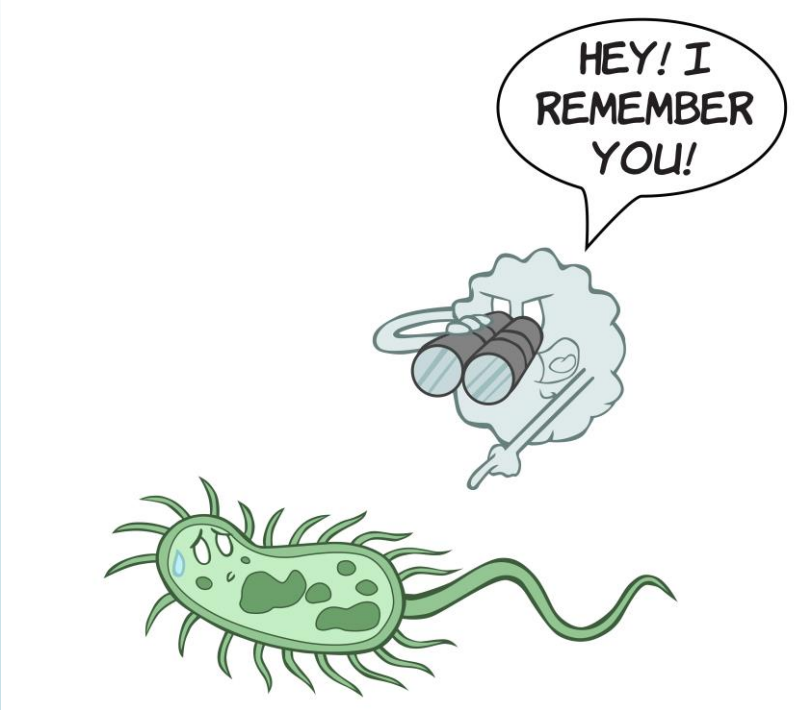
Document 7

Immunological Memory



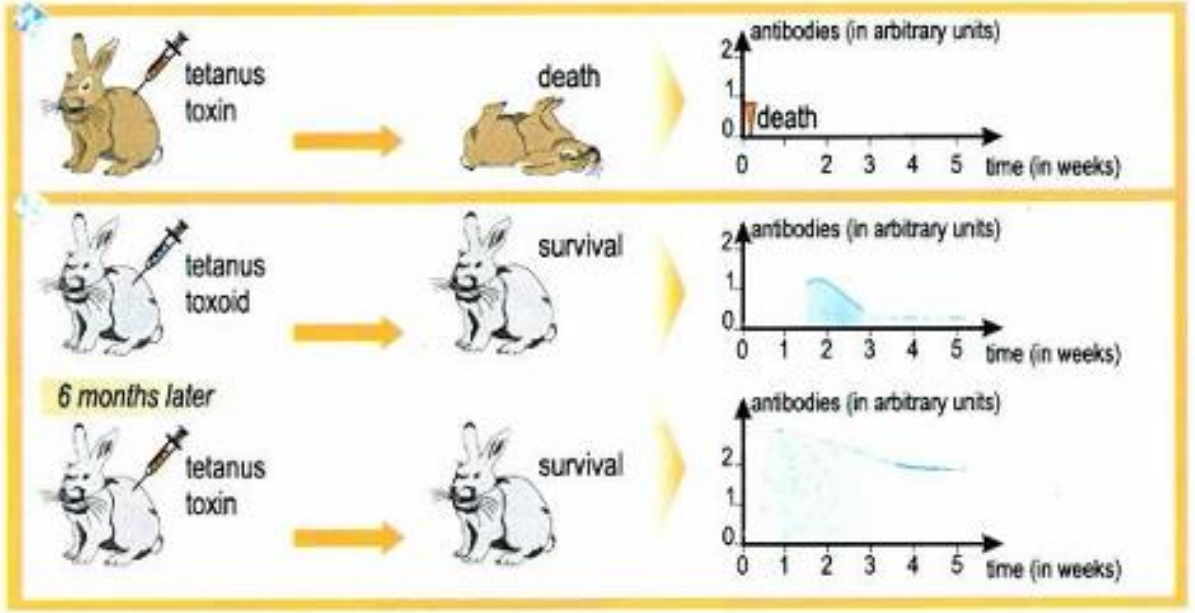
I. Characteristics of Primary and Secondary Response:

- **Primary immune response (I.R):**

- Occurs after the **first contact** with a certain antigen.
- It involves the activation of short-lived specific B and T cells effector cells.
- It involves the production of memory cells.

→ Characteristics of Primary I.R: Doc a, exp 2 (a), p.116:

- Long latency (1 week) .
  Latency: time needed to start releasing antibodies.
- Low amplitude (1 a.u).
  Short duration, rapid decreases (1.5 week ≈10 days).



