

Nutrition, Cardiovascular Disease and Stroke

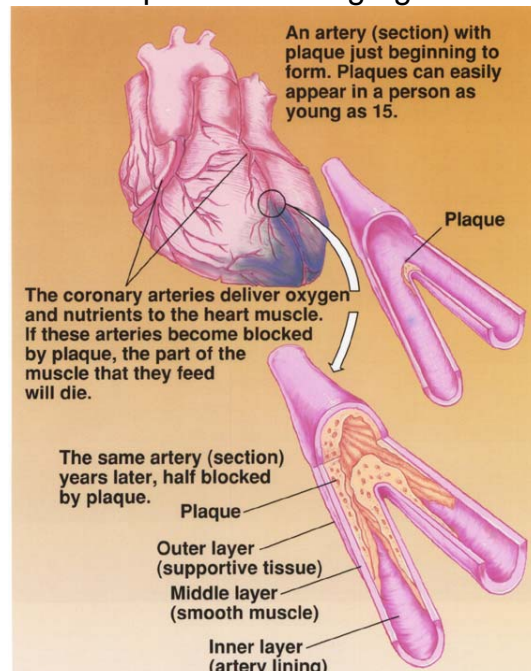
As we are aware, coronary heart disease is the number one cause of death in the United States. Strokes, caused when blood flow is stopped to regions of the brain, are also a circulatory system "disease", and the third leading cause of death in the United States. The American Heart Association has stressed lowering fat and cholesterol in the diet to lower the risk of cardiovascular disease for decades now. (They also emphasize stopping smoking).

Cardiovascular disease is any of a number of problems of the heart and circulatory system. The most common of these problems is **atherosclerosis**, which results from the formation of **plaques** along the inner walls of arteries, and **hypertension**, elevated blood pressure.

Development of Atherosclerosis

Most arteries have some fatty deposits that may become hardened to form a **fibrous plaque**. Almost everyone in the United States has some plaque formation by the age of 30. A diet high in saturated fat is directly correlated to fatty deposits and plaque formation in arterial linings.

- A **plaque** may be started when some damage to the lining of an artery occurs. Damage can be caused by the mechanical pulsing of the blood, by viruses, by increased pressure from hypertension, trauma, or from "nothing".
- If there is an arterial abrasion, platelets and macrophages rush to site.
- For some people and at some times platelets become "sticky" and fatty materials and cholesterol gets trapped in the repair area within the muscle cells of the artery.
- Fat, cholesterol and mineral deposits (especially calcium) accumulate in this trap area that over time becomes hardened as a **plaque**. Plaque formation naturally occurs with development and aging.



- An enlarging plaque may block an artery preventing adequate blood flow and oxygen delivery.
- Increased blood pressure results because arteries lose elastic recoil properties and because the response to diminished blood flow is to increase pressure.
- Chronic restriction of blood flow to the heart muscle damages tissue and may cause pain and pressure associated with **angina** or a **heart attack**. When blood flow is restricted to the brain, a **stroke** or **TIA** (trans ischemic attack) may occur.

Other Health Factors and Cardiovascular Disease

Formation of Blood Clots

- Platelets in the blood constantly form clots and dissolve. Since plaques are damaged areas, platelets are attracted to plaque locations. They may stick there and form clots.
- Platelet activity is to some extent controlled by the eicosanoids, especially the prostaglandins and thromboxanes, which are produced from omega-6 and omega-3 fatty acids. Thromboxane, in particular promotes blood clotting. Consumption of high fat meals increases risk of blood clotting. The increase of fat in the blood increases the risk of plaques rupturing as they take in more fat. The ruptured plaque attracts platelets forming a clot, which may block blood flow.
- Blood clots are given specific names

Thrombus

A thrombus is the formation of a clot at a plaque site. If the clot blocks the artery, the result is a thrombosis.

Coronary thrombosis heart attack

Cerebral thrombosis stroke

Embolus

A thrombus that breaks loose and travels is an embolus. If an embolus blocks a vessel, the result is an embolism.

Coronary embolism heart attack

Cerebral embolism stroke

Aneurysm

An aneurysm is a bulging of an artery wall where it has been weakened. If an aneurysm bursts, it causes a hemorrhage. Often, aneurysms are undiagnosed and life-threatening or fatal hemorrhages occur. **Hypertension** puts pressure on already weak aneurysms. Many aneurysms have no known cause. A **hemorrhagic stroke** can result from a burst aneurysm in the brain.

Cardiovascular Disease Risk Factors

About one-half of the heart attacks annually occur independently of any risk factor. None the less, for about half the heart attacks the following correlate:

- High serum cholesterol related to high LDL levels
- Diabetes
- Hypertension
- Obesity
- Smoking
- Physical Inactivity

Of these, fat intake, hypertension, insulin resistant diabetes and obesity are diet-related. Each of us can also take measures to stop smoking, if we do, and become more physically active. What can we do about these risk factors, and most specifically, cholesterol and LDL/HDL levels?

Role of LDLs and Cholesterol in Cardiovascular Disease

Let's review some background information.

- Cholesterol is synthesized in the liver from (mostly) digested and absorbed saturated triglycerides.
- Cholesterol is transported from the liver to cells by VLDLs and LDLs. Cholesterol is deposited in plaques by LDLs.
- Cholesterol in cells and blood is taken **back** to the liver for excretion by HDLs. The level of HDLs in blood is a direct factor in reducing blood cholesterol so it can't be deposited in plaques.
- Patients with heart disease often have high LDLs (strictly speaking serum cholesterol)
- When high serum cholesterol is hereditary, heart disease starts at young age (Hypercholesterolemia)
- Diseases associated with high LDLs have high risk of heart disease (diabetes, renal disease, hypothyroidism)
- Studies suggest that plaques form when cholesterol has been oxidized by free radicals in the artery walls. This is the basis for research on anti-oxidants and cardiovascular disease. Preliminary evidence seems to show that vitamin E has a protective function.

LDL Considerations

- Smoking increases LDLs and lowers HDLs
- Diet high in saturated fats high, LDLs high
- Monounsaturated fats are LDLs neutral

HDL considerations

- Some people genetically have HDLs. They are at low risk for cardiovascular disease
- Non-smokers always have higher HDLs
- Aerobic exercise, at least four times a week, helps raise HDLs
- Alcohol (in moderation) raises HDLs (But there are other alcohol risks, including risk of hemorrhage stroke)
- Consumption of fatty fish has been shown in some small studies to raise HDLs

How Does Diet Help Reduce Cardiovascular Disease Risk?

