



# PRIMARY AND SECONDARY IMMUNE RESPONSE

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# OBJECTIVES

- Define Primary Immune Response
- Define Secondary Immune Response
- Discuss Cells Involved in Primary and Secondary Immune Response
- Discuss Primary Immunodeficiency (PID)
- Discuss Secondary Immunodeficiency (SID)
- Compare Between Primary and Secondary Immune Response

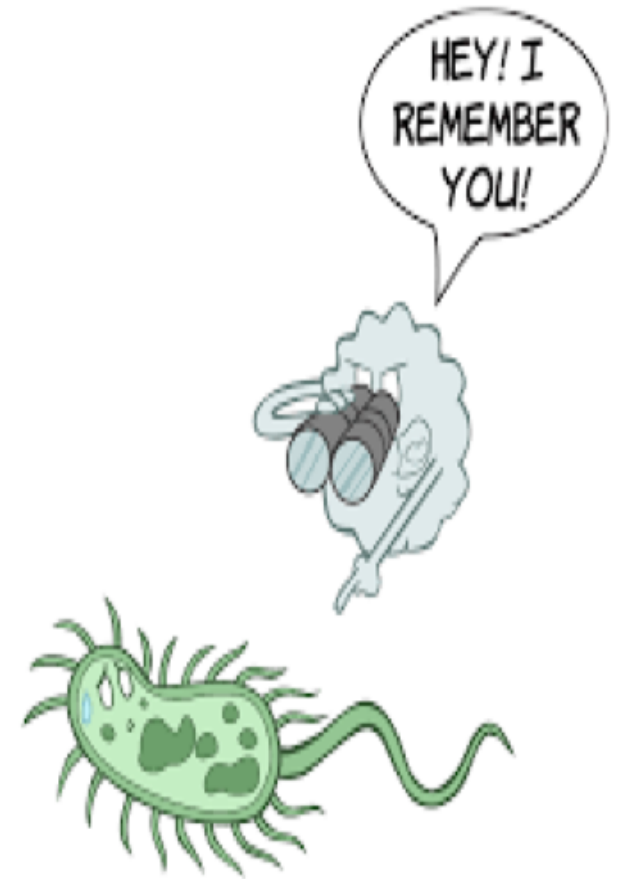
# DEFINE PRIMARY IMMUNE RESPONSE

- Occurs when an antigen comes in contact with the immune system for the first time. During this time, the immune system has to learn to recognize antigen and how to make antibody against it and eventually produce memory lymphocytes.



# DEFINE SECONDARY IMMUNE RESPONSE

- Occurs when the second time (3rd, 4th, etc.) the person is exposed to the same antigen. At this point immunological memory has been established and the immune system can start making antibodies.



