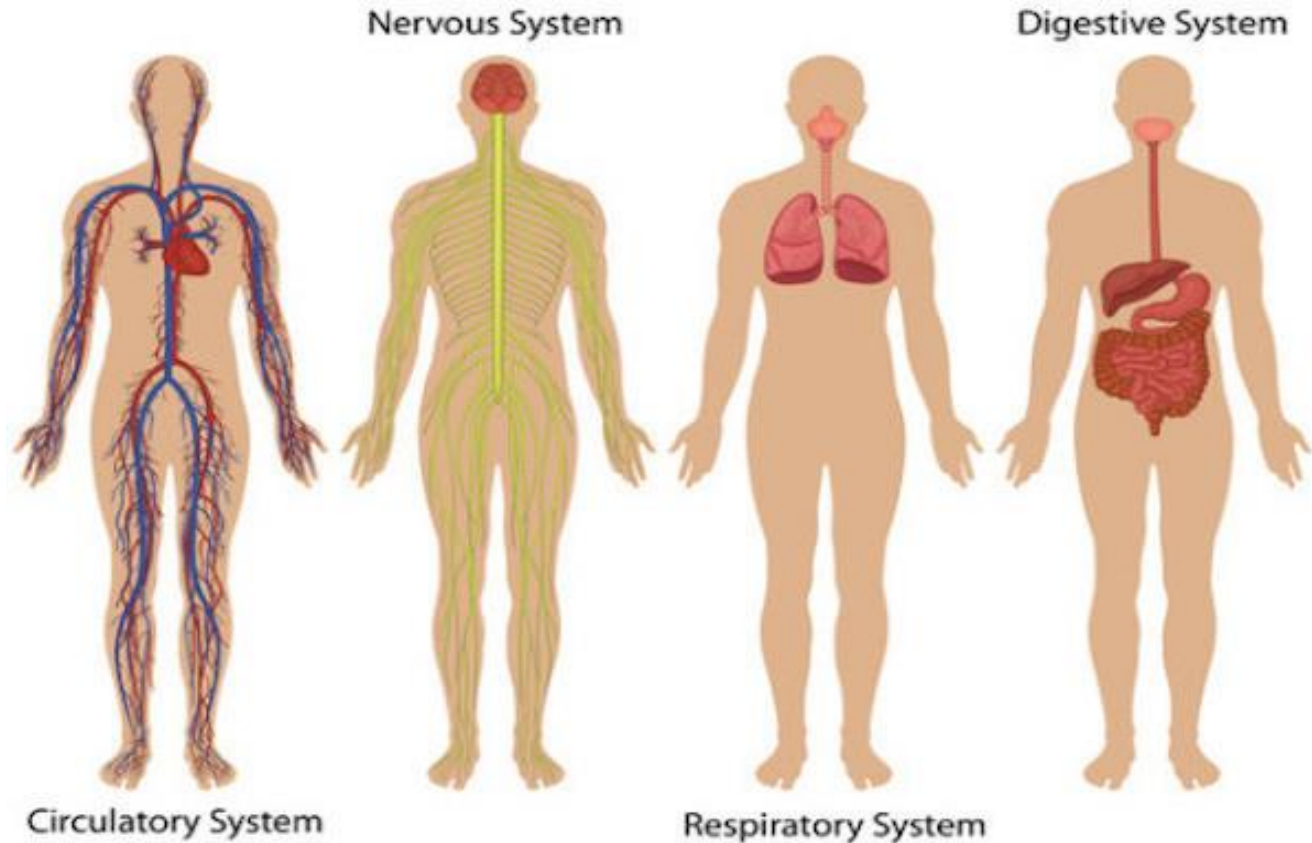


Fig. 1 **Cells of the immune system.**

Can affect systems
of the body ...

1. Respiratory (Lungs
& Breathing)
2. Digestive
3. Skin
4. Vascular
5. Central Nervous
System



histamine: a powerful dilator of capillaries & stimulator of gastric secretions which irritate body tissues; 10 mediators spill out; effects include:

- > dilation of blood vessels; they get leakier because blood escapes through the vessel wall
- > smooth muscles contract sharply; if in the lungs then air is expelled from the tubes; affects breathing; if in the bowels, semi-digested food is expelled, resulting in diarrhea

In food allergy reactions, the body misguidedly makes IgE antibodies to fit the antigen in otherwise innocuous foods

- swelling of lips & tongue occurs from leaky blood vessels
- anaphylactic shock occurs if the dilation of blood vessels is so great as to cause a drop in blood pressure.

