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**QUESTIONS**

1. Explain the role of the immune system.
2. Describe the 2 types of immunity.
3. Explain the different types of antibodies and their roles.

**ANSWER**

1. The role of an immune system is to protect our body from any foreign matters that might cause any damage or homeostasis imbalance. The success of the immune system depends on its ability to discriminate between foreign (non self) and host (self) cells. When an organism is threatened by microorganisms, viruses, or cancer cells, the immune system acts to provide protection. When a foreign matter enters the human body, our defense system recognizes this as foreign through the immune system. How the human body recognize foreign against itself employs a complex "I.D." system. Each cell in the human body carries on it's surface a mixture of proteins and sugars that serve to identify the cell to the immune system. Foreign objects lack the identifiers that all of the body's cells have, but each one has unique features or antigens where the immune system attaches identifiers called antibodies. This is the basis for the specific defense mechanisms. Once you have built the antibodies for a specific antigen, the immune system will respond faster than if the had been no previous exposure to the antigen (i.e. you are immune to the pathogen, but only that specific pathogen, because your immune system responds faster.) The non-specific part of the immune system is mostly composed of phagocytes (eating-cells) which engulf and digest foreign substances like bacteria and viruses, which do not bear the body's specific identifiers.
2. The 2 types of immunity we have are
3. **Innate immune system**; you are born with this immune system and it mainly consist of barriers on and in the body that keep foreign threat out. Examples are skin, stomach acid, enzymes found in tears and skin oil. Microorganisms or toxins that successfully enter an organism encounter the cells and mechanisms of the innate immune system. The innate response is usually triggered when microbes are identified by [pattern recognition receptors](https://en.wikipedia.org/wiki/Pattern_recognition_receptors), which recognize components that are conserved among broad groups of microorganisms, or when damaged, injured or stressed cells send out alarm signals, many of which (but not all) are recognized by the same receptors as those that recognize pathogens. Innate immune defenses are non-specific, meaning these systems respond to pathogens in a generic way. This system does not confer long-lasting [immunity](https://en.wikipedia.org/wiki/Immunity_(medical)) against a pathogen. The innate immune system is the dominant system of host defense in most organisms.
4. **Adaptive immune system**; The adaptive immune system evolved in early vertebrates and allows for a stronger immune response as well as [immunological memory](https://en.wikipedia.org/wiki/Immunological_memory), where each pathogen is "remembered" by a signature antigen. The adaptive immune response is antigen-specific and requires the recognition of specific "non-self" antigens during a process called [antigen presentation](https://en.wikipedia.org/wiki/Antigen_presentation). Antigen specificity allows for the generation of responses that are tailored to specific pathogens or pathogen-infected cells. The ability to mount these tailored responses is maintained in the body by "memory cells". Should a pathogen infect the body more than once, these specific memory cells are used to quickly eliminate it.

**Component of the immune system**

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| --- | --- |
| **Innate immune system** | **Adaptive immune system** |
| Response is non specific. | Pathogen and antigen specific response. |
| Composed of leukocyte. | Composed of antigen, B cells, T cells. |
| Exposure leads to immediate maximal response. | Lag time between exposure and maximal response. |
| Cell mediated and humoral component. | Cell mediated and humoral components. |
| No immunological memory. | Exposure leads to immunological memory. |
| Found in nearly all forms of life. | Found only in jawed vertebrates. |

1. Human antibodies are classified into five isotypes (IgM, IgD, IgG, IgA, and IgE) according to their H chains, which provide each isotype with distinct characteristics and roles.
2. **IgG**  
   IgG is the most abundant antibody isotype in the blood (plasma), accounting for 70-75% of human immunoglobulins (antibodies). IgG detoxifies harmful substances and is important in the recognition of antigen-antibody complexes by leukocytes and macrophages. IgG is transferred to the fetus through the placenta and protects the infant until its own immune system is functional.
3. **IgM**  
   IgM usually circulates in the blood, accounting for about 10% of human immunoglobulins. IgM has a pentameric structure in which five basic Y-shaped molecules are linked together. B cells produce IgM first in response to microbial infection/antigen invasion.  
   Although IgM has a lower affinity for antigens than IgG, it has higher avidity for antigens because of its pentameric/hexameric structure. IgM, by binding to the cell surface receptor, also activates cell signaling pathways.
4. **IgA**  
   IgA is abundant in serum, nasal mucus, saliva, breast milk, and intestinal fluid, accounting for 10-15% of human immunoglobulins. IgA forms dimers (i.e., two IgA monomers joined together). IgA in breast milk protects the gastrointestinal tract of neonates from pathogens.
5. **IgE**  
   IgE is present in minute amounts, accounting for no more than 0.001% of human immunoglobulin. Its original role is to protect against parasites. In regions where parasitic infection is rare, IgE is primarily involved in allergy.
6. **IgD**  
   IgD accounts for less than 1% of human immunoglobulins. IgD may be involved in the induction of antibody production in B cells, but its exact function remains unknown.