- Reduce saturated fat.
- Substitute high fiber carbohydrate foods for high fat foods.
- Consume fatty fish.
- Consume **foods** (not supplements) rich in antioxidants and vitamin E.
- Maintain appropriate weight.
- Moderate alcohol consumption may be of benefit to cardiovascular health.
- Folate, vitamin B6 and vitamin B12 may lower homocysteine levels that are a predictor of cardiovascular disease.
- Some substances (saponins and flavones) of legumes may lower LDLs (this includes soy products and sprouts)
- Pectins and gums of fruits and some vegies (and oat bran) may lower LDL by keeping saturated fats from being absorbed in intestine
- Monounsaturated triglycerides may lower blood pressure, and reduce the risk of cardiovascular disease in other ways, yet unknown. It may also affect cholesterol levels.

Hypertension

When blood vessels are partially blocked the body must increase blood pressure to compensate. Delivering oxygen and nutrients to cells and tissues is a priority. The increased blood pressure stresses vessels that no longer have optimum elastic recoil properties because of thickened plaque areas. The increased pressure also promotes more arterial damage with increased risk of platelet aggregation and clot formation.

Blood pressure is regulated by the combination of the force of blood being pumped from the heart and the resistance to flow in the arterioles and capillaries. Kidneys respond to blood pressure by regulating reabsorption of water. Kidneys also contribute to blood volume, which affects blood pressure. Increased blood volume increases blood pressure. Blood volume responds to osmotic balance, too.

Contributors to Hypertension

Science still doesn't know what causes hypertension in most people.

- However, **kidney function** is involved. When blood flow to the kidneys is reduced, the kidneys respond by increasing blood volume to increase blood pressure. The resultant hypertension stresses arteries.
- Those who are **obese** have more tissue to be serviced by more capillary beds. This can add strain to the heart, exacerbating existing arteriosclerosis and hypertension.
- **Type II diabetes** and **insulin resistance** are often related to hypertension, again through a kidney connection. Increased levels of insulin cause the kidney to retain sodium, which affects water retention and blood volume.
- High **alcohol** consumption raises blood pressure and increases risk of stroke
- **Mineral levels** seem most correlated to hypertension
 - Sodium High intake raises blood pressure for some people.
 - Potassium High intake may lower blood pressure, protects against stroke
 - Calcium High intake may lower blood pressure
 - Magnesium High intake may lower blood pressure

The Hypertension Risk Factors

- Smoking taxes the heart increasing blood pressure.
- High levels of blood lipids and a high fat diet promote hypertension.
- Diabetes is correlated with high blood pressure.
- All men and older women are more likely to have hypertension than younger women.
- As one ages, the arteries lose elastic recoil, and hypertension can be a result.
- A family history of hypertension is a predictor of hypertension.
- Those who are obese are more likely to have hypertension.

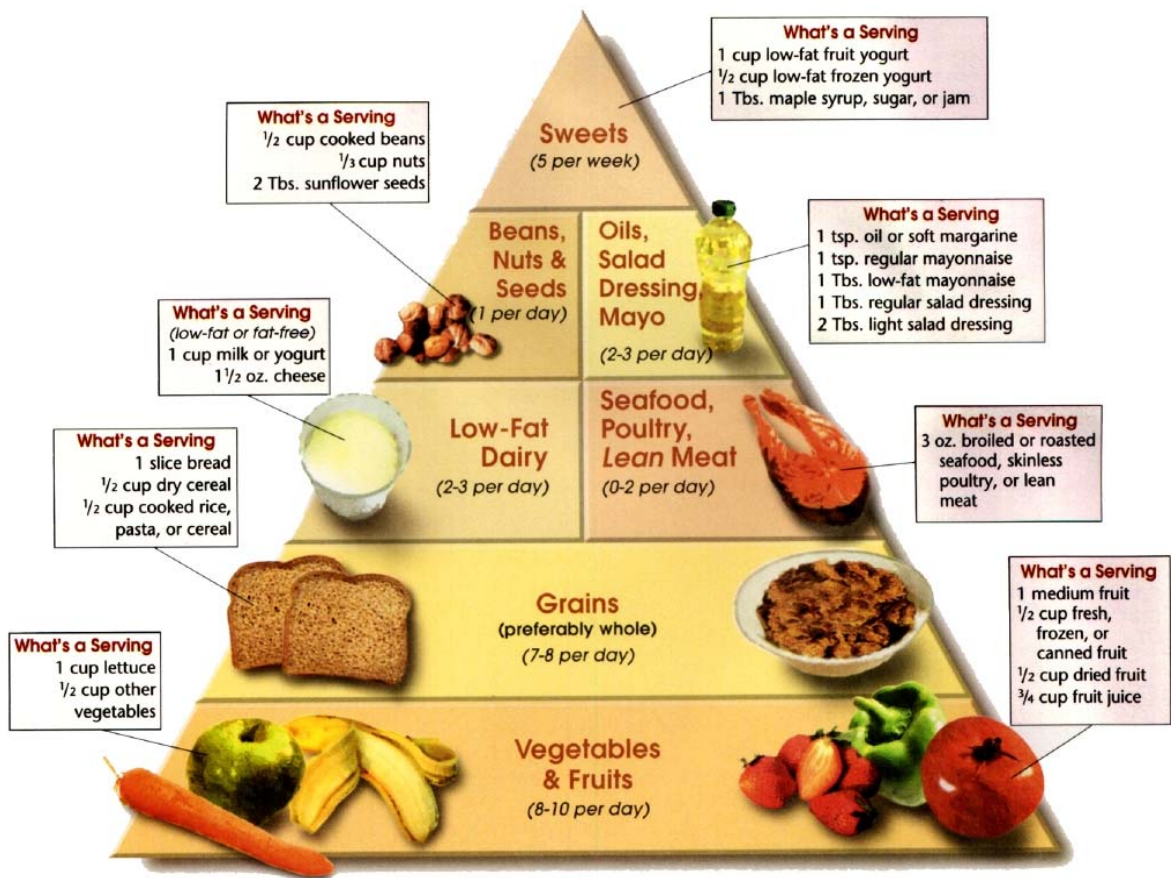
Hypertension is highest among African Americans.

Diet and Hypertension

The DASH (Dietary Approaches to Stop Hypertension) Diet:

The Dash diet, as discussed earlier, was developed to help lower cholesterol and blood pressure – and for those who follow it, it works. CSPI's *Nutrition Action* (May 2003) modified the DASH diet to represent it in the familiar pyramid form, and added whole grain emphasis.

The DASH diet has vegetables and fruits as its foundation (base) and whole grains at level two. Low-fat dairy and meats share level three, with fish and poultry taking priority. The added fourth level includes legumes, nuts and seeds and oils for healthy fats. Sweets remain at the top, but servings are limited to three - five times/week. The DASH diet is also low in sodium.



Note: Choose lower-salt foods from all categories.