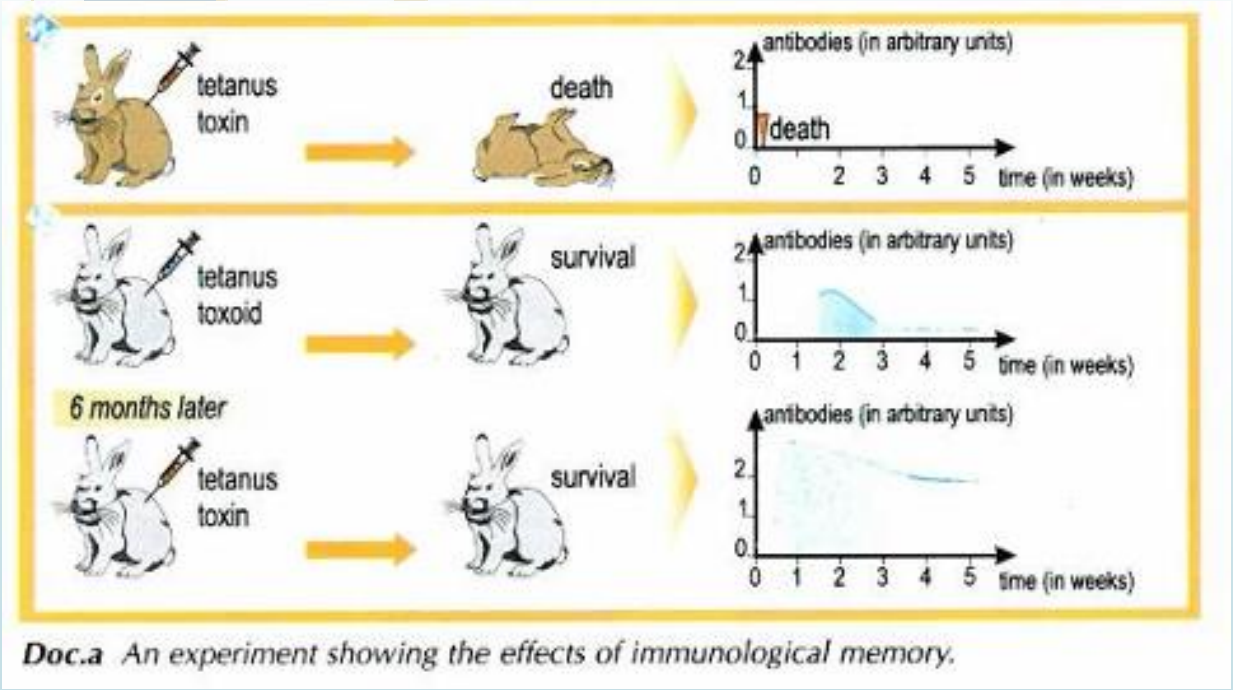
Doc.a *An experiment showing the effects of immunological memory.*

- **Secondary I.R:**

- Occurs after the **second encounter** with the **same antigen.**

→ **Characteristics of Secondary I.R:** Doc a, exp 2 (b), p.116:

- Faster (2days latency).
- Higher amplitude (3 a.u).
- More persistent (more than 5 week).



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***Vaccination:**

- Is a preventive method that prevents infection by microbes.
- It includes the use of attenuated or killed antigen that is non-pathogenic but immunogenic.
- It induces a primary I.R and produces memory cells leading to immunization of the organism against this specific antigen.

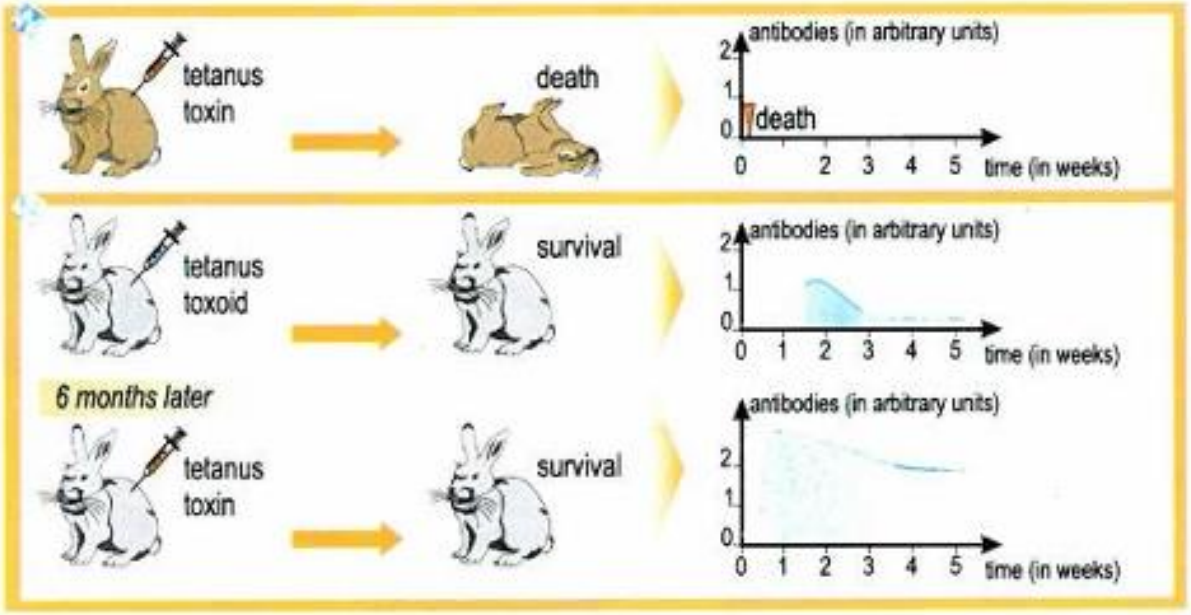
- Application 1:

- **Referring to Doc.a,p.150, answer the following questions:**

1- Interpret the results of exp 1.