C. Types of Immune System Reactions

- 1. Type I - (food):** immediate, generalized, anaphylactic reaginic from mediators -- IgE & IgG, usually respiratory, dermal
- 2. Type II:** occurs within hours, days, weeks; cytotoxic; attracts phagocytic cells resulting in cell death
- 3. Type III:** occurs within weeks, activation of complement system and platelet aggregation; stimulates lysosomal & vasoactive substances resulting in tissue inflammation

4. Type IV - (food): cellular; delayed allergic reactions & rejections of transplants;

5. Type V: stimulate hypersensitivity reaction; the antibody causes cells to divide rather than to die.

D. Clinical Disorders (*Possibly*) Resulting from Food Allergies

A foreign antigen enters the blood, is neutralized by an antibody to form immune complexes, which then become fixed to a target organ or tissue. Examples:

1. arthritis: possibly 5% of people with RA have sensitivity to food; some examples are **tartrazine** (yellow food coloring, milk, & tobacco).
2. systemic lupus erythematosus: sensitivities reported include sodium nitrite, black walnut, alfalfa seed & sprout; L-canavanine (a non-protein amino acid component of alfalfa)



English Walnuts vs Black Walnuts:

The English walnut has a more appealing taste and is mostly used in cooking, baking, making ice-creams, and roasting because of the unique flavor. The black walnut, on the other hand, has a stronger, earthier flavor. Due to the vast consumer preference for English walnuts, it is almost impossible to find black walnuts in the local supermarket.

However, there are a few companies such as Hammons in the United States that produce and ship black walnuts directly to consumers.

While English walnuts end up directly on consumers' plates, black walnuts are used mostly for making flavorings and extracts by industrial buyers. Black walnuts also have slightly more fat and protein content than their English counterparts.



3. inflammatory bowel syndrome
4. schizophrenia
5. migraine headaches
6. learning disabilities
7. cardiac arrhythmias

The possibility exists that any condition which is related abnormal digestion (e.g. overeating, antacids, & achlorhydria) may favor the absorption of potentially sensitizing substances past the gut wall and into circulation.

G. Cereal Grains

1. Wheat ... albumin, wheat germ agglutinin a concanavalin A-purified glycoprotein a trypsin inhibitor globulin, gliadin & gluten
2. rice - glutelin & globulin
3. corn -

H. Oil Seeds

1. cottonseed
2. sesame seed

I. Vegetables

1. tomato (glycoproteins (unripe content < ripe

- J. Tree Nuts 1. walnuts

Cross Reactivity To Pollen Occurs



Orchard



Cantaloupe Honeydew Watermelon
Cucurbitaceae



Peanut
Fabaceae
(old Leguminosae)



White potato Tomato
Solanaceae



Timothy



Swiss chard
Amaranthaceae



Orange
Rutaceae



Birch



Apple Peach Plum Pear Cherry Apricot Almond

Rosaceae



Carrot Celery Parsley Caraway Fennel Coriander Aniseed

Apiaceae



Soybean Peanut

**Fabaceae
(old Leguminosae)**



Hazelnut
Betulaceae



Ragweed



Cantaloupe Honeydew Watermelon Zucchini Cucumber

Cucurbitaceae



Banana

Musaceae



Mugwort



Celery Carrot Parsley Caraway Fennel Coriander Aniseed

Apiaceae



Bell
pepper

Solanaceae



Black
pepper

Piperaceae



Mustard Cauliflower Cabbage Broccoli

Brassicaceae



Garlic Onion

Liliaceae

Well documented cross-reacting foods

- Cow's milk** → goat's milk, mare's milk, sheep's milk
- Hen's egg** → goose, turkey, duck; chicken meat, bird's feathers
- Codfish** → mackerel, herring, other fishes
- Peanut** → soy, green bean, lima bean
- Shrimp** → crab, crayfish, lobster


























..... less well documented


































- Hazelnut** → other nuts
- Wheat** → grass pollen, rye, sesame, maize, buckwheat, oats
- Kiwi** → birch & birch cross-reacting foods
- Apple** → (same as above)
- Banana** → latex, avocado, pear, fig?