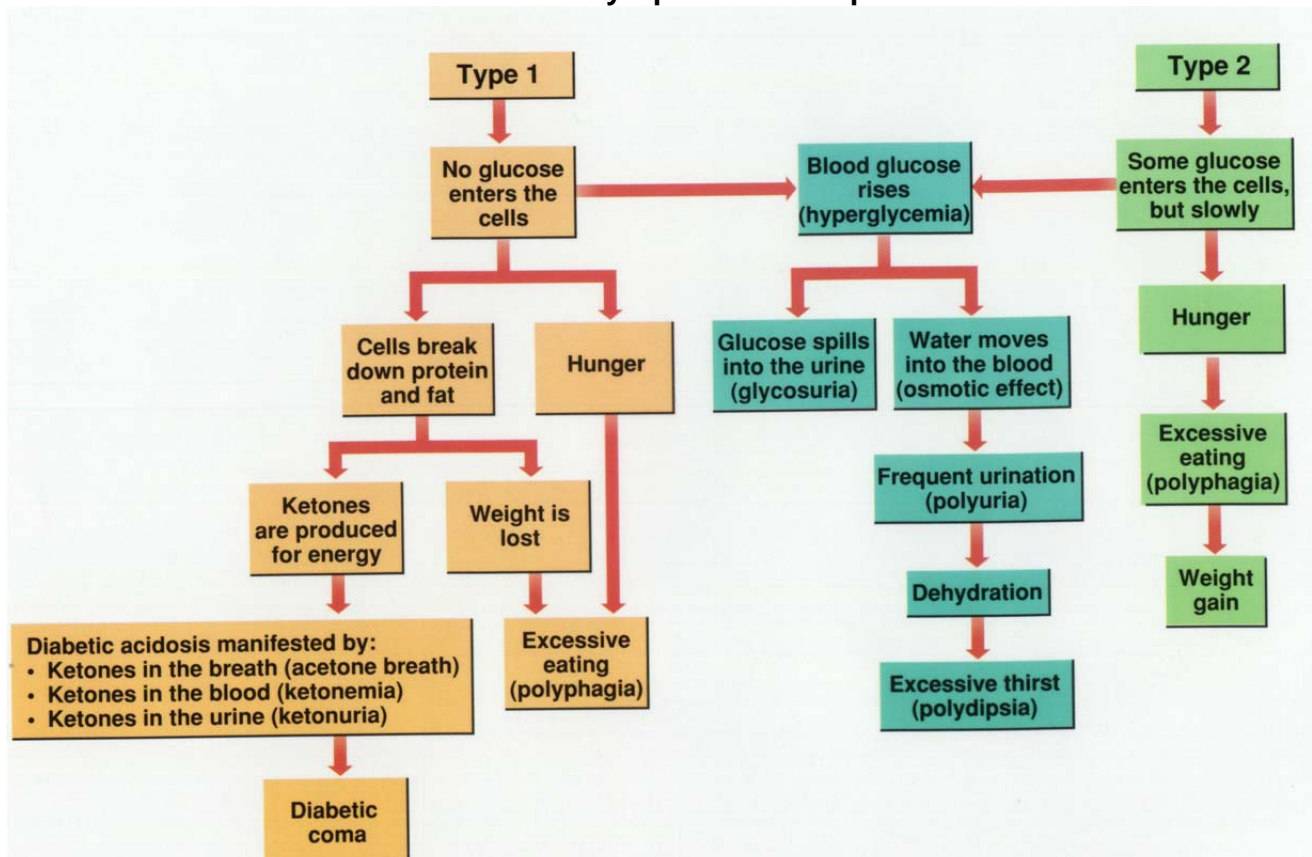
Diabetes Mellitus

Diabetes is the sixth leading cause of death in the United States and a contributor to kidney disease, cardiovascular disease and hypertension. Diabetics have twice the risk of the general population of cardiovascular disease.

Diabetes results when the levels of glucose in the blood are high because one cannot produce insulin, which promotes uptake of glucose into cells, or cells do not respond to insulin produced – insulin resistance. About 5 - 10% of diabetes is caused from the pancreas' inability to produce insulin. This is known as **Type 1 Diabetes**. Those who have Type 1 diabetes must have insulin provided and are insulin-dependent. Type 1 diabetes is sometimes called **IDDM**.

Type 2 Diabetes occurs when the cells do not respond to the insulin produced. Type 2 diabetes used to be a disease of older people and has a large obesity component. People who are obese require more insulin to maintain normal blood glucose levels. Type 2 diabetes is showing up in increasingly younger people in the United States. Type 2 diabetics can often control their disease with diet and weight control and may not need additional insulin. Often, people with type 2 diabetes produce excessive quantities of insulin since the signal to produce insulin is high blood glucose.

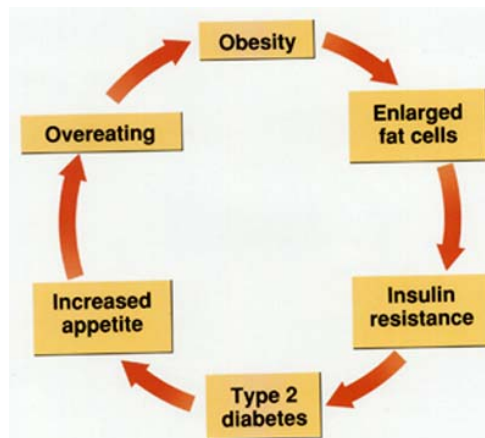
Diabetes Symptoms Compared



Diabetes is an insidious disease with multiple complications and health compromises. Those who have diabetes must regulate blood glucose levels through diet.

Type 1 diabetics must be excessively sensitive to diet to minimize blood glucose overloads and underloads and regulate insulin injections to meet body needs. The **American Diabetic Association** produced the original exchange plan diets for those with diabetes.

Those with type 2 diabetes need to moderate weight and control diet for many of the same reasons. A moderate and monitored intake of carbohydrate uniformly spaced throughout the day is often recommended. Often those with type 2 diabetes who are also obese (which is most) have elevated blood lipid levels and must also moderate fat intake. Type 2 diabetics may be the group who benefit from a bit more protein in their diet. However, a diet high in whole grains, legumes and lots of vegetables is best.



Effects of Diabetes

Complications from glucose imbalances damage blood vessels. Diabetes affects all blood vessels, both large and small.

- Artherosclerosis risk doubles among diabetics.
- Kidney vessels are damaged and kidney disease is a complication of diabetes.
- Blood vessels in the eyes are damaged leading to blindness.
- Nerve damage results from lack of proper circulation. Diabetic neuropathy is common.
- Circulation is affected with damage, and gangrene, particularly of the lower extremities is a risk. Diabetics suffer amputations from loss of circulation and subsequent gangrene.

