

College Guild

PO Box 696, Brunswick, Maine 04011

Health and Disease

Unit 5 of 5

The Immune System

Welcome to the last unit of this course: The Immune System! Unlike the other bodily systems in the course which are associated with an organ (i.e., the heart, lungs, or brain), the immune system is made up of a complex network of different types of cells, proteins, and organs all over the body. These components come together to cause allergies, fight dangerous infections, and even heal your wounds. This final unit will focus on understanding some of the immune system's main functions, as well as reflecting on how you can use the knowledge of this course to stay healthy.

DISCLAIMER: Under many prison regulations and restrictions, inmates are *not* allowed to provide medical care under the direction of organizations or educational resources such as College Guild. This curriculum therefore serves as a purely educational resource to those interested in learning (a) more about their health and (b) some of the interventions that medical professionals use, NOT as instructions to provide that medical care or directions to make treatment decisions.

Glossary of Terms

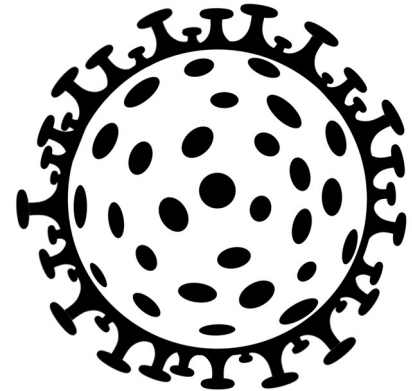
1. **Immune system:** the complex system of organs, tissues, and cells that fight infection and protect you from harmful substances.
2. **Germ:** A microorganism such as viruses or bacteria. Usually associated with disease.
3. **Viruses:** An often-disease-causing germ that multiplies inside the hosts' living cells.
4. **Antibody:** A type of protein in our bodies produced by our immune systems that binds specially to harmful substances (i.e., from disease or allergens) called **antigens**.
5. **Antigens:** Any substance that triggers the immune system to produce antibodies against it.
6. **Immunity:** Resistance to a specific disease-causing organism, such as a **virus**.
7. **Vaccine:** A drug that is designed to stimulate **immunity** to a particular infectious disease.
8. **Anaphylaxis:** An life-threatening allergic reaction that affects a person's circulation or ability to breath.
9. **Allergen:** Any substance that can cause an allergic reaction.
10. **Shock:** A life-threatening condition when there is insufficient blood flow in the body.
11. **Antihistamines:** A class of drug that treats mild allergy symptoms.
12. **Hives** or (Urticaria): Red, itchy, raised bumps on the skin. Caused by mild and severe allergic reactions.
13. **AIDS:** A life-long disease caused by the **HIV** virus that progressively destroys your immune system.
14. **Hepatitis B:** An often-life-long disease caused by the HBV virus that damages your liver.

Part One: Infection and COVID-19

We commonly associate getting sick with getting a fever, headaches, and a runny nose — but why do we feel this way? What is happening to our bodies? And how do we feel better? This is the job of the **immune system**. It is first important to understand what it means to get sick. Getting **infected** means that a **germ**, or disease-causing microorganism (such as bacteria, **viruses**, or fungi) has entered your body and begun to spread. **Viruses**, for example, invade our body's cells and use them to multiply, helping them to spread throughout our bodies. This process can kill, damage, or change the infected cells, triggering our immune system to fight it off. This activation of the immune system makes us “feel sick” as our body works to fight off the **infection**.¹

1. **Remember the last time you got sick. What happened to your body?**
2. **Microorganisms like viruses are incredibly small — *billions* can fit on the tip of a pin! Since viruses are invisible to the naked eye, how do you think our ancient ancestors explained “getting sick”?**
3. **Not all of our bodily defenses are microscopic. Why do you think we sneeze?**

You might have heard that white blood cells, a main part of the **immune system**, fight infection. They do so by identifying and attacking foreign invaders like **viruses**. White blood cells also produce **antibodies**, which are designed by your immune system to “defeat” a specific **virus**. They work kind of like a lock (**antibody**) and key (**virus**) — once your body successfully fights off the germ, it will keep this “key” in case you ever get infected with the same virus again. In other words, you get **immunity** from a specific disease when your body is able to make an **antibody** for it. This is why in most cases, you can't get the same **virus** twice.



A simplification of the COVID-19 virus
Via Wikimedia/McBdixon¹³

4. **Imagine we couldn't become immune from sicknesses, and get it multiple times in a row. With this in mind, why is having immunity so important for people who live together?**
5. **Why might someone who has been infected with COVID-19 twice have an easier time fighting it off the second time?**

Viruses, such as the SARS-CoV-2 virus that causes COVID-19, can be quite contagious. COVID-19 spreads primarily through droplets that infected persons release when they breathe, talk, or cough. These **virus**-containing particles get into our bodies by landing in our eyes, noses, mouths, or other openings in the body. It is important to note that the symptoms of COVID-19 — such as cold-like symptoms (eg., fever), loss of taste/smell, or body aches — usually take several days to begin, meaning that many who have contracted COVID-19 won't know they have it, potentially infecting others.²

6. **Think about these protocols used during the pandemic. Briefly explain why each is important:**
 - a. **Frequent hand-washing**
 - b. **The use of masks**
 - c. **Social distancing (maintaining 6ft+ between people)**

How do vaccines work?