Upon injection the rabbit in exp 1 with tetanus toxin, it died.

This means that tetanus toxin is fatal.



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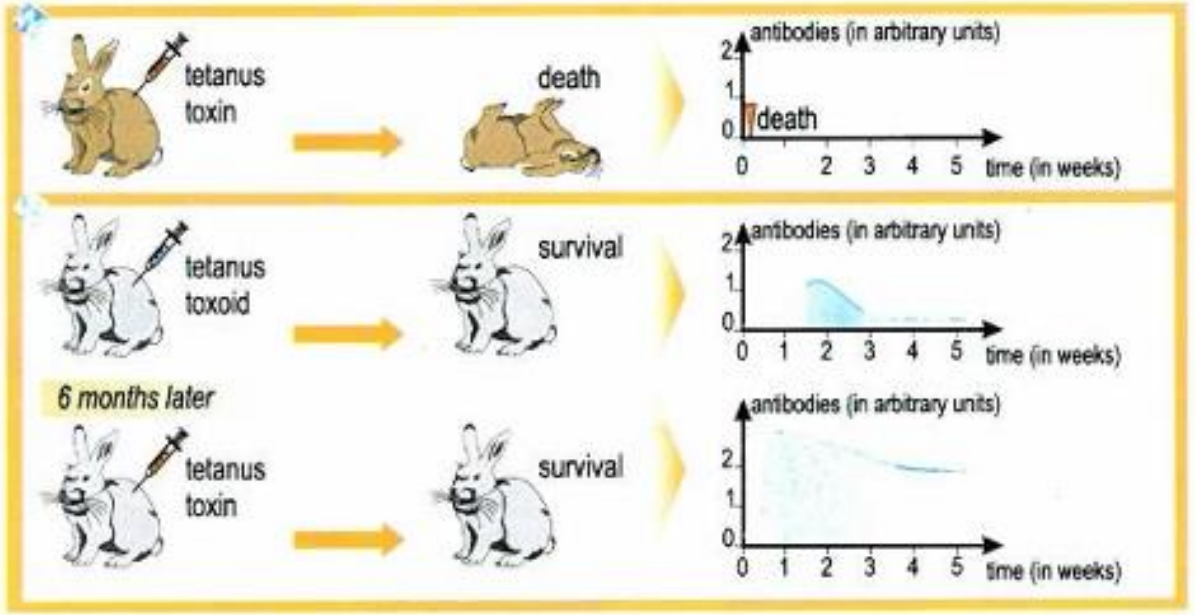
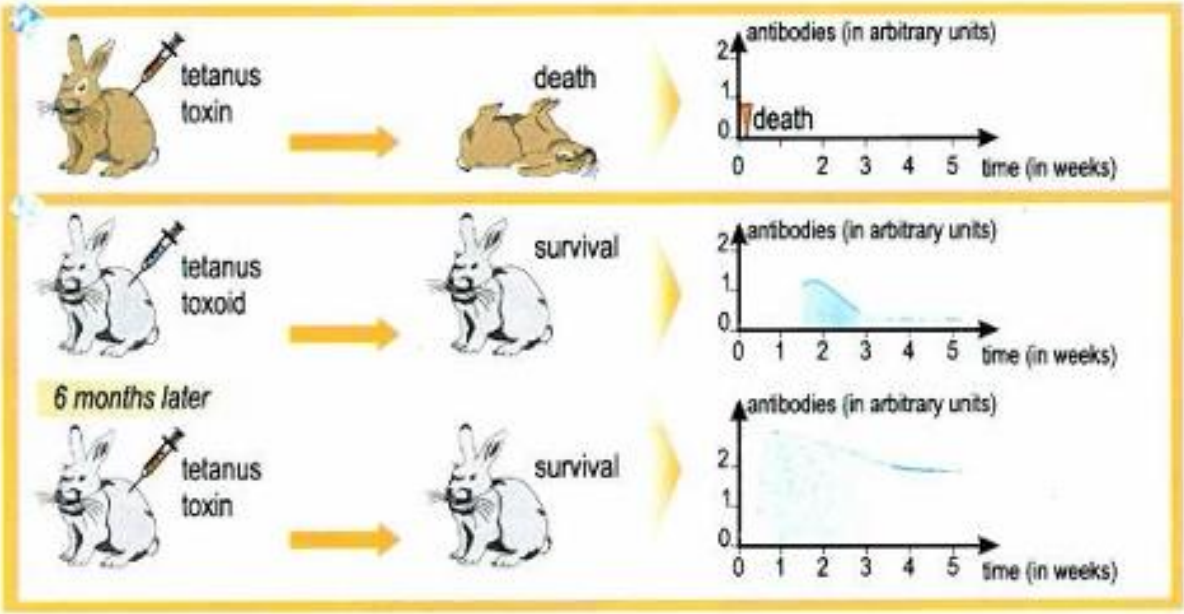
2- Explain the result of exp 1.