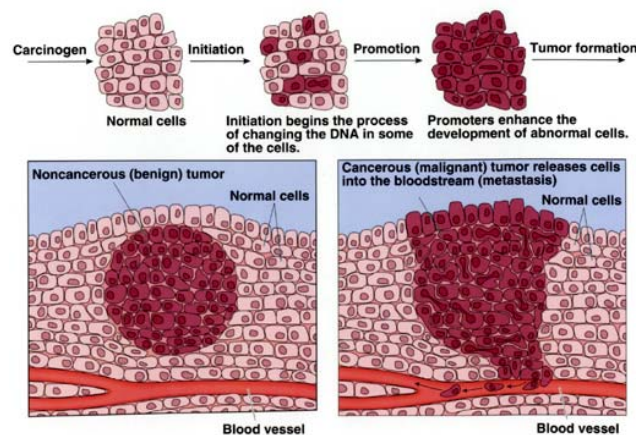
Cancer and Nutrition

The current estimates are that 1/3 of the children born today will get some form of cancer in their lifetime. Lung cancer is still a major killer, and the cause of most lung cancers is straightforward: smoking. The three most common cancers are breast cancer (an assortment of cancers), prostate cancer and colon cancer.

When cancers develop cell division controls malfunction. For example, normal cell division has a number of checkpoint controls that ensure that division proceeds correctly. When checkpoint controls go awry, abnormal division results. Cancer cells have abnormal plasma membranes and abnormal cytoplasm. Cancer cells divide rapidly and ignore overcrowding inhibition signals. They can make masses of cells called tumors. Once cell controls are not in effect, rapidly dividing cancer cells lose normal positioning and adhesion properties, too. Cancer cells can spread to other areas of the body, or **metastasize**. Once a cell line becomes cancerous, cell division cannot be stopped, and will continue until the individual in whom the cancer cells reside dies, unless the cancer cells can be successfully destroyed or excised surgically.

From what we know today, the steps in cancer development are:

- Exposure to a carcinogen from the environment by ingestion, inhalation, etc., naturally or via contamination
- Entry of the carcinogen into a cell
- Initiation of cancer via sufficient DNA changes in cell division control genes
- Promotion and enhancement of cancer via cell transformation
- Tumor formation and uncontrolled cell growth



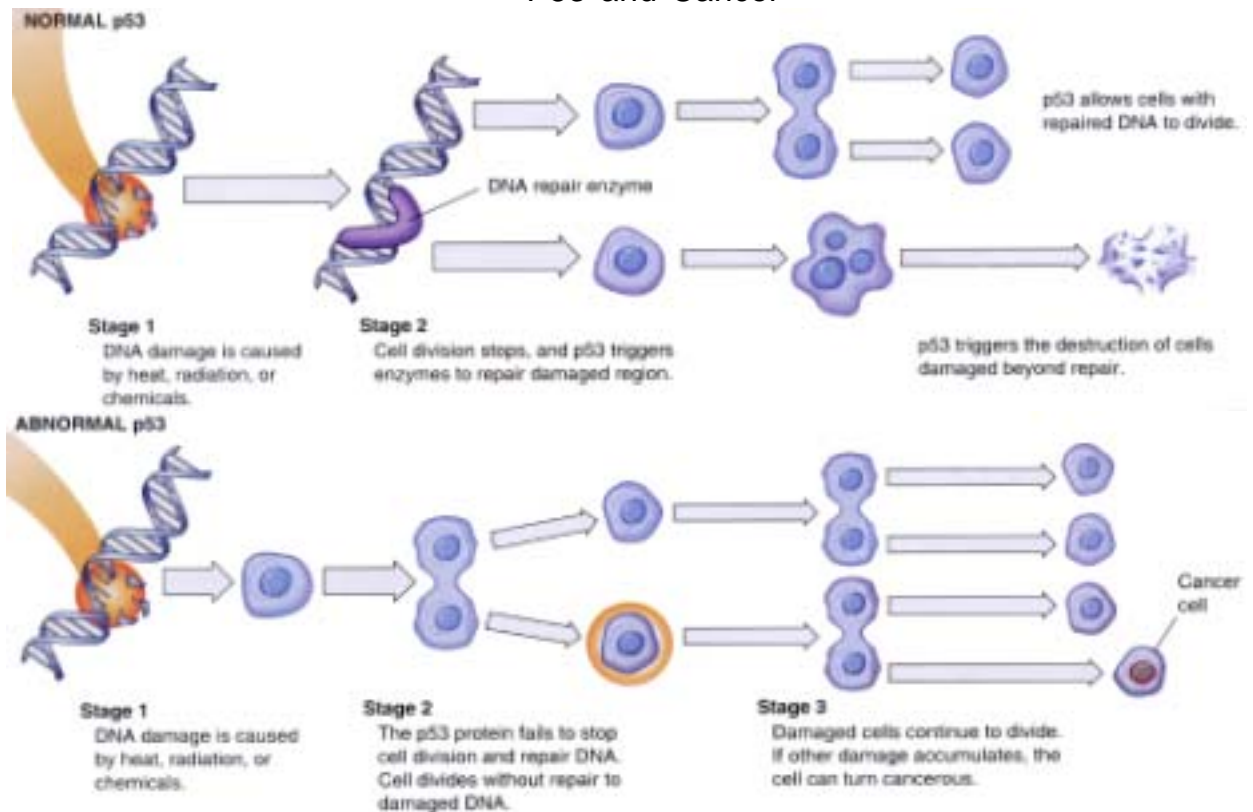
Most believe that the onset of cancer is an accumulation of mutations rather than one single alteration. This correlates with the increase in many cancers with aging. A gene that has the potential to induce cancer is called an **oncogene**.

No one knows why any one person gets cancer. Some cancers are familial, and probably genetic. Some cancers are related to the environment, especially the smoker's environment. A substance that causes a change in DNA that can lead to cancer is a **carcinogen** and exposure to a carcinogen is the first step in cancer.