Your body is able to produce **antibodies** to develop a “memory” of an illness so that it can fight it off easily — but what if we were able to give our bodies these “memories” without ever getting the **virus**? This is the basis of **vaccination**. For example, the Pfizer and Moderna COVID-19 vaccines work by delivering mRNA instructions to our bodies on how to make the proteins that trigger an **antibody**-producing immune response in our bodies.³ Therefore, COVID-19 **vaccines** do not have COVID-19 in them — a common misconception.

There is a lot of misinformation about **vaccines**. For example, many people used to believe that **vaccines** cause autism — this has been proven false, numerous times.⁴ **Vaccines are in no way harmful**, and allergic reactions are very rare. In fact, it is more likely to be *struck by lightning* than to have a bad reaction to a **vaccine**!⁵

*The most common reactions from a **vaccine** are very mild: pain at the injection sight, fever, or aches. These are signs that your body’s immune response is working.*



Via Pexels/cottonbro studio¹⁴

7. **It’s natural to be skeptical of vaccines — the science behind them is hard to understand. Using what you now know, what would you say to someone who is worried about getting the COVID-19 vaccine?**
8. **Explain why it might make sense that at-risk populations (eg., healthcare workers, or people with underlying health conditions) got the vaccine first. Do you think they should have this priority?**

You might wonder why, despite being **vaccinated**, you can still get COVID-19 — or even get it more than once, which might seem to contradict what you know about **immunity**. The reason lies in how **viruses** evolve: the longer a **virus** circulates, the more it adapts and changes. This is why reinfections are possible and why booster shots are necessary. Booster shots are designed to target the specific COVID-19 variants currently circulating, enhancing the body’s ability to respond effectively to these evolving strains. Even though **vaccination** won’t eliminate your chances of getting infected, they will build your body’s defense against it, meaning that the disease is much less dangerous, and much more bearable.

Part Two: Allergies

Unlike **viruses** like those that can cause COVID-19, allergies are not caused by germs. Allergies, which can range from a mild stuffy nose to a life-threatening **anaphylaxis**, are rather the response of our immune system to **allergens**. **Allergens** are various types of irritants that some people’s body recognizes as foreign and dangerous, causing their **immune system** to flare up and attack the substance.⁸ While most **allergens** are actually harmless, this overreaction of the **immune system** causes allergies.

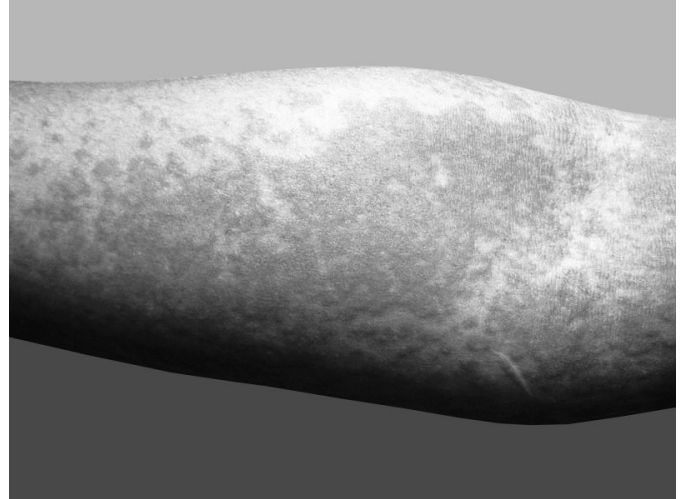
9. **How are allergies actually similar to our body’s response to fight a virus?**

10. You might have experienced allergies of your own. They sometimes get worse at particular parts of the year. Why do you think this is?

Examples of **allergens** include all sorts of foods, animals, pollen, mold, dust mites, insect stings, perfumes, or medications. While there are countless allergy symptoms, the most common mild ones include sneezing, congestion, eye/nose itchiness and a reddish raised rash called **hives** (pictured right).

These symptoms are caused by your immune system's release of histamine. This is why the type of medications called **antihistamines** (such as Benadryl, Zyrtec, or Claritin) are used to decrease allergy symptoms. **Antihistamines** work by blocking histamine, and therefore can relieve allergy symptoms.