Analyze…, this is because tetanus is virulent and fatal, and the rabbit is not immunized previously against it, so it doesn't have memory cells against tetanus to ensure its protection.



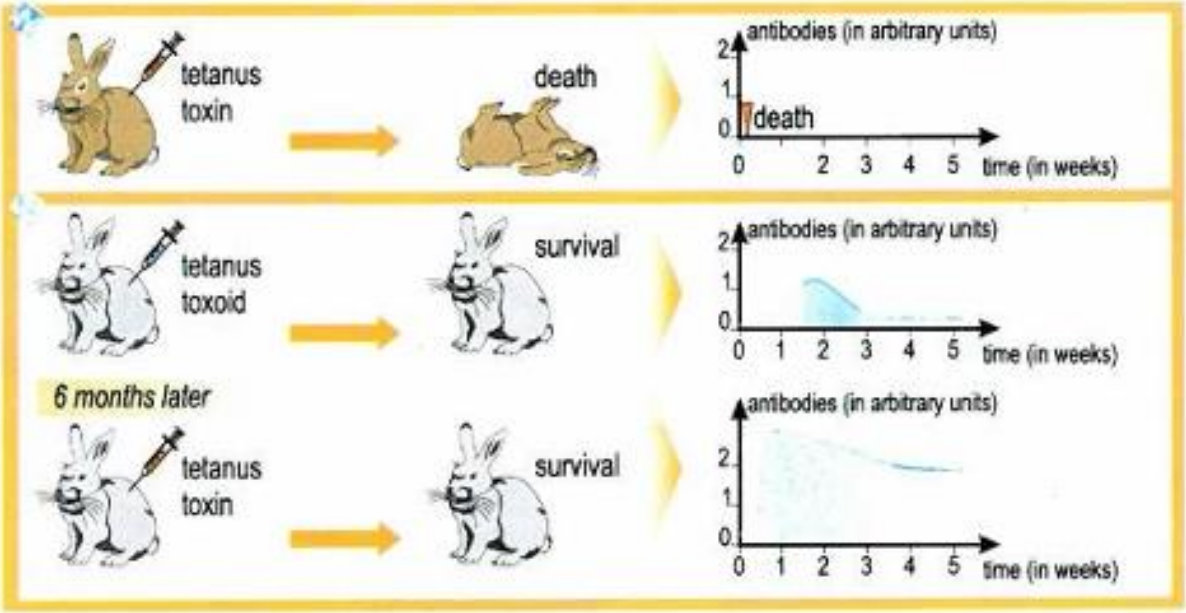
Doc.a *An experiment showing the effects of immunological memory.*



Doc.a *An experiment showing the effects of immunological memory.*

3.1. Compare the max amount of antibodies produced and the duration of the primary and secondary I.R.

The max amount of antibodies produced during the primary I.R is 1 au less than that during the secondary I.R which is 3 a.u. While, the duration of the primary I.R is 3 1.5 week, shorter than that of the secondary I.R which persists for more than 5 weeks.



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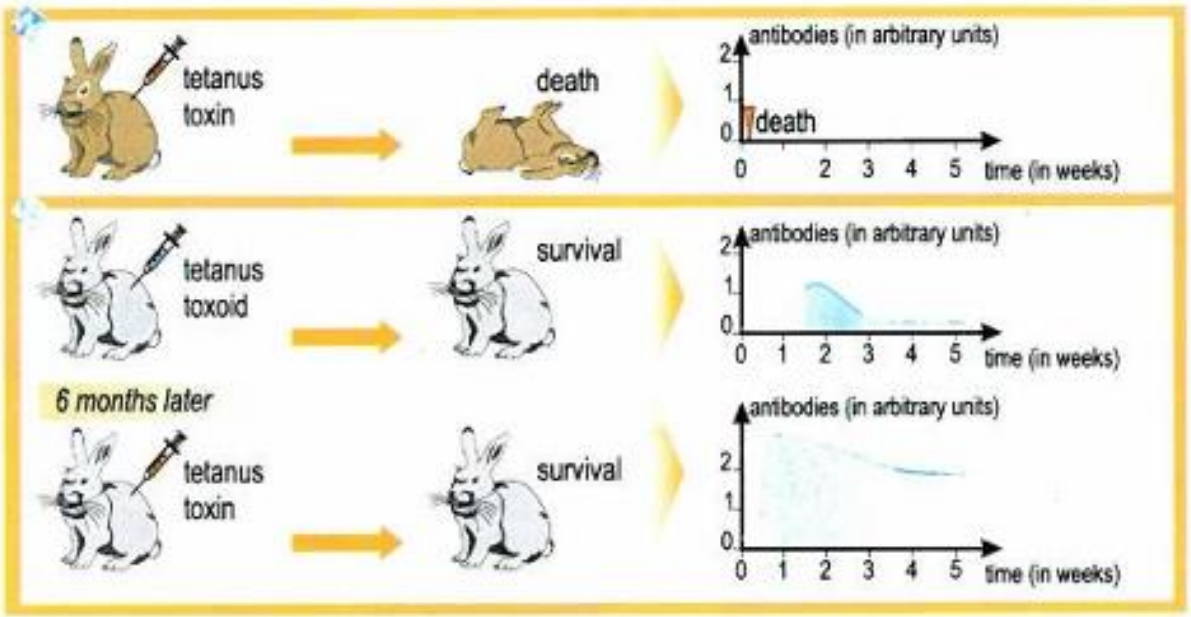
3.2. Conclude the characteristics of the secondary I.R.

