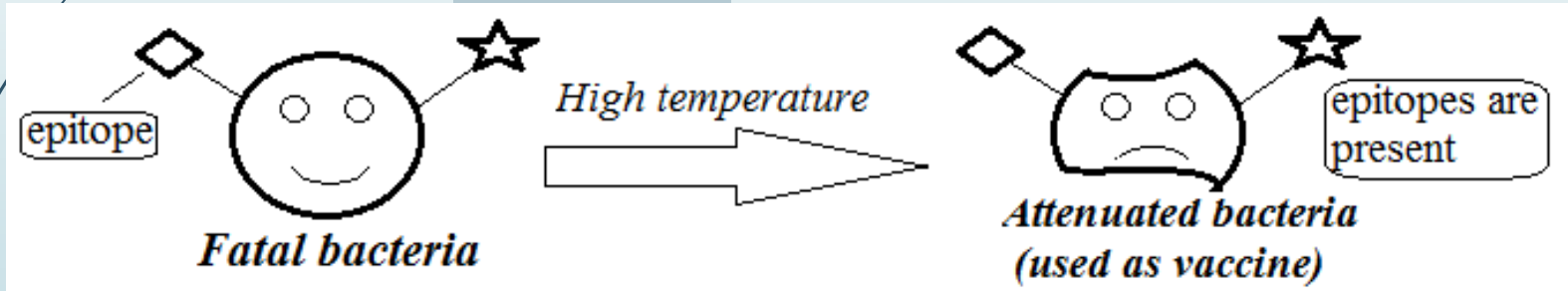
Document 2

Specific Immune Response

- Specific immune response (S.I.R) is the third line of defense in the body.
- S.I.R occurs when the non- S.I.R fails to eliminate the intruder.
- S.I.R depends on the identity of the intruder and attacks it in a specific way.

I. Experimental Study

- Living (pathogenic) bacteria are fatal, virulent or lethal. When bacteria are placed at high temperature, they die or become weakened or attenuated, but they keep their epitopes.



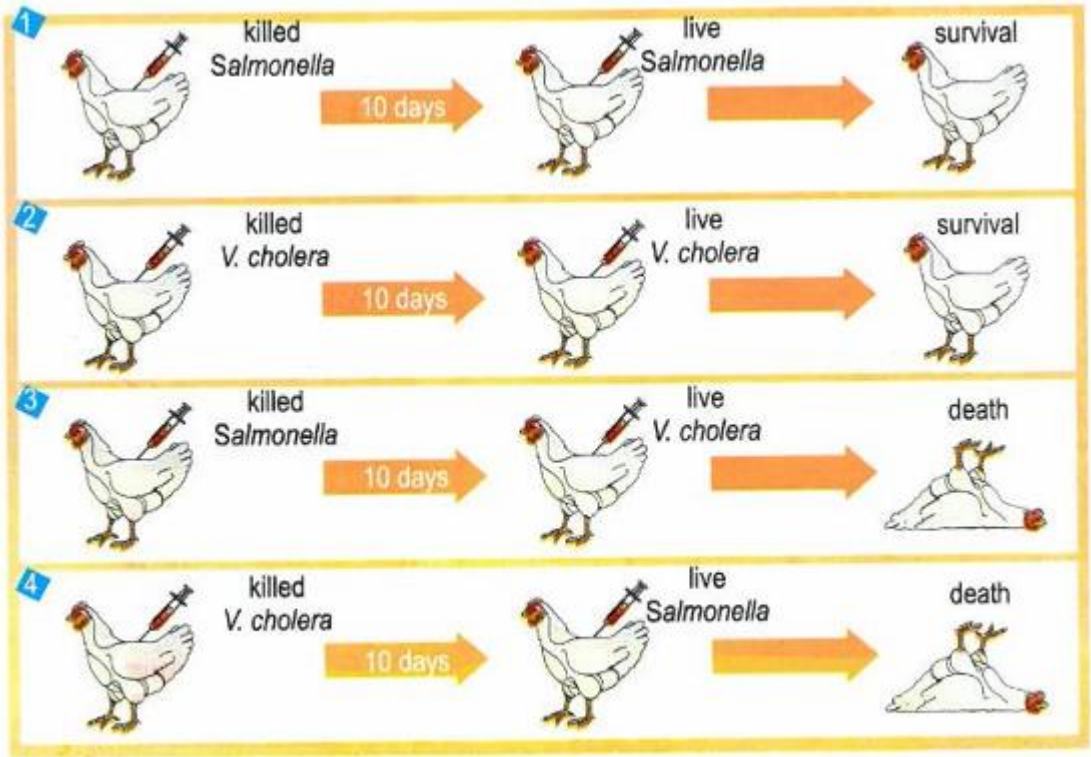
- Application 1:

Vibrio cholera and Salmonella are two types of bacteria that cause serious intestinal infections. Experimental injections of live Vibrio or Salmonella to animals are fatal. If they are submitted to high temperatures, the bacteria die but their antigens are preserved.