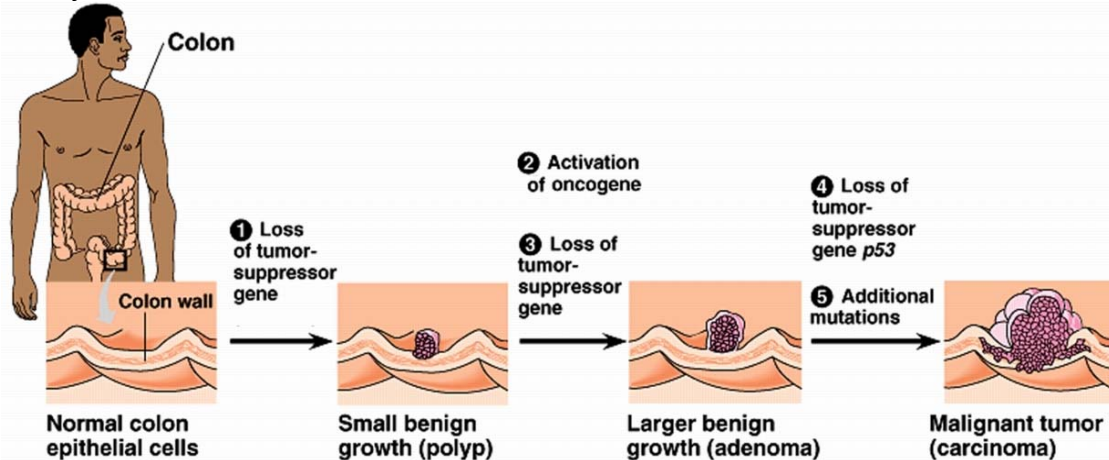
Any number of things in our surroundings can activate oncogenes. Chemicals that do so are called carcinogens. Radiation and the combustion products from tobacco are two of the most common carcinogens. Asbestos and some heavy metals in particulate form are also carcinogens. Many steroids in higher than normal concentrations are carcinogenic. For others, substances in foods may be cancer causing, cancer promoting or, conversely cancer preventing. A high fat, low fiber diet is suspected as being cancer promoting. A diet with abundant cruciferous vegetables may be anti-cancer promoting. Some viruses promote cancer formation.

One specific protein product of an oncogene that is important in cell division is the **P53 tumor suppressor gene**. P53 is a transcription factor for genes that keep a cell's DNA repaired and genes that delay the cell's rate of cell division so that there is time for DNA repair. If the cell is in bad shape, P53 activates cell suicide genes to prevent the harmful mutations from being passed on. Such cell death is called **apoptosis**. When p53 is defective or missing, cancers are more likely.

P53 and Cancer



Familial colon cancer provides an example of how an accumulation of malfunctions of gene controls progresses into cancer. Mutations in cells of the colon affect tumor-suppressing genes that result in abnormal cell division forming a polyp. Activation of an oncogene further affects tumor-suppressing genes so the growth enlarges. If P53 is affected, it can no longer call in the cell-destroying or DNA repair enzymes, so additional mutations result leading to malignancy.



Nutrition seems to be most important in inhibiting the initiation and promotion cancer steps. For colon cancer, adequate calcium, vitamin D and folate may reduce risk, along with a general diet rich in whole grains, vegetables and fruits and low in fat and especially low in animal fats and red meats.

Some Evidence for Dietary Causes of Cancer

- Japanese immigrants to US have increased colon cancer and decreased stomach cancer when US food habits adopted (second generation). Japanese in Japan have high stomach cancer and low colon cancer.
- 7-Day Adventists have 1/2 to 2/3 lower cancer mortality than population as a whole (This is when cancers linked to smoking and alcohol are not counted.) They are generally ovo-lacto-vegetarians. Smoking and alcohol are not a part of the 7-day Adventist life style. Hot condiments, spices and pork are also not allowed in the diet. Many are college educated.
- Affluence and diets rich in fat and animal protein are cancer correlated. Breast and colon cancer are correlated with affluence.
- Laboratory studies show that animals exposed to carcinogens are more likely to develop tumors when fed a high fat diet.

High Fat Diet and Cancer?

- Diets high in fat may displace fruits, vegetables and grains that contain substances that might inhibit cancer.
- Diets high in polyunsaturated fatty acids, in particular omega-6 fatty acids may affect the integrity of cell membranes, making them more susceptible to carcinogen entry.
- Those with a higher proportion of body fat secrete more steroid hormones. Many breast cancers are estrogen positive.

High Fiber Foods and Cancer Prevention?

To substantiate the positive role of fiber, people with high fat diets who also have high fiber intake have lower rates of cancer than those who have high fat with low fiber diets.

- Fiber speeds transit time in intestine (less exposure to harmful materials)
- Vegetables and whole grains high in fiber are those foods that also contain phytochemicals and antioxidants that might be protecting cells from potential carcinogens. It may be the food in which the fiber is delivered, not fiber that protects.

The following have been established as affecting carcinogens. All are in plants.

- Folate is needed to repair DNA. Folate is abundant in green leafy vegetables.
- Vitamin C inhibits the formation of nitrosamines, common in cured meats, and is an anti-oxidant.
- Vitamin A plays important role in the immune system and maintaining mucus membranes.
- Phytochemicals in many plants stimulate the production of carcinogen destroying enzymes.
- Indoles and other substances found in Cruciferous vegetables induce the activity of an anti-cancer enzyme.
- Resveratrol in grapes and peanuts helps scavenge carcinogens.
- Citrus fruits contain limonene and other flavinoids.
- Legumes have protease inhibitors and saponins which may prevent tumors from spreading and cancer cells from multiplying.
- Allyl sulfides produced by members of the *Allium* genus increase production of enzymes that help excrete carcinogens.
- Phytic acid found in grains binds excess iron preventing iron from producing free radicals.
- Vitamin E as an antioxidant may destroy free radicals.

The Bottom Line for Health

Whole Grains
Legumes
Cruciferous Vegetables
Carotene rich foods
Vitamin C rich foods
Vitamin E rich foods

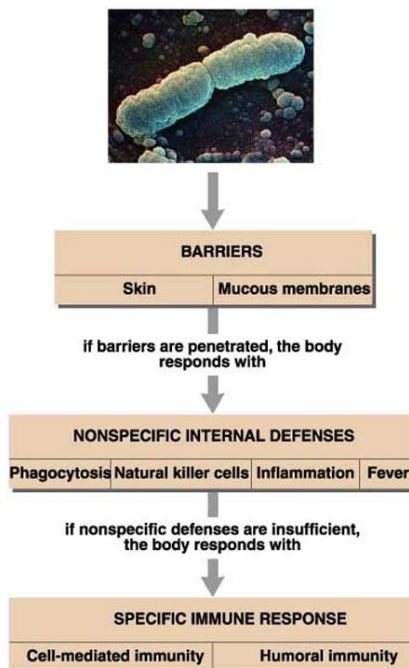
A good mix of grains, legumes and other vegetables, with fruits for taste!

The Immune System and Health

Our immune system is our first defense against foreign substances: spores, bacteria, viruses, particulates, etc. It is a multiple defense system, specific and non-specific, external and internal. Better overall health produces a better overall immune system. There is no one nutrient or type of nutrient that assures maximum functioning of the immune system, but balanced diets do provide all cells of the body with the best chance of being able to do their specific jobs. This is equally true for the cells of the immune system. In addition, proper food handling reduces the exposure of our digestive system to potential pathogens and other harmful substances. Malnutrition reduces the ability of one to face infections and disease and is a primary contributor to the thousands of deaths that occur daily in our world from hunger-related problems.