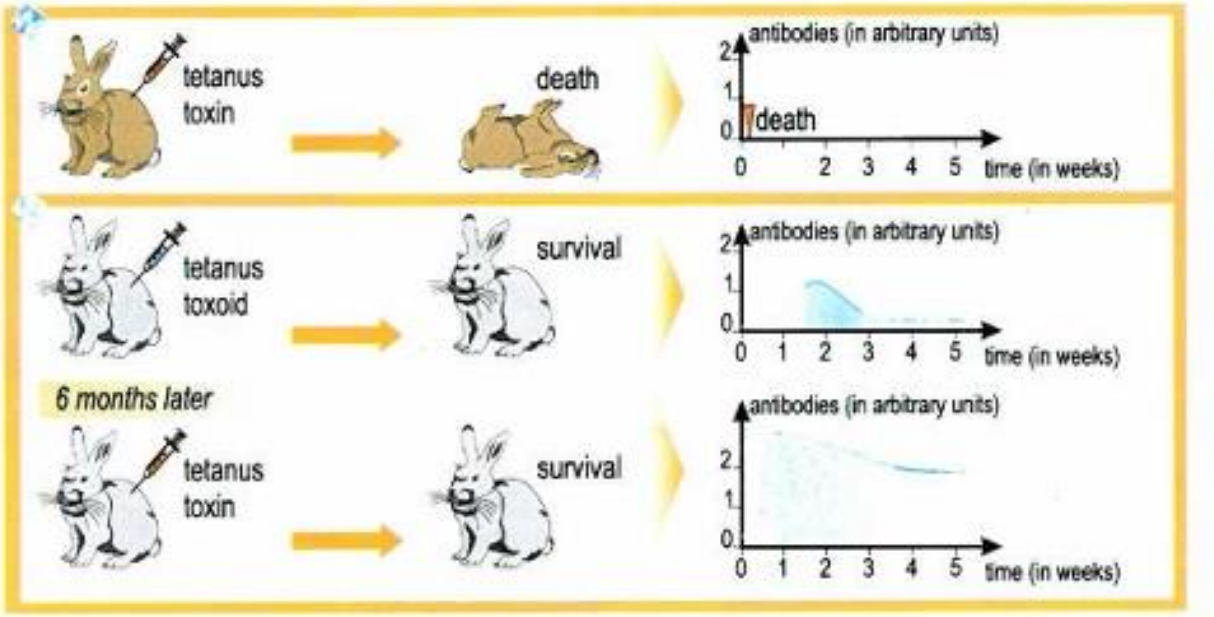
Thus, the secondary I.R is important having higher amplitude and long lasting.



Doc.a *An experiment showing the effects of immunological memory.*

4. Formulate a hypothesis explaining the cause of difference between secondary & primary responses.

Hypothesis: The presence of memory cells allows a rapid production of antibodies and leads to more amplified and more persistent response.



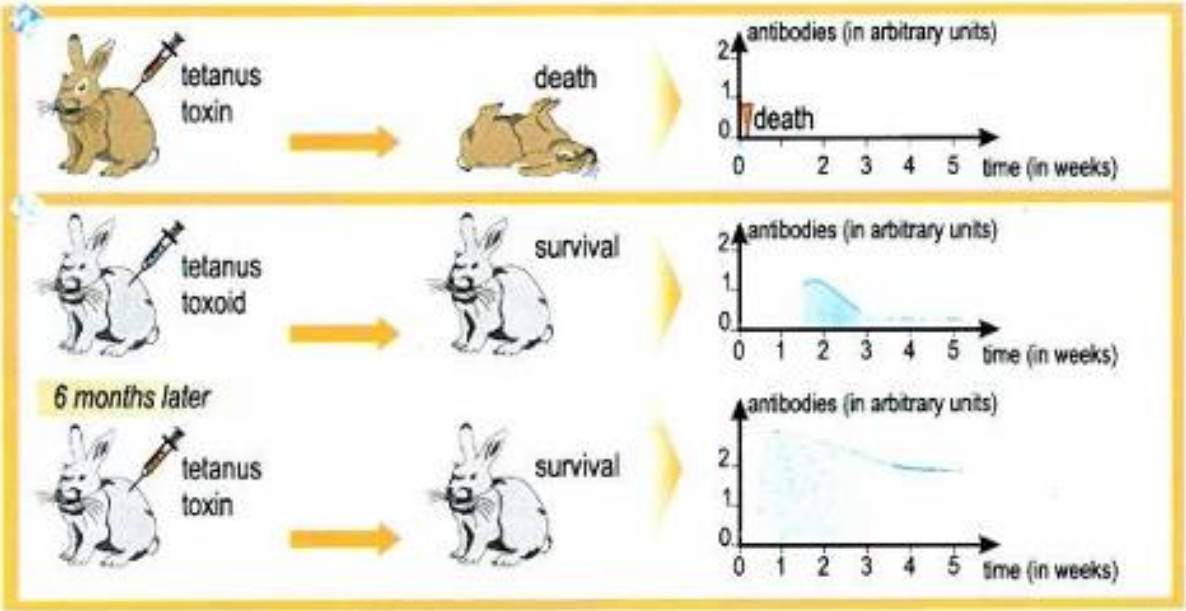
Doc.a *An experiment showing the effects of immunological memory.*