Hives or "Urticaria" on an arm



Wikimedia/James Heilman¹²

However, allergic reactions can also be severe. **Anaphylaxis** is when the immune system overreacts to an allergen and releases enough chemicals that can cause your body to go into **shock** (remember to the first unit). In this case, **antihistamines** won't work quickly enough to serve as treatment. Instead, the immediate treatment for **anaphylaxis** is an injection of epinephrine (adrenaline), commonly in the form of an EpiPen.⁹ The person should then seek medical attention. As **anaphylaxis** is a life-threatening condition, it is important to know how to recognize its signs and symptoms. Some include:

- A. **Breathing difficulties:** swelling of the throat, tongue or face (can prevent breathing); shortness of breath or "tight" feeling in chest; wheezing.
- B. **Drop in blood pressure:** feeling lightheaded or dizzy; a rapid, weak pulse; loss of consciousness.
- C. **Widespread skin reactions:** rash (i.e., **hives**) that cover a large portion of the body; face swelling.
- D. **Gastrointestinal distress:** abdominal pain; nausea; vomiting.

11. Imagine your cellmate has eaten peanuts and you think they might be experiencing an allergic reaction. What might you check to determine if it's serious? What would you do after that?

12. What are some everyday items or situations you might need to be cautious about if you or someone you know has allergies?

Part Three: Staying Healthy

Of course, getting the common cold — or maybe even COVID-19 — likely isn't going to be the worst thing that ever happened to you. That's why it's also important to discuss some of the other diseases that are transmitted easily, but much more dangerous to your health. An example is **HIV**, the virus that causes **AIDS**, a life-long debilitating disease. While the symptoms of **AIDS** can be flu-like at first, they will get worse over time, and may include memory loss, itchy rashes on your face, or diarrhea that lasts weeks at a time. But the worst part of **AIDS** is that it will destroy your immune system.¹⁰

13. AIDS stands for acquired immune deficiency syndrome. What might happen to individuals who have a weakened immune system due to the disease?

Another disease to watch out for is **Hepatitis B**, caused by a **virus** called **HBV**. Whereas **AIDS** damages your immune system, **Hepatitis B** damages your **liver**, which can also be fatal. Some symptoms to watch out for are dark urine (the color of cola!), yellowing of the skin or eyes, and abdominal pain. However, **Hepatitis B** is especially dangerous because some people who get it are symptom-free, meaning they won't know they have it without getting a blood test. That's why the safest thing to do is to get **vaccinated** for it.

14. Since there is a vaccine available for Hepatitis B, would you consider getting it?

Both **Hepatitis B** and **AIDS** are spread primarily through bodily fluids: blood, semen, or vaginal fluids. This means it is most commonly transmitted through:

- Unprotected sex
- Sharing and using unclean tattoo needles or guns
- Sharing razors or other sharp objects
- Sharing drug paraphernalia like syringes or cookers

15. Pick two of the bullet points above. How might someone engage in these practices safely, so they diminish their risk of contracting AIDS or Hepatitis B?

16. Once you get HIV/AIDS, you have it for life — there is no vaccine or cure. Why might it be important for individuals, especially those in close living conditions like prisons, to be aware of the symptoms and transmission methods of infectious diseases like Hepatitis B and AIDS?

Part Four: Wrapping Up The Course

Congratulations on (almost) finishing the 'Health and Disease' course! Of course, we've only scratched the surface — the health of the human body is such a complex area of science that people dedicate their lives to understanding it. But, hopefully you know a bit more about what's going on inside of you, and maybe feel more confident in emergency situations. Let's review some of the key points in each unit:

1. The Cardiovascular System:
 - A telltale sign of a heart attack is a painful "crushing sensation" in the chests; get help quickly.
 - Raising the legs of someone experiencing shock (inadequate blood flow) will help get blood to essential regions like the heart and brain.
 - A good diet and a physical exercise routine is the best way to prevent heart disease, the leading cause of death worldwide.
2. The Respiratory System
 - Use the heimlich maneuver (wrap arms around torso, hand covering fist below rib cage; pull forcefully upwards) to dislodge an airway obstruction — like someone who is choking on food.
 - Smoking — even once a day — is *incredibly* dangerous! It will not only kill you, but those around you: the secondhand smoke that kids inhale will make their lungs never fully develop.
3. The Nervous System
 - Act F.A.S.T. to recognize the signs of stroke: is their **F**ace drooping? One of their **A**rms drifting, if you hold them up like a zombie? Is their **S**peech slurred? If yes, it is **T**ime to act fast: get help!

- For someone with dementia experiencing a delusion, it is better to compassionately redirect rather than correct their confusion. The same goes for sleepwalking.
4. The Mind and the Gut
- Know how to recognize and end a panic attack: you may feel an increase in breathing, heart rate, tingling sensations, blurred vision, or even a sense of losing control. Breathing deep, slow breaths will signal your body to end these feelings.
 - The mind is very connected to the “gut”: stomach pain may accompany anxiety, and vice versa.
5. The Immune System
- Anaphylaxis is a type of severe allergic reaction that may compromise the ability to breathe. They necessitate the use of an ‘Epi-Pen’ and immediate medical treatment.
 - Lifelong diseases like AIDS and Hepatitis B are preventable by practicing protected sex (use a condom) and not sharing or properly cleaning tattoo and drug paraphernalia.
- 17. Review each point carefully (and keep this list). Name three ways you could improve your health or look out for others using the above reference.**

Since this is your last unit in the course, we welcome any feedback you have!

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