Let's look just briefly at our immune system before we leave our discussion of diet and health issues.



External Defenses of the Immune System

- The outer layer of our **skin** protects from water loss and penetration by unwanted substances
- Mucus membrane linings of digestive, respiratory and urinary systems prevent unwanted substances from penetrating into the body; mucus also traps bacteria and other substances

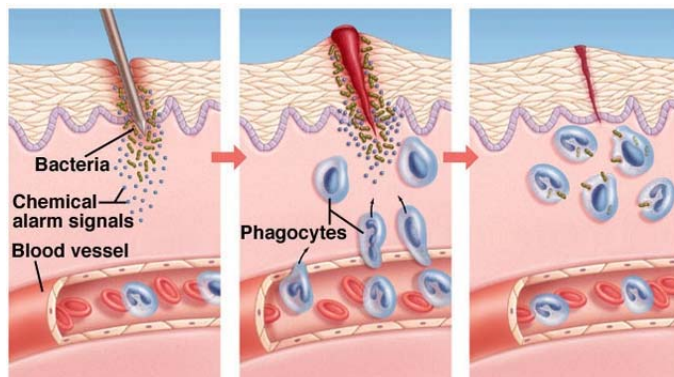


- A variety of secretions in saliva, tears and the gastric juices also protect.

Internal Defenses of the Immune System

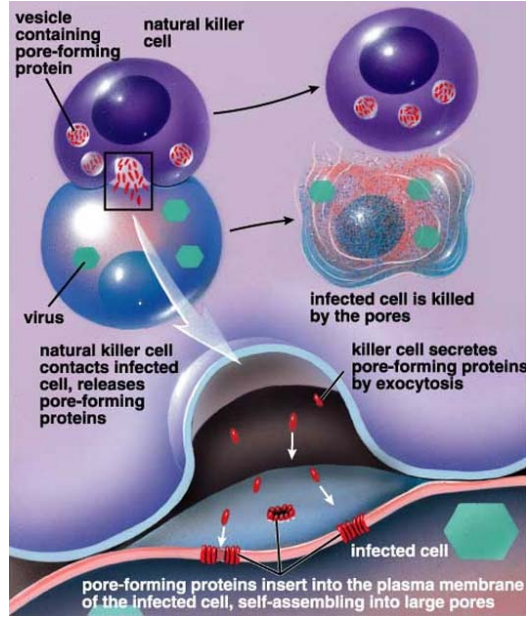
Non-specific Inflammatory Response

- Responds to
 - Foreign substances
 - Damaged tissues
- Localized chemical signals are produced which include
 - Localized chemical signals (**kinins** and **histamines**), produced by "most cells", promote vasodilation in response
 - **Pyrogens** affect the temperature regulators of the brain resulting in increased temperature, which may inhibit some pathogens
- Inflammation: Swelling and redness in area from increased blood flow and fluid accumulation results



Inflammation Response

- Capillaries become leaky to plasma proteins, including a special set of proteins called **complement**.
 - Complement enhances dilation and permeability of cell membranes. Natural "Killer" WBCs migrate from blood to region of "damage" to destroy damaged cells.



- Complement releases phagocytic- attracting chemicals. Phagocytic WBCs migrate from blood to region of "damage" to consume foreigners by phagocytosis.



WBC leaving capillary



Phagocytosis

Symptoms of non-specific inflammatory response in action

- Increased temperature, inflammation and pain in injured area
- Swelling stimulates pain receptors and pain-causing chemicals, such as prostaglandins so we are aware of the problem
- Fluids causing swelling may help to cushion injured area

Specific Immunity)

The specific immune response is responsible for maintaining tissue environment and for destroying specific invaders as well as damaged tissues.

Specific immunity is the function of two groups of WBC that "patrol" the body and reside in lymph tissues.

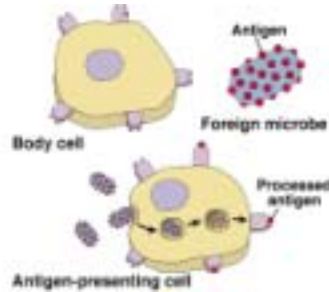
- T-cells (T-lymphocytes)
T-cells are made in bone marrow and mature in the thymus (with specific antigen recognition). T-cells target body cells and tissues that are infected or damaged.
- B-cells (B-lymphocytes)
B-cells are made and mature in bone marrow (with specific antigen recognition). B-cells target pathogens in the extracellular environment.

How do specific immune cells work?

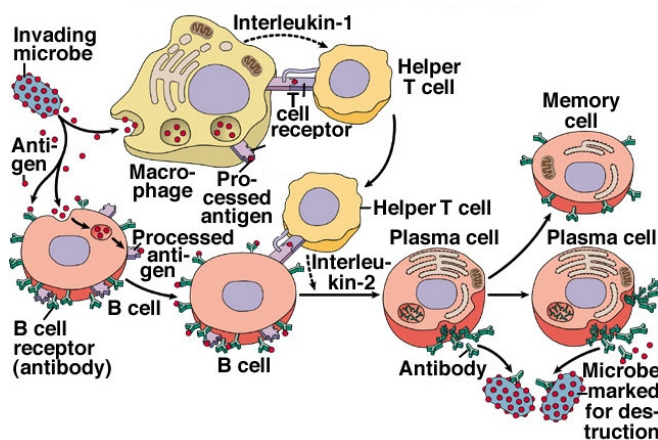
Primary Immunity

Circulating macrophages of the non-specific defense system trigger the specific immune system. These macrophages are responsible for programming specific lymphocytes in the body

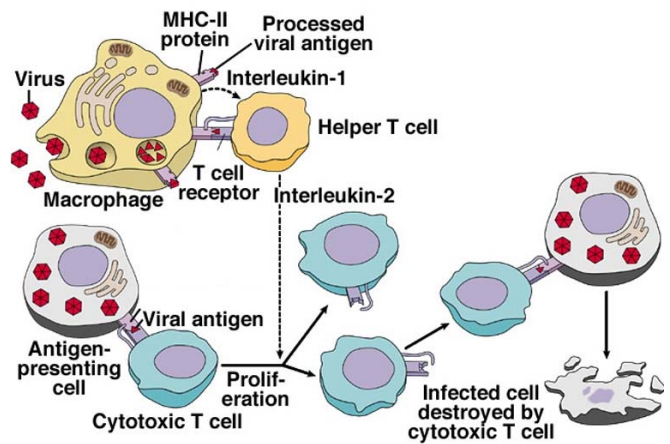
- As circulating macrophages "digest" invaders, the antigen (the substance recognized as foreign, or the "trigger") of the invading substance is transferred to the macrophage surface as a unique **antigen marker**.