5. Name the method used to protect the rabbit against tetanus toxin, exp2.

Vaccination

6. Explain the long delay needed for the primary I.R to start.

The long delay of the primary I.R is due to the absence of memory cells where macrophages need time to become APC and to activate TH which also need time to activate BL which in turn differentiate into plasma cells and release antibodies.



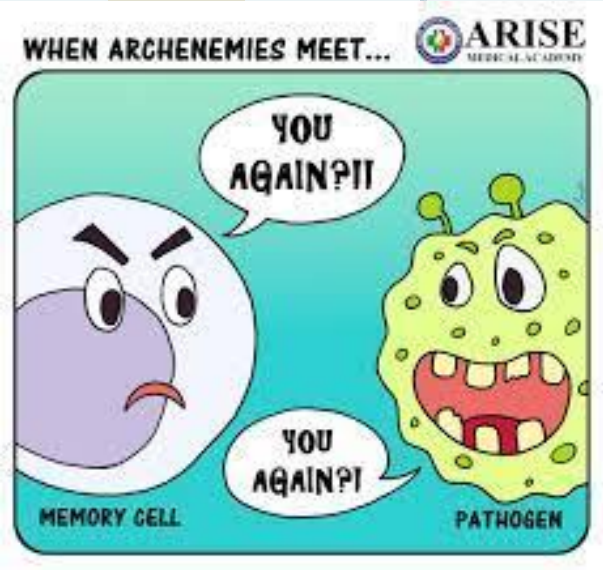
Doc.a *An experiment showing the effects of immunological memory.*

7. Specify the type of the I.R involved.

Specific humoral I.R, because antibodies are the effector molecules involved in the response against tetanus.

II. Basis of Immunological Memory:

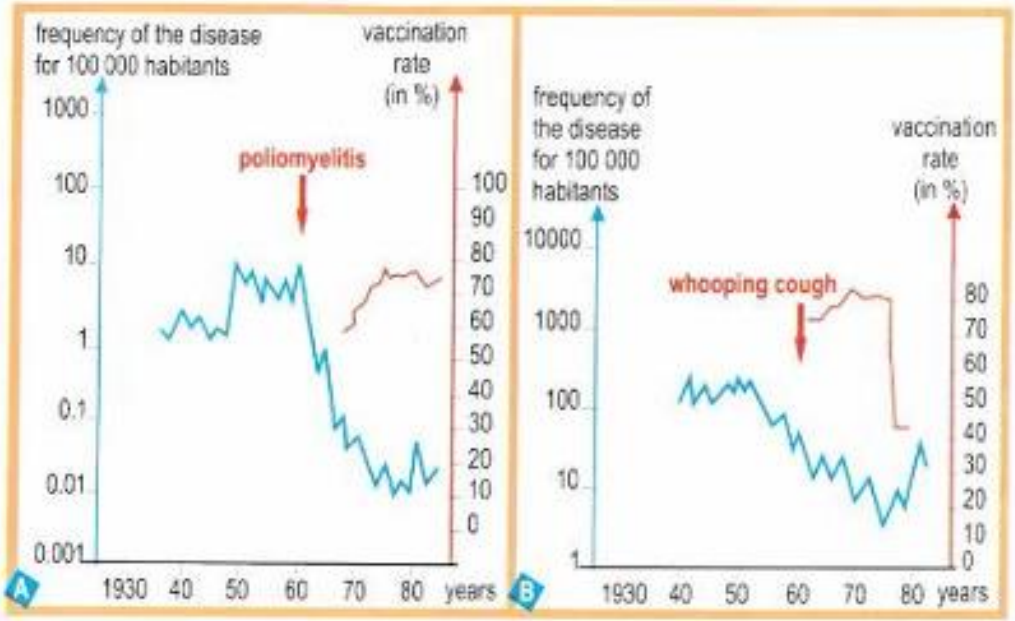
Memory cells which are partially differentiated after the first contact with the antigen will multiply and differentiate faster after the second contact with the same antigen.