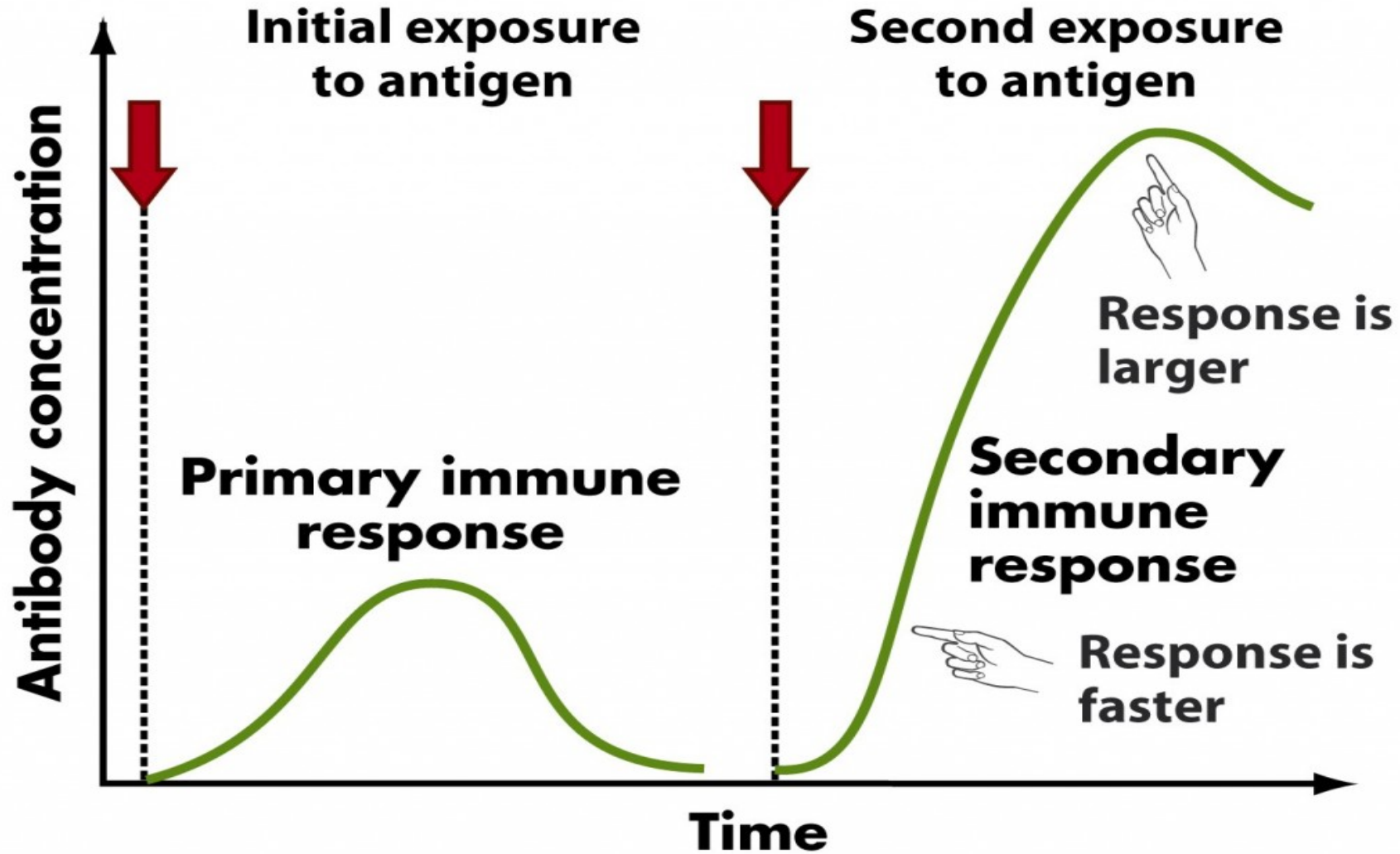


Figure 49-16 Biological Science, 2/e  
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# DISCUSS CELLS INVOLVED IN PRIMARY AND SECONDARY IMMUNE RESPONSE

- **Plasma Cells**

Fully differentiated B-lymphocyte (white blood cell) which produces a single type of antibody.

- **Memory B Cells**

**B cell** sub-type that are formed within germinal centers following primary infection and are important in generating an accelerated and more robust antibody-mediated immune response in the case of re-infection (also known as a secondary immune response).

# DISCUSS SECONDARY IMMUNODEFICIENCY (SID)

SIDs are more common than PIDs and are the result of a primary illness, such as HIV, or other external factor such as malnutrition or some drug regimens.

Most SIDs can be resolved by treating the primary condition.

- **Example:**

- *Malnutrition* – Protein-calorie malnutrition is the biggest global cause of SIDs which can affect up to 50% of the population in some communities in the developing world.

# DISCUSS PRIMARY IMMUNODEFICIENCY (PID)

PID disorders are inherited conditions, some PIDs are diagnosed during infancy or childhood, many are diagnosed later in life.

## ■ Causes:

- Single-gene mutations
- Unknown genetic susceptibility combined with environmental factors.

## ■ Example:

- *B cell immunodeficiencies (adaptive)* – B cells are one of two key cell types of the adaptive immune system. Their main role is to produce antibodies, which are proteins that attach to microbes, making it easier for other immune cells to detect and kill them



# COMPARE BETWEEN PRIMARY AND SECONDARY IMMUNE RESPONSE

## Primary Immune Response

## Secondary Immune Responses

Lag Phase

Longer, (4-7 days) sometimes as long as weeks or months

Shorter (1-4 days) due to the presence of memory cell.

Antibody Level

Reaches peak in 7 to 10 days.

Reaches peak in 3 to 5 days.

Antibody Production

Mainly IgM, small amount of IgG are also produced.

Mainly IgG, sometimes small amount of IgM, IgA and in the case of allergy IgE are produced.

## Primary Immune Response

## Secondary Immune Responses

Amount of ab. production

Depends on nature of antigen. Usually produced in low amount.

Usually 100-1000 times more antibodies are produced.

Ab. & Ag. affinity

Affinity of antibody is *lower* for its antigen

Antibodies have *greater* affinity for antigen.

Appearance

Appears mainly in the lymph nodes and spleen.

Mainly in the bone marrow, followed by the spleen and lymph nodes

# CONCLUSION

- Primary immune response happens when antigen comes in contact with immune system for the first time, and secondary immune response happens when it comes in contact more than once.
- PIDs disorders are inherited conditions and SIDs and are the result of a primary illness.

# REFERENCES

- <https://pediaa.com/difference-between-primary-and-secondary-immune-response/>
- <https://microbeonline.com/differences-between-primary-secondary-immune-response/>

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thank you