- Virgin B-cells may also contact the antigen while in circulation, and process the antigen. Once a B-cell processes an antigen it becomes a specific B-cell.
- As antigen-marked macrophages circulate, they come into contact with Helper T-cells and stimulate helper T-cells to activate a series of specific immune system responses.
 - Helper T-cells bind to antigen-possessing B-cells to promote rapid division of specific B-cells
 - Helper T-cell secretions promote rapid division of Cytotoxic (Killer) T-cells



B-cell Antibody Sequence

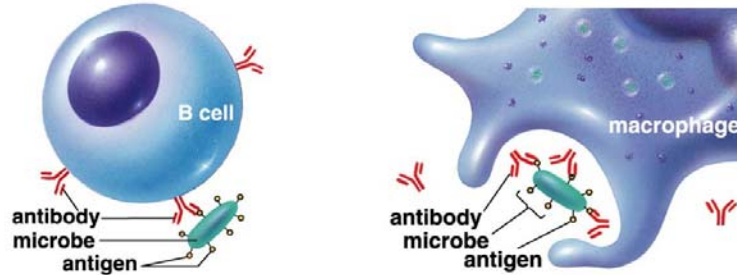


Cytotoxic T-Cell Sequence

Anti-body (Humoral) Mediated Response for Extracellular Targets)

Sensitized B-cells (with the antigen marker) divide rapidly and differentiate into **plasma cells** that secrete **antibodies**. Antibodies act in the following ways:

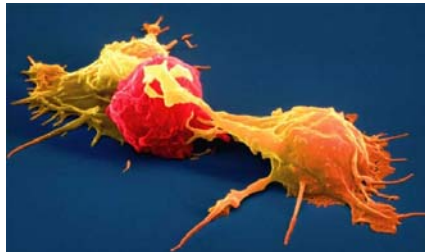
- Antibodies neutralize toxins by coating the molecules so they become inactive.
- Antibodies cause agglutination of foreign cells, so macrophages can consume the clump.
- Antibodies can cause antigens to precipitate so macrophages can consume them.



Some B-cells divide and form memory cells for subsequent attacks. These memory cells reside in lymph nodes until needed.

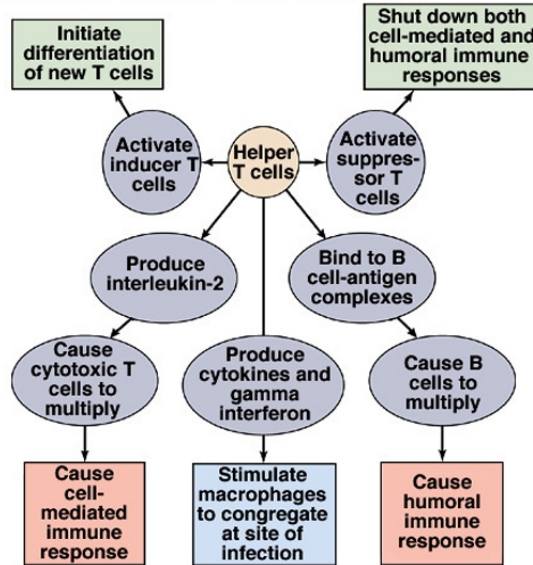
Cell-Mediated Immune Response (T-cell activity)

A few sensitized (marked) T-cells can be stimulated by a helper T-cell to divide rapidly and form an army of **Cytotoxic T-cells**. Cytotoxic T-cells work by "punching holes" into target cells (those infected with a virus, damaged, diseased, or a foreign substance) causing the cells to be destroyed.

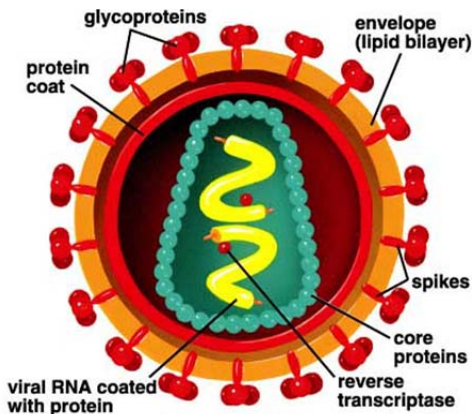


Cytotoxic T-cells and Cancer Cell

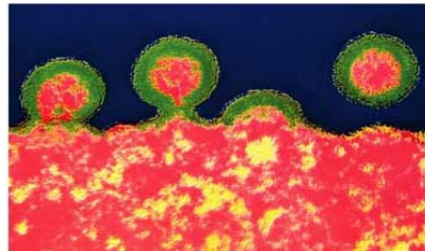
- Other T-cells become suppressor T-cells that secrete chemicals to diminish the division of B and T cells as the amount of antigen diminishes (when the job is done)
- Some T-cells become memory cells needed for a secondary response.
- The majority of T-cells in circulation, however, are the Helper T-cells that enhance the immune response when activated by antigens, as discussed.



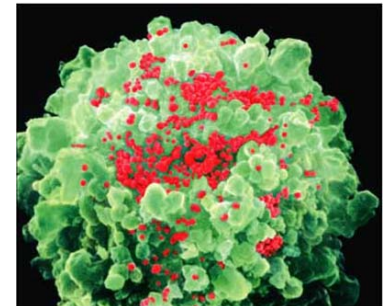
HIV (the virus responsible for AIDS) attacks helper T-cells, specifically the CD4+ T-cells, seriously impacting the specific immune system response, as the T-cells are damaged and destroyed.



