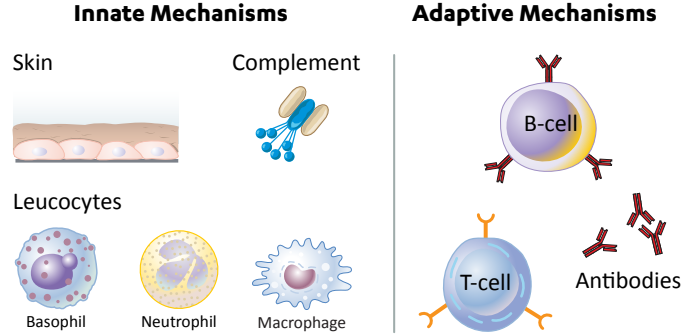


# Immunology 1: Key Fact Card Side 1

## Differentiate innate and adaptive immunities

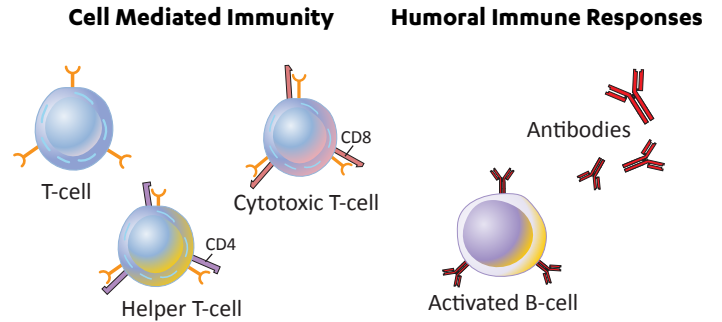
- Adaptive mechanisms are “learned responses” that become more powerful after repeated exposure to the same antigen.
- Innate mechanisms such as skin and complement are the “first line of defense” that respond and function the exact same way every time they encounter a pathogen.



## List mechanisms and components of adaptive immunity and describe cell mediated immunity and humoral immunity

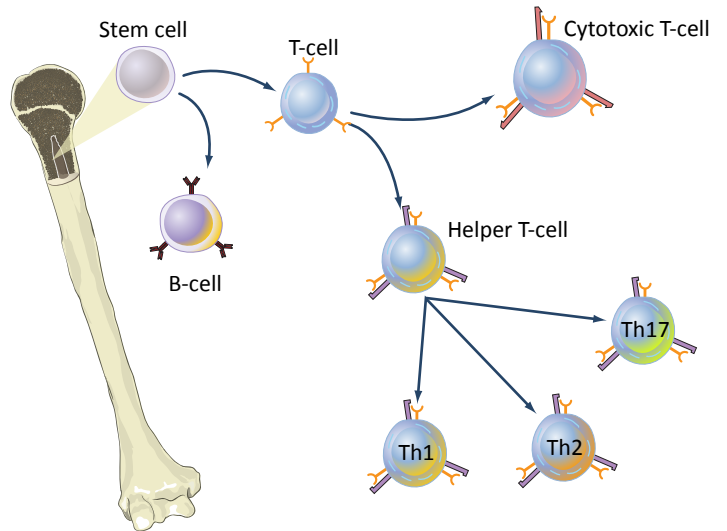
Adaptive immunity consists of cell mediated immune responses and humoral immune responses.

- Cell mediated immunity: special cells recognize and destroy pathogens; T-cells are the major players.
- Humoral immune responses: target extracellular (outside the cell) pathogens; B-cells and antibodies are the major players.



## Explain the process of lymphocyte maturation

- Both T and B lymphocytes arise from hematopoietic stem cells in the bone marrow but their paths diverge and they mature in different places.
  - B-cells stay in the bone marrow to mature
  - T-cells move to the thymus to mature
    - Helper T-cells “help” or induce an immune response. There are three kinds:
      - Type 1 or Th1: mostly involved with cytotoxicity and inflammatory reactions
      - Type 2 or Th2: more effective at stimulating B-cells and inducing humoral immune responses
      - Th17: can initiate an inflammatory response and in addition to their role in neutralizing pathogens, are also associated with chronic inflammation and certain autoimmune diseases
    - Cytotoxic T-cells mainly kill cells on their own

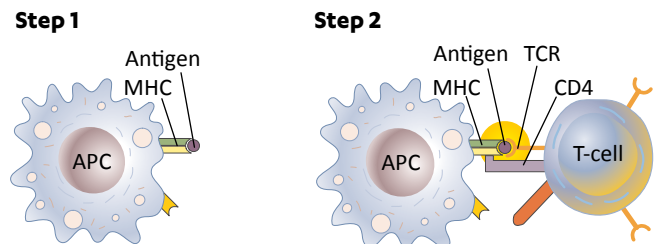


## List the steps in T-cell activation

**Step 1:** Antigen Processing: dendritic cell encounters antigen. Dendritic cell engulfs antigen and prepares it for presentation on the cell surface as part of MHC-antigen complex.