Ficus tree

The latex dust of this tree, a member of the fig family, increases exposure to this potential allergen.



If allergic to:	Risk of reaction to at least one:	Risk of cross reactivity
A legume* peanut 	Other legumes peas  lentils  beans 	5% 
A tree nut walnut 	Other tree nuts brazil  cashew  hazelnut 	37% 
A fish* salmon 	Other fish swordfish  sole 	50% 
A shellfish shrimp 	Other shellfish crab  lobster 	75% 
A grain* wheat 	Other grains barley  rye 	20% 
Cow's milk* 	Beef hamburger 	10% 

If allergic to:	Risk of reaction to at least one:	Risk of cross reactivity
Cow's milk* 	Goat's milk 	92% 
Cow's milk* 	Mare's milk 	4% 
Pollen  birch  ragweed	Fruits/vegetables  apple  peach  honeydew	55% 
Peach* 	Other Rosaceae  apple  plum  cherry  pear	55% 
Melon*  cantaloupe	Other fruits  watermelon  banana  avocado	92% 
Latex*  latex glove	Fruits  kiwi  banana  avocado	35% 
Fruits  kiwi  avocado  banana	Latex  latex glove	11% 

Plant foods may cause discomfort ...

- Lectins
- FODMAPs
- oxalates

<https://www.hsph.harvard.edu/nutritionsource/anti-nutrients/lectins/>

Common Food Sources of Lectins

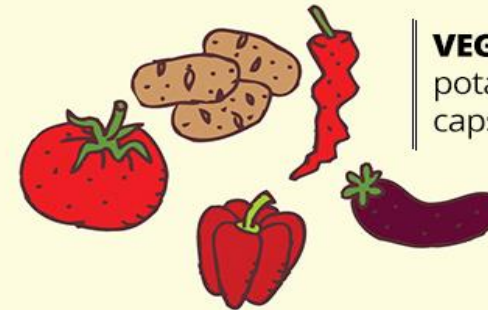


LEGUMES - soybeans, kidney beans, peas, lentils, peanuts.

GRAINS - wheat, barley, rice, rye, corn, oats.



VEGETABLES - tomatoes, potatoes, aubergines, capsicums, chillies.



FRUITS - lemons, oranges, grapefruit.



OTHERS - cashews, other nuts, seeds.

III. Non-Allergic Sensitivities

A. **Lectins:** bind to mast cells and effect histamine release; they bind to carbohydrates on surface cells; this leads to hyper-permeability of the gut.

Some are airborne. Many lectin containing foods are eaten raw, -- especially true of tomatoes. Other lectins are heat resistant.

Lectins bind to cells and cell products.
mouth, stomach (gastrin-secreting cells) small & large bowel,
pancreas, liver, duodenum

Foods with documented lectin reactions include: tomato, lettuce, cucumber, vanilla, yogurt, coconut, bananas, others ...
bye, bye piña coladas



Different Lectins

1. Glycoproteins

2. **agglutinins** which can make RBC's clump together and solidify the serum!

A famous lectin, ricin, was used by the KGB on an umbrella tip to murder an agent! Made from castor oil (from *Ricinus communis*)

3. **Mitogenic lectins** – phytohemagglutinins (PHA) are very heat resistant. But the effect varies with the species.

> pokeweed lectins stimulate lymphocytes when they enter circulation.

> Hodgkin's Disease developed in a town that had a response from processing navy beans.

Dangerous ricin

Ricin is one of the most poisonous naturally occurring substances known. It could be used as an agent of biological warfare.

Ricin is derived from beans of castor oil plant, which is easily available worldwide

Castor oil: Used in brake and hydraulic fluid

Ricin facts

- Per gram, it is 6,000 times more poisonous than cyanide
- Can be fatal when inhaled, ingested or injected
- Very toxic to cells, damages all organs
- No vaccine available
- Traces of ricin have been found in Afghan caves
- Used to kill Bulgarian dissident Georgi Markov in London, 1978

Symptoms: ■ Weakness ■ Fever ■ Cough ■ Seizures
■ Lung damage ■ Heart failure ■ Upset stomach

Ricinus communis

NOTE: Beans and plant are not to scale



The Castor Plant

<http://en.wikipedia.org/wiki/Ricin>



Castor Bean
(*Ricinus communis* L.)