III. Importance of immunological memory:

1. Draw out a conclusion, doc c.

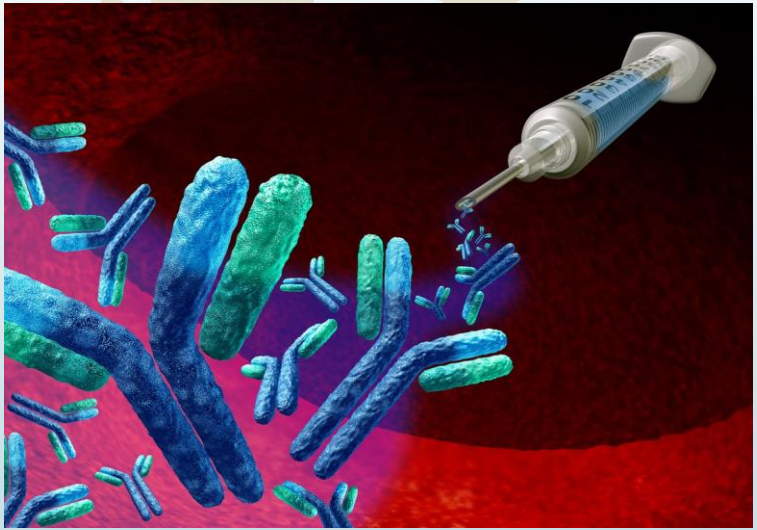
   The introduction of vaccine reduces frequency of diseases (it eradicates the disease).



Doc.c *Graphic results of the epidemiological survey performed in England from 1930 till 1979. Each arrow indicates the date of introduction of mass vaccination for each disease.*

***Vaccination decreases the mortality rate by diseases.**

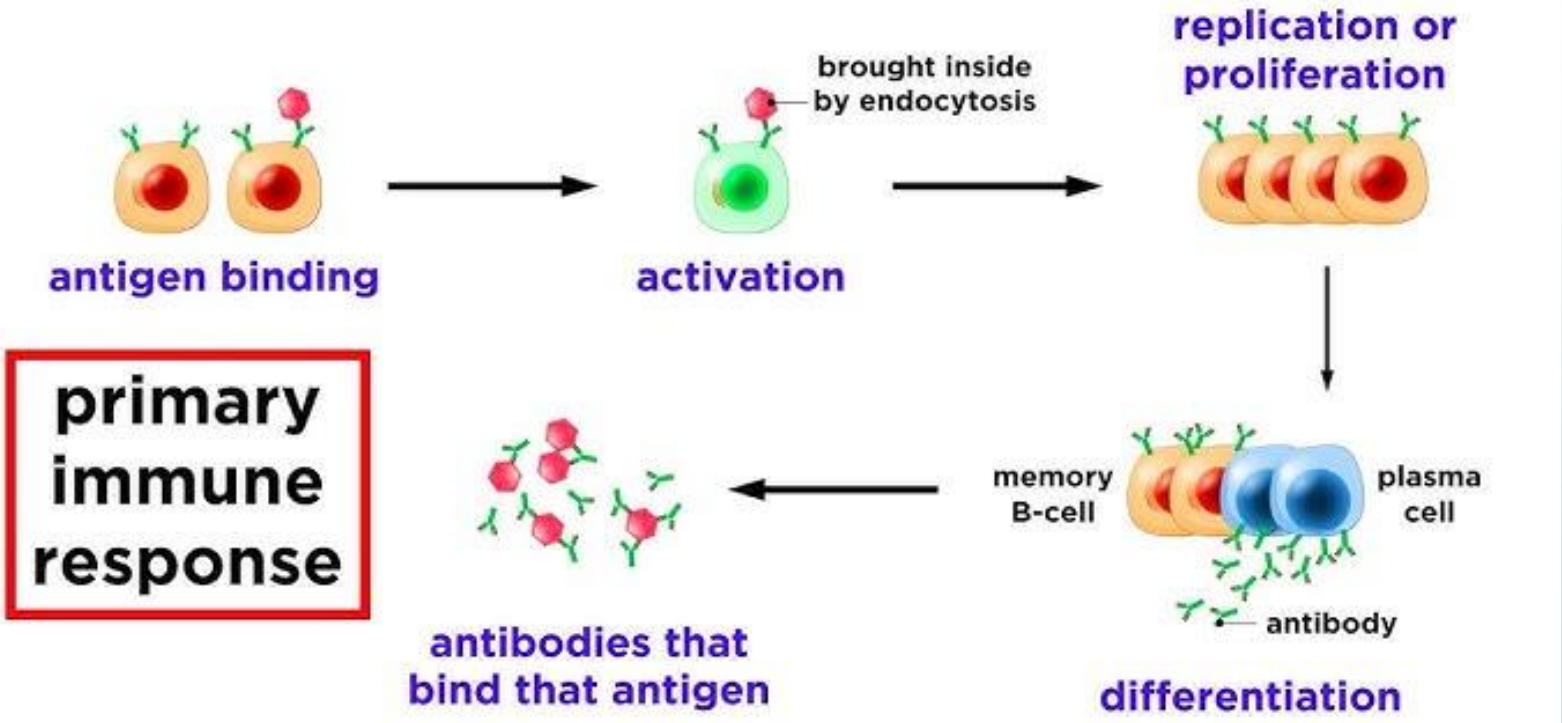
***Serotherapy:** is a curative method that involves the transfer or injection of specific antibodies from an immunized individual to an infected one.