- Referring to Doc.a, p.140, answer the following questions:

1- Indicate the difference between killed salmonella and live salmonella.

Killed salmonella (KS) is attenuated (not lethal) while live salmonella (LS) is lethal.

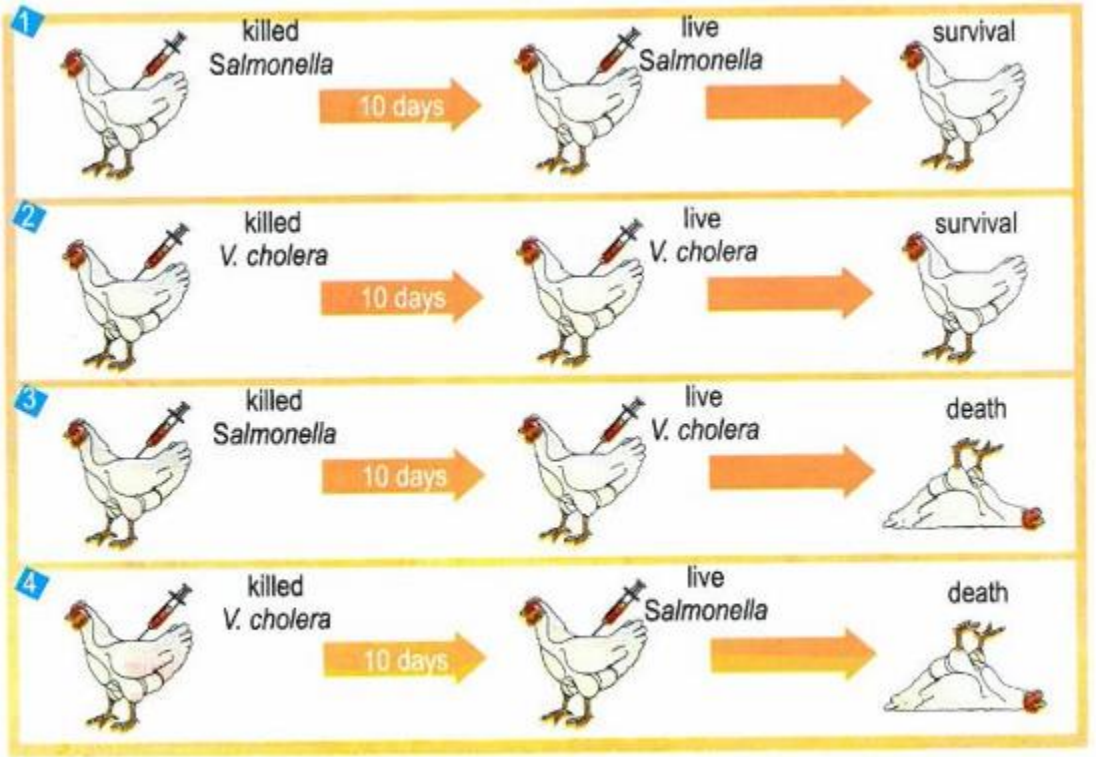


Doc.a *Induction of specific immune responses.*

2- Analyze experiments 1 and 2. What do you conclude?

In experiment 1, after injection of the hen with KS, followed after 10 days by injection with LS, the hen survived. Similarly in experiment 2 after the injection of the hen with KC followed 10 days by the injection with LC, it survived.

Therefore, the injection of the attenuated microbe provides immunity that protects against the virulent microbe.