M. Williams 1995

B. ingestion of chemical mediators such as scombroid
fish poisoning = histamine poisoning.
histamine in foods - created by bacteria; occurs in
cheeses, sausages, fish (indicated by a peppery
taste)



Scombroid Poisoning

Symptoms generally appear within minutes to an hour after eating affected fish.

- tingling or burning sensation in the mouth
- rash on the face and upper body
- throbbing headache
- hives and itching of skin
- nausea
- vomiting and/or diarrhea

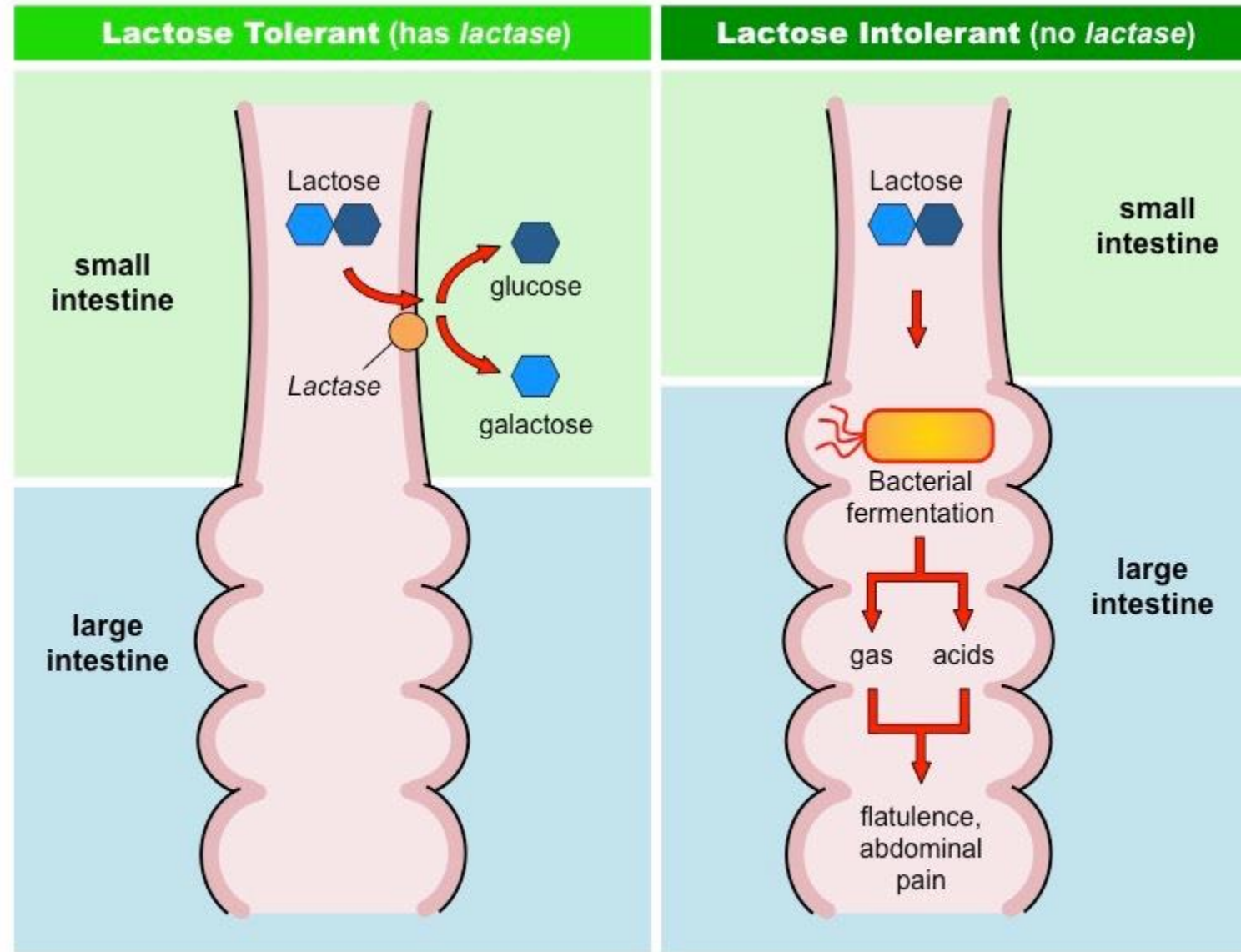
Treatment:

- antihistamines, such as diphenhydramine (Benadryl) and cimetidine (Tagamet[®]).
- generally only last a few hours



Enzyme Activity Levels

1. Lactose Intolerance



- **Peptides:** bind to mast cells and stimulate degranulation; includes egg white, strawberries, crustaceans, tomatoes, fish, pork, chocolate
- **Proteolytic enzymes:** found in pineapple and papaya can activate mast cells.



- **Food Idiosyncrasy?:** Chinese Restaurant Syndrome: food associated migraine; may involve stomach, intestines, bowel, skin, lungs, blood, & CNS

• Sulfite Sensitivity

Sulphur dioxide & other sulphites are

- ♦preservatives very effect & inexpensive
- ♦antioxidants which prevent browning
- ♦broad spectrum antimicrobial action

Sulphite Preservatives include:

sulphur dioxide

sodium bisulphite

sodium metabisulphite

sodium sulphite

potassium bisulphite

potassium metabisulphite

Sulfites in Foods

- Some foods naturally contain sulfites
- For some foods, sulfiting agents are added to retain color, freshness, or other preservative effects
- Foods commonly containing sulfites and sulfiting agents
 - Processed meats or seafoods
 - Fermented, cured, or pickled foods
 - Dried foods
 - Vinegar and wine



b. Sources of Sulphite Exposure

- ◆ industrial air pollution
- ◆ foodstuffs
- ◆ patient medications
- ◆ cleaning agents
- sulphite sensitive are acutely sensitive to very small amounts of inhaled sulphite.
- these patients can often tolerate a greater concentration of ingested sulphite than inhaled.

Possible sources of sulphites in foodstuffs

Category	Examples
• Beverages	Soft-drinks, fruit juices, grape juice (esp citrus drinks)
• Alcoholic Bev.	Wine, beer, cocktail mixes
• Condiments	Wine vinegar, pickles, salad dressings
• Confections	Molasses
• Dips	Avocado and others
• Fish	Canned or fresh shrimps, shellfish
• Fresh fruit &	Grapes, fresh pre-cut potatoes vegetables
• Gravies	Gravies, sauces
• Processed fruits	dried fruit, fruit juice concentrated, purees, dried coconut

- Processed veg. Instant mash potatoes, restaurant salad bars, dried vegetables, canned or pickled vegetables, salad dressings, purees
- Processed meats Sausage, cold meats, pate
- Puddings, fruit fillings, & gelatin
- Grain products Cornstarch, gravies, noodle rice mixtures
- Jams, jellies
- Snack foods Dried fruit snacks
- Soups Dried or canned soups
- Sweet sauces/syrups Molasses, pancake syrup, corn or maple syrup

Symptoms and Signs

- throat irritation to bronchospasm and/or shock
- coughing and/or bronchospasm
- urticaria & exacerbation of eczema.
- degree of sensitivity to the sulphites and whether the sulphite is in a ***bound or unbound*** form.
- time to onset of symptoms can vary from 5 mins to 30 mins.
- may improve spontaneously within 30 minutes
- many for even longer

Foods Whose Labels Contain Allergens

Food	Ingredient
Worcestershire sauce	anchovies, sardines
Barbecue sauce	pecans
Imitation butter flavor	milk proteins
Water-added ham	milk & soy
Sweet & sour sauce	wheat & soy
Egg substitutes	egg white
Low fat peanut butter	soy
Pet food	eggs, wheat, milk, & soy

Replacements for Highly Allergenic Foods/Ingredients – as tolerated

- Wheat/Gluten (rye & barley) – gluten free (rice based) flour products
- Nuts – melon seeds & sesame seeds
- Eggs – tofu
- Corn & other grains – varieties of rice, potatoes buckwheat, quinoa, & yams
- Peanuts – roasted chick pea & roasted soy
- Fish - poultry
- Soy