HIV



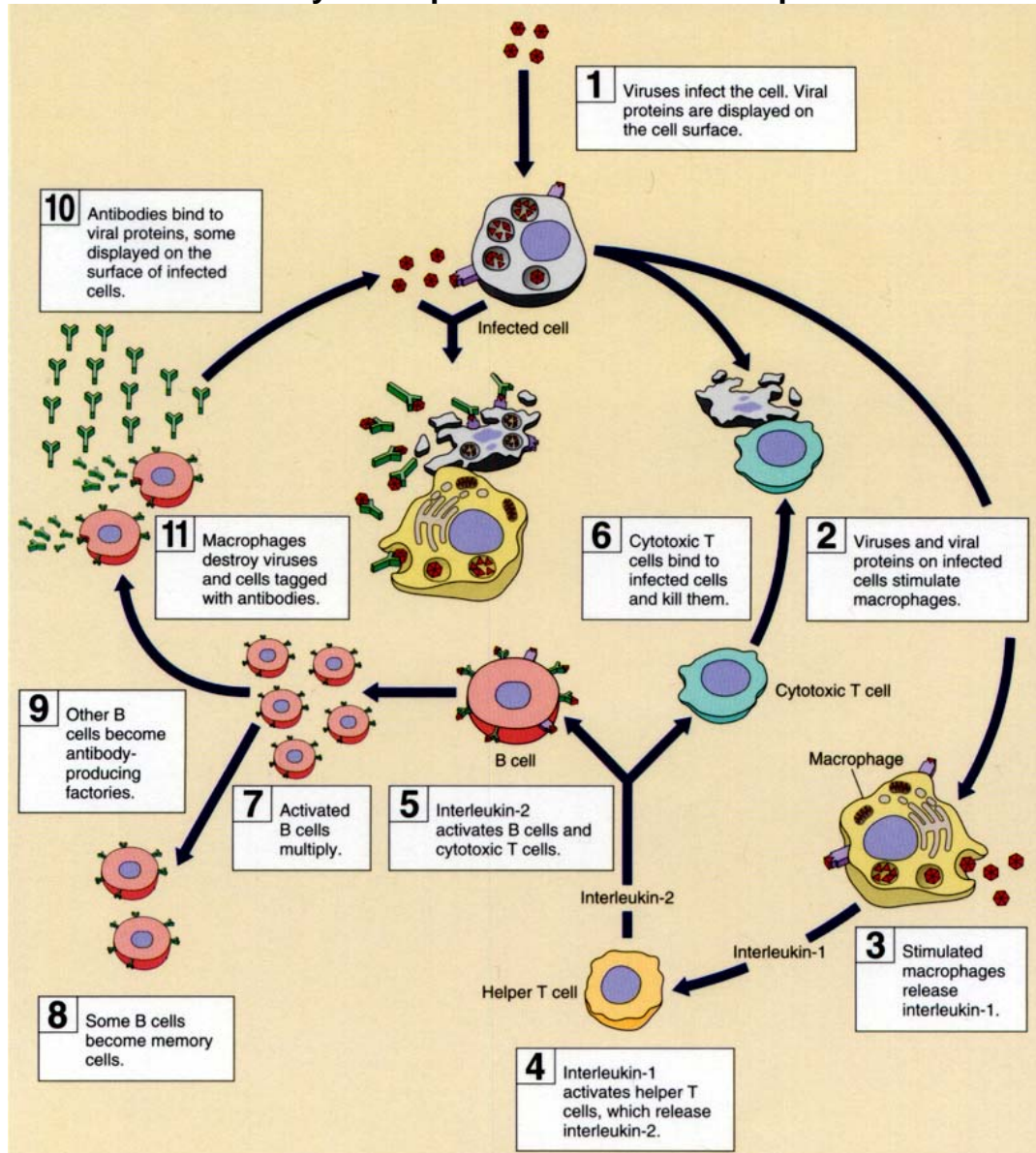
HIV on surface of helper-T cells



Ultimately, with the immune system undermined in this way, the body weakens and cannot fight off infectious diseases and other foreign substances. Once HIV infection progresses to AIDS, those infected too often exhibit wasting symptoms, related to starvation and the body's immune system's inability to respond to infection and disease. Inadequate food consumption, malabsorption, the drug therapies and other intestinal distress along with increased metabolic rate all contribute to the wasting symptoms. Nutritional adequacy and food safety is critical for those with HIV. People with weakened immune systems are more susceptible to food-borne illnesses.

A first exposure (primary immunity) requires about 6 - 10 (or more) days to be effective. After the first exposure memory cells can activate responses in 1-2 days.

Summary of Specific Immune Response

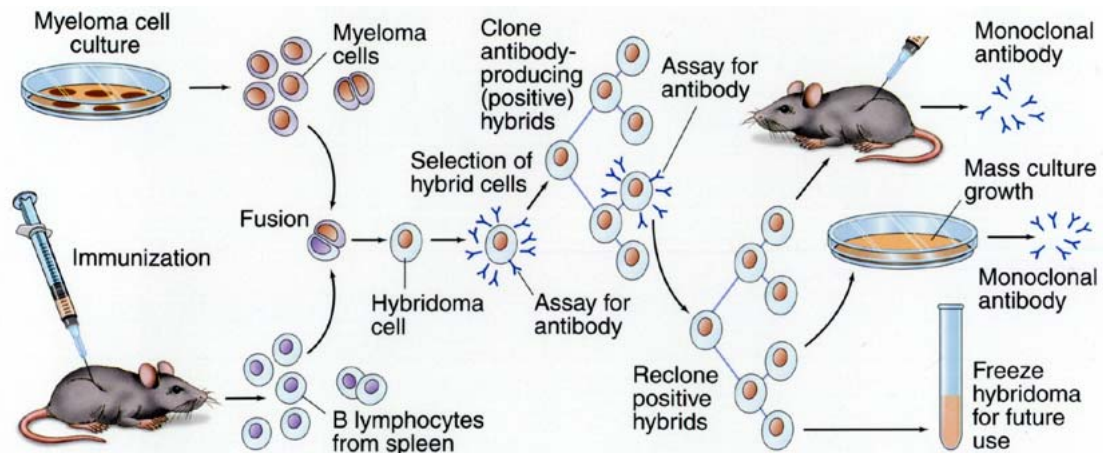


Secondary immunity - Immunization

The immune system can be activated by the deliberate introduction of an antigen to promote development of memory lymphocytes. **Active immunity** can be accomplished through vaccination. A vaccine can be a weakened (non-lethal) form of invader or a toxic by-product of an invader. A **booster** provides subsequent exposure that ensures more rapid future immune response.

Passive immunity can be obtained from a mother who passes antibodies through the placenta or when nursing to an infant. Passive immunity is sometimes distributed by injection of specific antibodies using an animal serum (such as horse serum). Passive immunity is not permanent since no memory cells are induced. The recipient is receiving pre-made antibodies only.

Monoclonal antibodies are used in medical diagnoses such as pregnancy detection. A host organism is exposed to a specific antigen and then "sacrificed". B-lymphocytes are removed from the spleen and incubated with cancer cells in culture. The cells formed produce large amounts of monoclonal antibodies with the specific antigen marker. Monoclonal antibodies can also be injected back into the antigen donor for passive immunity from the specific antigen. Genetically engineered monoclonal antibodies are used for some cancer treatments. They target growth factor signal proteins that promote cell division in cancer cells and signal the immune system to destroy them.



Problems with the Immune System

The immune system is not perfect. Allergies are caused by an immune system that is too reactive, particularly the non-specific histamine responses. Autoimmune diseases such as rheumatoid arthritis and lupus are debilitating. Those who require organ transplants face tissue rejection because the transplanted tissue is recognized as foreign. Some components of aging may be related to the failure to recognize non-self, opening our bodies up to foreign invasion.