**Step 2:** Antigen presentation: dendritic cell encounters T-cell with compatible TCR. The MHC-antigen complex binds to TCR. CD4 cell surface protein increases strength of binding.

(continued on Side 2)



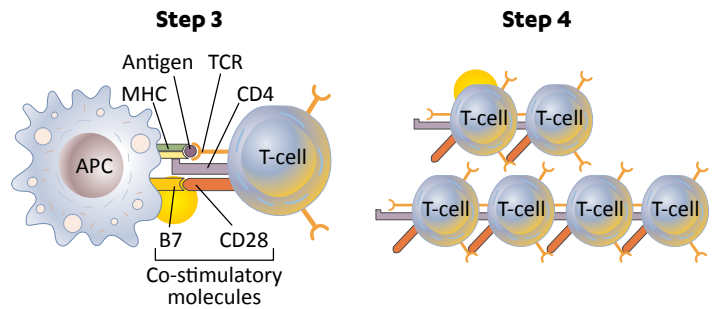
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# Immunology 1: Key Fact Card Side 2

(continued from Side 1)

**Step 3:** Co-stimulatory signaling: the co-stimulatory signal is necessary for full T-cell activation.

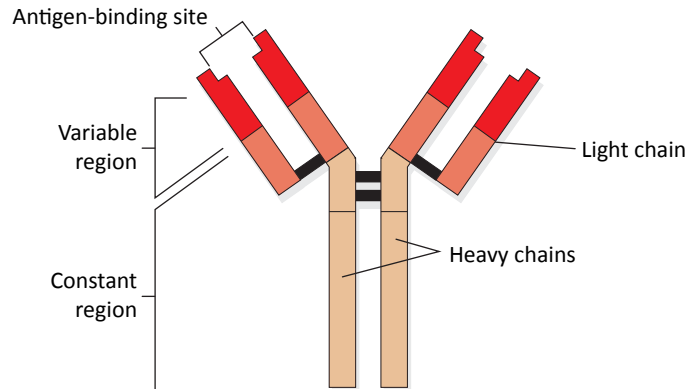
**Step 4:** Cytokine signaling: activation leads to production and release of certain cytokines and T-cell proliferation.



## Describe humoral immunity

Antibodies (aka immunoglobulins) are composed of multiple parts, including constant and variable regions.

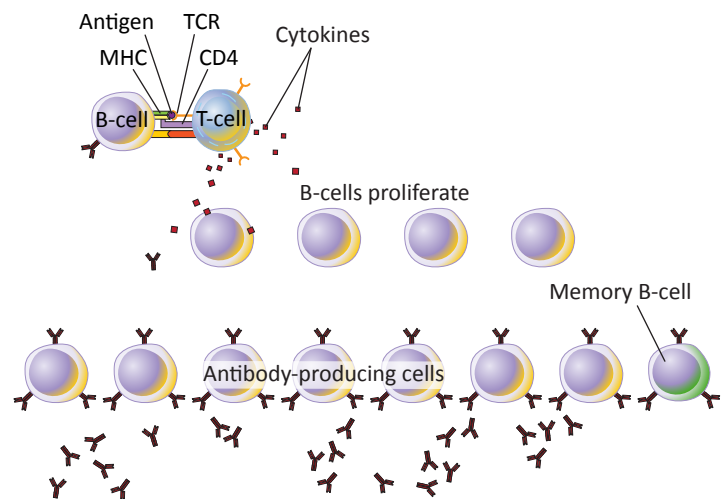
- Variable: unique portion of antibody that forms antigen-binding site
- Constant: same for each antibody of a given class—constant region determines the function an antibody performs in the immune system



## List the steps in B-cell activation

Antibodies: can help trigger complement and can target pathogens for destruction through several different mechanisms

1. B-cell receptor (BCR) on a naïve B-cell interacts with its matching antigen. If this happens in the presence of cytokines or other situations that stimulate growth, the B-cell is activated.
2. The B-cell presents antigen on an MHC class II molecule, and this antigen is able to interact with the TCR on a helper T-cell.
3. This activates the T-cell.
4. This triggers the release of certain cytokines such as IL-4, IL-5, IL-6, IL-10 and IL-13. These conditions trigger B-cell proliferation and differentiation into antibody-forming cells that produce large amounts of antibody, and memory B-cell that “remember” this antibody for months or years just in case the antigen or pathogen appears again.



## Explain the coordinated immune response

- Interaction between multiple immune mechanisms, both innate and adaptive.
- Within the adaptive immune system, cell mediated immune mechanisms and humoral immune mechanisms function in a coordinated manner to achieve activation and trigger immune responses.
- Activation of adaptive immune responses can trigger other immune mechanisms.

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