NON-INFECTIOUS DISEASES

Cardiovascular Disease: Diseases not caused by pathogens are called non-infectious diseases. Diseases caused by unhealthy blood vessels are called cardiovascular diseases. Cardiovascular disease affects one out of every two people in the U.S.

Types:
- Hypertension / High Blood Pressure:
  - Constant, unhealthy, high pressure against artery walls
  - Pressure against artery walls during a heartbeat
  - Pressure against artery walls in between heartbeats

- Fatty plaque build-up inside arteries (primarily coronary arteries)
- Chest pain / Pressure due to lack of oxygen to the heart
- Unuseful quivering of the heart - resulting in no blood flow - MUST BE SHOCKED!
- When part of the heart dies due to lack of oxygen as a result of a blocked coronary artery
- When part of the brain dies due to lack of oxygen

Cancer:
- What is it? Rapid, uncontrolled growth and reproduction of abnormal (good-for-nothing) cells
- What's the difference between a malignant and a benign tumor? Benign = non-cancerous / Malignant = cancerous
- What is metastasis? When a malignant tumor spreads to other parts of the body

Classifications of cancers and tissues involved:

<table>
<thead>
<tr>
<th>Classification</th>
<th>Tissue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carcinoma</td>
<td>skin or tissues that line or cover internal organs.</td>
</tr>
<tr>
<td>Sarcoma</td>
<td>bone, cartilage, fat, muscle, blood vessels, or connective or supportive tissue.</td>
</tr>
<tr>
<td>Leukemia</td>
<td>blood-forming tissue such as the bone marrow</td>
</tr>
<tr>
<td>Lymphoma</td>
<td>cells of the immune system.</td>
</tr>
<tr>
<td>Central nervous system cancers</td>
<td>cancers of the brain and spinal cord</td>
</tr>
</tbody>
</table>
Cancer causing agents are otherwise known as: **Carcinogens**

Name three carcinogens that you have heard of:

- Oncogenes

Oncogenes are:

- Cancer causing genes (stimulated by carcinogens)

Major risk factors for cancer that are associated with lifestyle choices:

- Smoking, excessive alcohol intake, high fat diet, excessive sun exposure

**ABCD’S OF SKIN CANCER**

<table>
<thead>
<tr>
<th>Asymmetry</th>
<th>Border irregularity</th>
<th>Color</th>
<th>Diameter: ⅛ inch or 6mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;image&gt;</td>
<td>&lt;image&gt;</td>
<td>&lt;image&gt;</td>
<td>&lt;image&gt;</td>
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</tbody>
</table>

**Specific Cancer Signs and Symptoms**

- Change in Bowel Habits or Bladder Function
- A Sore That Do Not Heal
- Unusual Bleeding or Discharge
- Thickening or Lump in Breast or Other Parts of the Body
- Indigestion or Trouble Swallowing
- Obvious, recent Change in a Wart or Mole (A,B,C,D’s)
- Nagging Cough or Hoarseness

**ABCD’S OF SKIN CANCER**

- **A- Asymmetry:**
  - If one-half of the mole or growth does not match the other half.

- **B- Border Irregularity:**
  - If the edges of the mole or growth are ragged, notched or blurred.

- **C- Color:**
  - The pigmentation of the growth is not uniform. Shades of tan, brown and black are present. Dashes of red, white and blue add to the mottled appearance.

- **D- Diameter:**
  - If the width is greater than 6 mm (about the size of a pencil eraser), it could be an indicator of an abnormal skin growth.
<table>
<thead>
<tr>
<th>Treatments for cancer</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Radiation**        | • high doses of radiation to kill or damage cancerous cells  
• breaks a strand of the DNA molecule inside the cancer cell  
• a local treatment. |
| **Chemotherapy**     | • taking certain types of medicines (drugs) to treat cancer.  
• More of a widespread treatment |
| **Surgery**          | • Most people with cancer will have some type of surgery. |
| **Immunotherapy**    | uses certain parts of the immune system to fight disease, including cancer.  
* stimulating your own immune system to work harder or smarter  
* giving you immune system components, such as man-made immune system proteins  
used along with or after another type of treatment to boost its effects. |

How does bacteria cause infection?

- They can live on their own
- They multiply quickly - and die quickly
- When they die they let off toxins that make us sick

**FACT:**
To prevent food poisoning - keep hot foods hot and cold foods cold. Bacteria multiply fastest in foods kept at room temp. Bacteria do not grow at temperatures below freezing but they may survive, so it's important to thaw frozen foods in the refrigerator to prevent growth. What do you think are some other ways to prevent food poisoning?

- Keep hot foods hot and cold foods cold
- Wash hands often
- Cook chicken, fish and pork thoroughly
- Use different utensils/cutting boards for handling raw meat (prevent cross-contamination)
- Thaw food in refrigerator
- Do not refreeze food

### INFECTIOUS DISEASES
Infections are the most common cause of human disease. They range from the common cold to debilitating conditions like chronic hepatitis to life-threatening diseases such as AIDS. Disease-causing microbes (pathogens) attempting to get into the body must first move past the body’s external armor, usually the skin or cells lining the body’s internal passageways.

Name and explain the four ways that humans generally contract pathogens.