Good Fiber sources (as tolerated & considering pollen cross reactivity)

Vegetables to Replace:

Tomatoes

Fruits to replace:

banana & kiwi

strawberries

Whole Grains to replace

wheat

- Suggestions

asparagus broccoli

spinach cabbage

cucumbers

apples, pears, plums,

grapes, cherries

millet, quinoa, buckwheat

Elimination Diet

The elimination diet may be chosen from foods with the lowest reaginic activity. A regimen composed of foods from the following list can be followed for 7 days to demonstrate either remission or significant improvement of symptoms.

rice (in any form)	chicken	apricots
pineapple	beets	sweet potato
cranberries	lettuce	peaches
white vinegar	pears	apples
asparagus	olive oil	honey
sugar (cane or beet)	lamb	carrots
	salt	

HEALTHY EATING PLATE

Use healthy oils (like olive and canola oil) for cooking, on salad, and at the table. Limit butter. Avoid trans fat.



The more veggies – and the greater the variety – the better. Potatoes and French fries don't count.

Eat plenty of fruits of all colors.



STAY ACTIVE!

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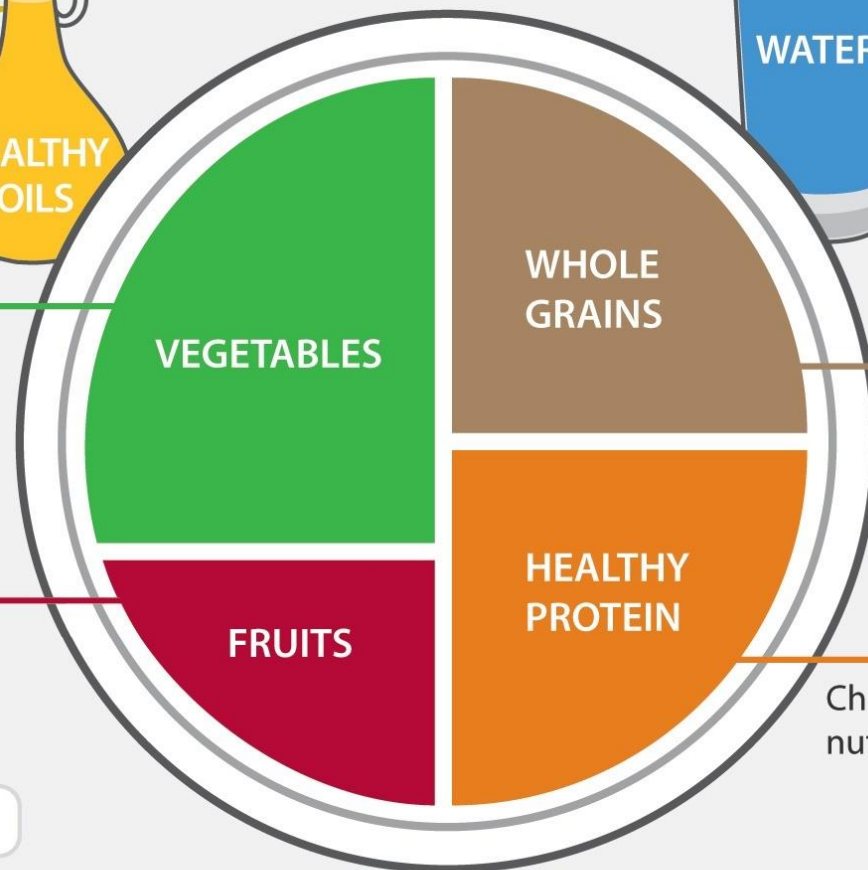
Harvard T.H. Chan School of Public Health
The Nutrition Source
www.hsph.harvard.edu/nutritionsource



Drink water, tea, or coffee (with little or no sugar). Limit milk/dairy (1-2 servings/day) and juice (1 small glass/day). Avoid sugary drinks.

Eat a variety of whole grains (like whole-wheat bread, whole-grain pasta, and brown rice). Limit refined grains (like white rice and white bread).

Choose fish, poultry, beans, and nuts; limit red meat and cheese; avoid bacon, cold cuts, and other processed meats.



Harvard Medical School
Harvard Health Publications
www.health.harvard.edu



Questions? Comments?



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