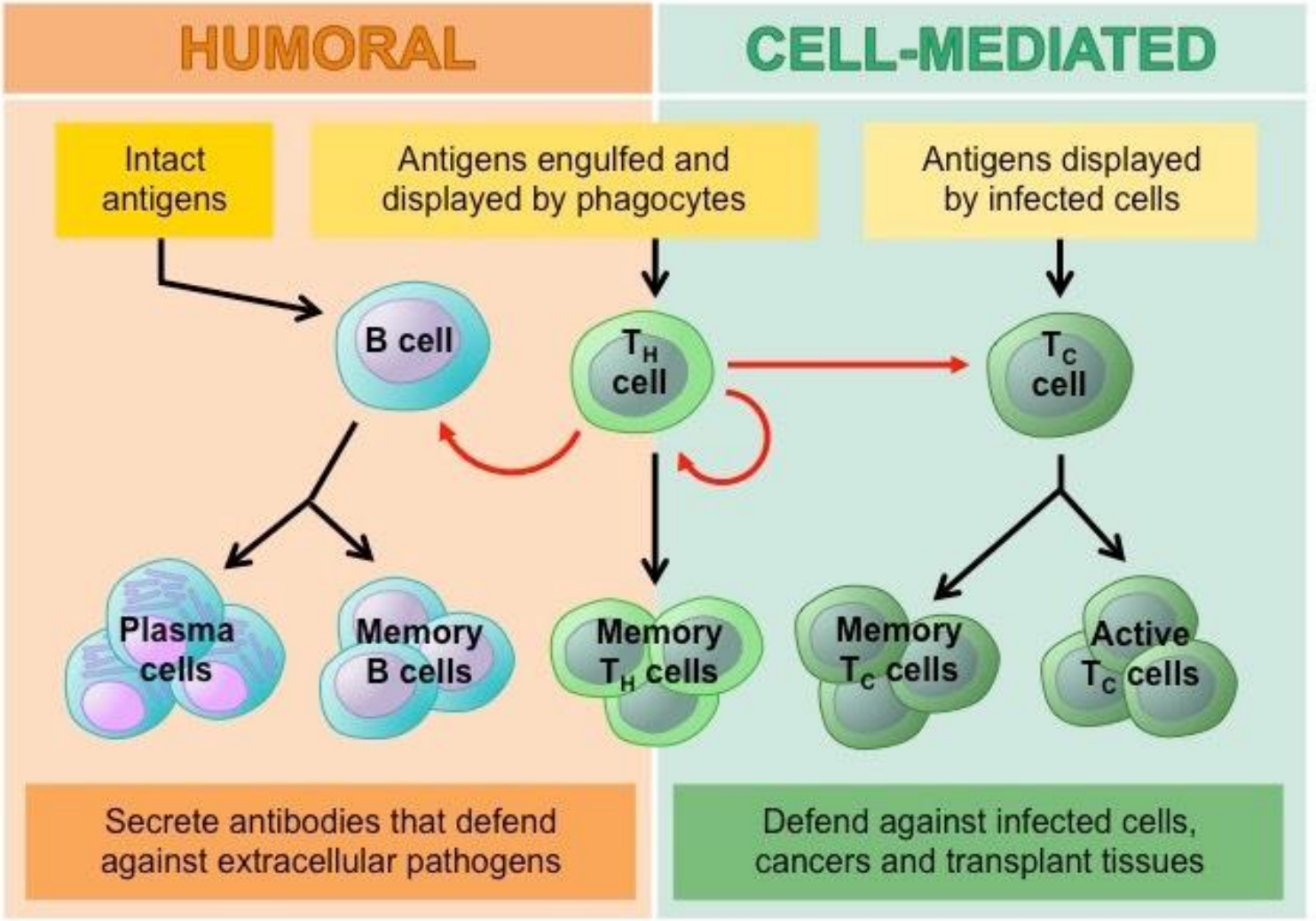


*Title: Table of comparison between vaccination and serotherapy.

Vaccination	Serotherapy
- Injection of attenuated microbe - Provide active immunity: the antibodies are produced by the organism's own immune system. - Primary contact with antigen produces memory cells. - Preventive method (taken before infection). - Lasts for a long time.	- Injection of ready-made specific antibodies. - Provide passive immunity: the antibodies are transferred. - No memory cells. - Curative method (taken after infection) - Lasts for few weeks.

humoral immune response




HUMORAL
CELL-MEDIATED
Intact antigens
Antigens engulfed and displayed by phagocytes
Antigens displayed by infected cells
B cell
T_H cell
T_C cell
Plasma cells
Memory B cells
Memory T_H cells
Memory T_C cells
Active T_C cells
Secrete antibodies that defend against extracellular pathogens
Defend against infected cells, cancers and transplant tissues