1. **Person to Person**
   - Common Cold
   - Influenza

2. **Person to Animal**
   - Rabies
   - Bird Flu

3. **Person to Contaminated Object**
   - Food Poisoning
   - Door Handles

4. **Person to Environment**
   - Tetanus
   - Giardia (Montezuma’s Revenge)

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<table>
<thead>
<tr>
<th>TIME</th>
<th>NUMBER OF BACTERIA</th>
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</thead>
<tbody>
<tr>
<td>10:00</td>
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<tr>
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<td>18:00</td>
<td>2,067,152</td>
</tr>
</tbody>
</table>
How does viruses cause infection?

• They cannot live on their own (They are ‘half-lifes’)

• They need a ‘HOST CELL’ to inject their DNA into

• They hijack the host cell and use it as a VIRUS FACTORY

• Once enough virus is made - the host cell ruptures and the new viruses go looking for more host cells to hijack

LINES OF DEFENSE AGAINST INFECTION

Concentric Circle Defense

Just like a castle uses a concentric circle of defense tactic to defend itself against invaders - our immune system uses a similar defense strategy with 3 lines of defense against disease: 1) Physical/Chemical barriers, 2) Inflammation, 3) Immune System

Identifying SELF VS. NON SELF

The key to a healthy immune system is its remarkable ability to distinguish between the body’s own cells—self—and foreign cells—nonself.

The body’s immune defenses normally coexist peacefully with cells that carry distinctive “self” marker molecules. But when immune defenders encounter cells or organisms carrying markers that say “foreign,” they quickly launch an attack.

Anything that can trigger this immune response is called an antigen. An antigen can be a microbe such as a virus, or even a part of a microbe. Tissues or cells from another person (except an identical twin) also carry nonself markers and act as antigens.

Briefly Explain why tissue transplants may be rejected.

The tissue is not recognized and instead attacked like it is an antigen

1st Line of Defense: Physical and Chemical Barriers

The pathogen must enter the body through 1st line of Defense

The skin provides an imposing barrier to invading pathogens. It is generally penetrable only through cuts or tiny abrasions. The digestive and respiratory tracts—both portals of entry for a number of microbes—also have their own levels of protection. Microbes entering the nose often cause the nasal surfaces to secrete more protective mucus, and attempts to enter the nose or lungs can trigger a sneeze or cough reflex to force microbial invaders out of the respiratory passageways. The stomach contains a strong acid that destroys many pathogens that are swallowed with food.

List some Physical or Chemical Barriers the body uses to thwart off initial invasion of pathogens.

- Skin
- Sweat
- Tears
- Saliva
- Hair
- Sneezing
- Coughing
- Stomach acid
- Feces
- Urine
- Vomit
- Mucus
- Cilia
Everything that enters our body gets asked for its identification (is it a friend? Or foe?) If it is not recognized as a friend it is called an **antigen** and is then attacked.

**3rd Line of Defense: Immune System**

- HELPER T-CELLS
- KILLER T-CELLS
- B CELLS
- ANTIBODIES
- PHAGOCYTES

All immune cells begin as immature **stem cells** in the bone marrow. They respond to different **cytokines** (**chemical signals**) to grow into specific immune cell types, such as T cells, B cells, or phagocytes.

**2nd Line of Defense: Inflammation**

Generalized responses to pathogen infection - not targeted at a specific cell type
Causes localized redness, swelling, heat, and pain

**Phagocytes** - scavenger cells which "eat" foreign material to destroy them
Macrophages secrete communication chemicals to other white blood cells = increases body temperature (i.e. causes a fever)
- This enhances the WBC's ability to protect the body
- Causes drowsiness - reduces the body's energy usage and stress

**I am a HELPER T-CELL and I have a very important job in the immune system:**

1) I am the ‘General’ of the immune system - I coordinate immune responses by communicating with other cells - I GIVE THE ORDERS WITHOUT ME THE TRAINED KILLER CELLS WOULD NEVER GET THE ORDERS TO FIGHT!
I am a KILLER T-CELL

1) I am a specialized T-Cell that looks for pathogens to kill directly

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I am a B-CELL and I have 2 important jobs in the immune system:

1) I make a Chemical ‘Sketch’ of every new Intruder (Pathogen)

2) I make specific Antibodies that ‘tie-up’ pathogens and render them harmless

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I am an Antibody

I am specific to just one pathogen and my job is to tie-up’ pathogens and render them harmless so that killer cells can destroy the pathogen.

---

I am a PHAGOCYTE

I AM AN EATER CELL or a scavenger cells that "eats" foreign material to destroy them.
What does it mean to be immune to a disease?

You have already made the sketch and the antibodies that recognize the specific pathogen - therefore it cannot make you sick.

Young children get a greater number of infectious diseases per year than older children and adults. Why do you think this is so?

They haven’t lived long enough to have developed enough ‘sketches’ - therefore pathogens enter the body ‘unrecognized’.

Disorders of the Immune System

Allergies (A CASE OF MISTAKEN IDENTITY!)
The most common types of allergic diseases occur when the immune system responds to a false alarm. In an allergic person, a normally harmless material such as grass pollen or house dust is mistaken for a threat and attacked.

Disorders of the Immune System

Autoimmune Diseases
Sometimes the immune system’s recognition apparatus breaks down, and the body begins to manufacture T cells and antibodies directed against its own cells and organs. Misguided T cells and autoantibodies, as they are known, contribute to many diseases.

- T cells that attack pancreas cells contribute to diabetes
- Autoantibodies known as rheumatoid factor is common in people with rheumatoid arthritis.
- People with systemic lupus erythematosus (SLE) have antibodies to many types of their own cells and cell components.