

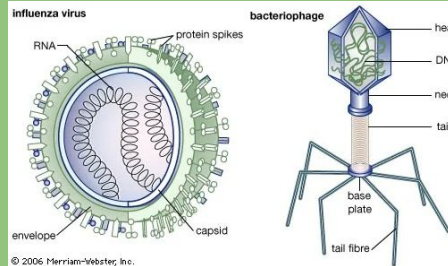
# Microbiology

The study of microorganisms, such as viruses and bacteria.<sup>1</sup>



# Viruses

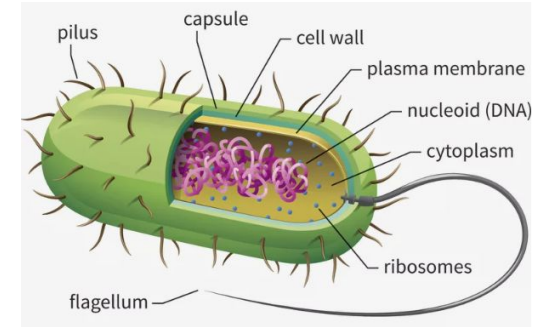
Viruses are small and simple in comparison to other microorganisms. They are only made of a genetic code, proteins, and sometimes lipids.<sup>4</sup>



- Rely on other organisms for replication of DNA/RNA and protein production.<sup>6</sup>
  - If they cannot replicate on their own, are they “alive?”
  - With some debate, some scientists agree they are not alive.<sup>7</sup>
- Use host machinery like polymerases (make DNA/RNA) and ribosomes (make protein).<sup>7</sup>

# Bacteria

Bacteria are prokaryotic single-cell microorganisms. They do not contain a nucleus.<sup>2</sup>

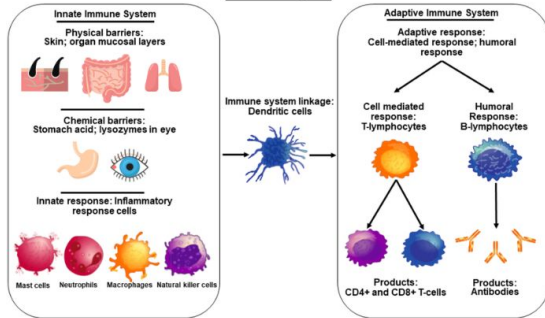


- Exist in a lot of places in the environment/organisms and play a large role.
  - They can aid digestion of cellulose in animals.<sup>2</sup>
  - About 99% of the genetic material we have is not ours, it is from microorganisms.<sup>11</sup>
- Developing antibiotic resistance, making antibiotics ineffective.<sup>12</sup>

# Immunology

The immune system is involved in removing foreign material from the body, including fighting infections.

The Immune System



- Innate response - initial protection, including skin and some white blood cells (WBC).<sup>14</sup>
- Adaptive response - later response that is more specific to pathogen.
  - T cells activate B cells to make plasma cells that make antibodies.<sup>14</sup>
  - Memory T and B cells are made for the next exposure.<sup>14</sup>
- Antibodies bind to pathogens, causing other WBCs to kill the pathogen.<sup>14</sup>

# Vaccines

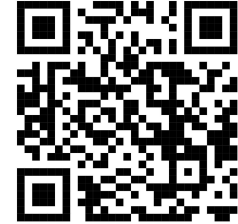
The goal of vaccines is to create an immune response from the host, allowing a faster response when the host is exposed to a pathogen.<sup>17</sup>



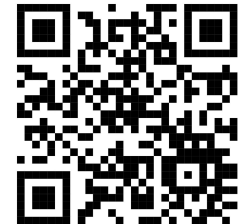
- Types of vaccines can include inactivated or live-attenuated.
  - Inactivated vaccines - killed pathogens
  - Live-attenuated vaccines - weakened pathogens.<sup>16</sup>
- Expose immune system to pieces of pathogen, creating memory cells.
  - Do not spend time creating T and B cells to fight pathogen. This makes a faster immune response.<sup>17</sup>

# Contact and Additional Information

Additional Questions and Answers:



Sources:



If there are any questions, comments, or concerns, please contact me at [Tateyama@colostate.edu](mailto:Tateyama@colostate.edu)