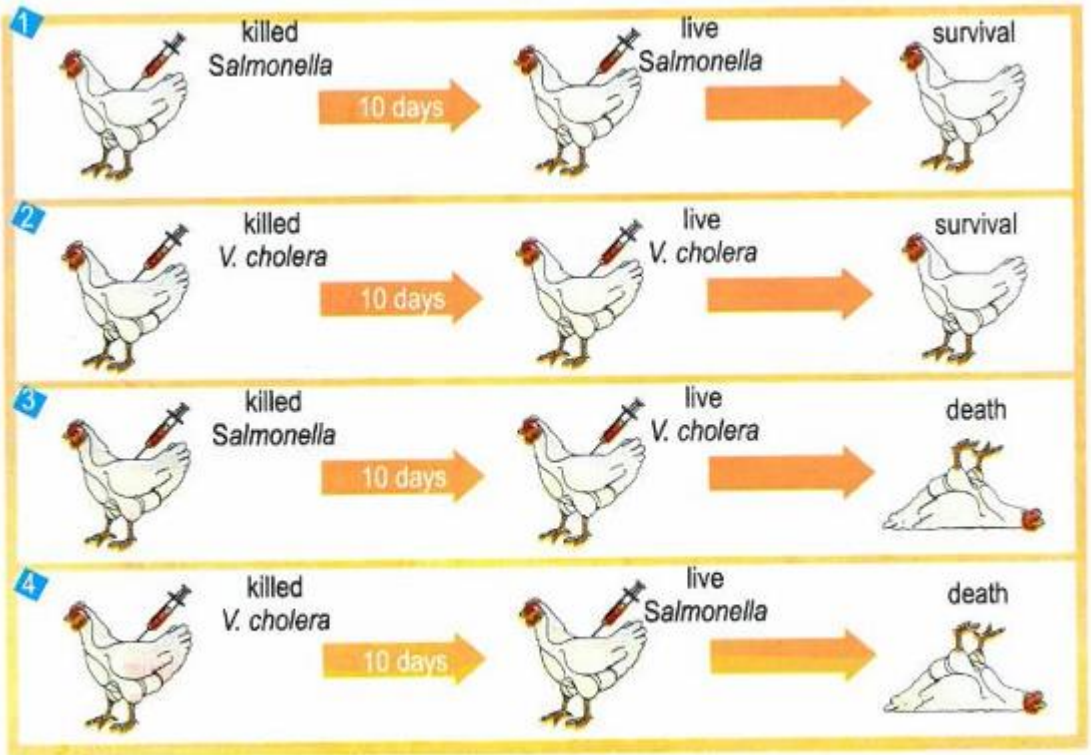


Doc.a *Induction of specific immune responses.*

3- Name the therapeutic method used in experiments 1 and 2.
Vaccination.

4- Interpret experiments 1 and 3. What can you conclude about the immune response.

Upon injection a hen in experiment 1 with KS followed after 10 days with LS, the hen survived. While, upon injecting the hen in experiment 3 with KS followed after 10 days with LC, the hen died.



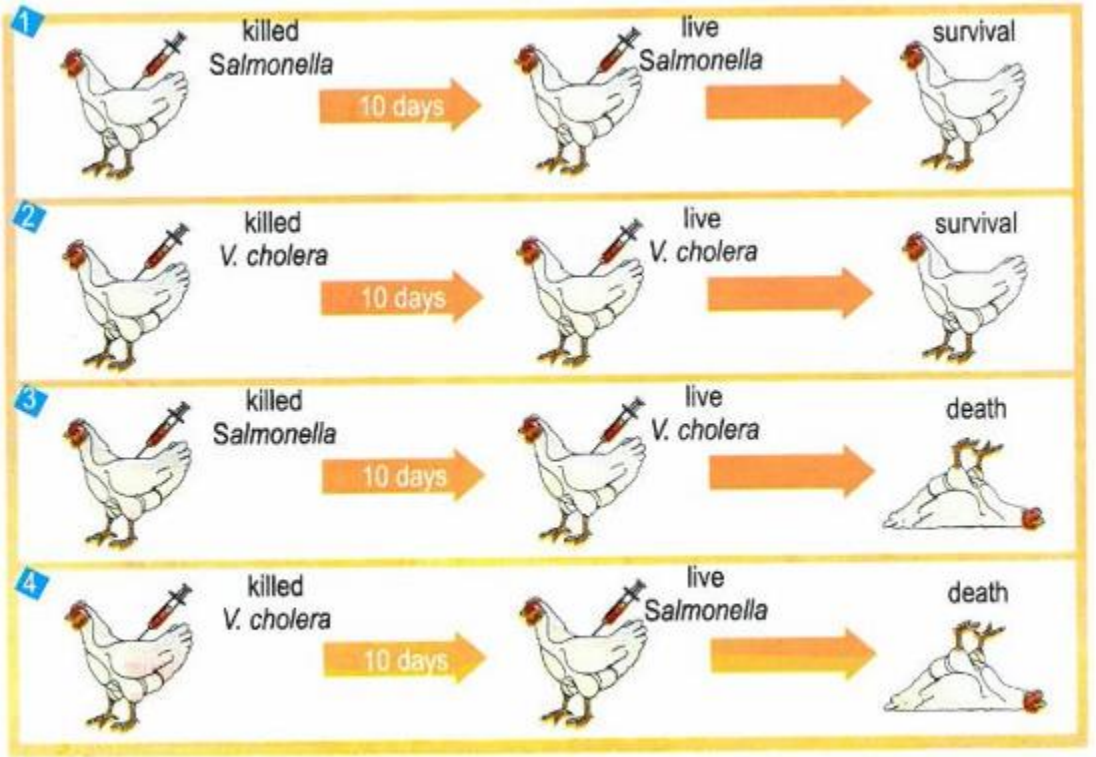
Doc.a *Induction of specific immune responses.*

This means that KS provides immunity (protection) for the hen against LS only but not against LC.

Therefore, the immune response is specific.

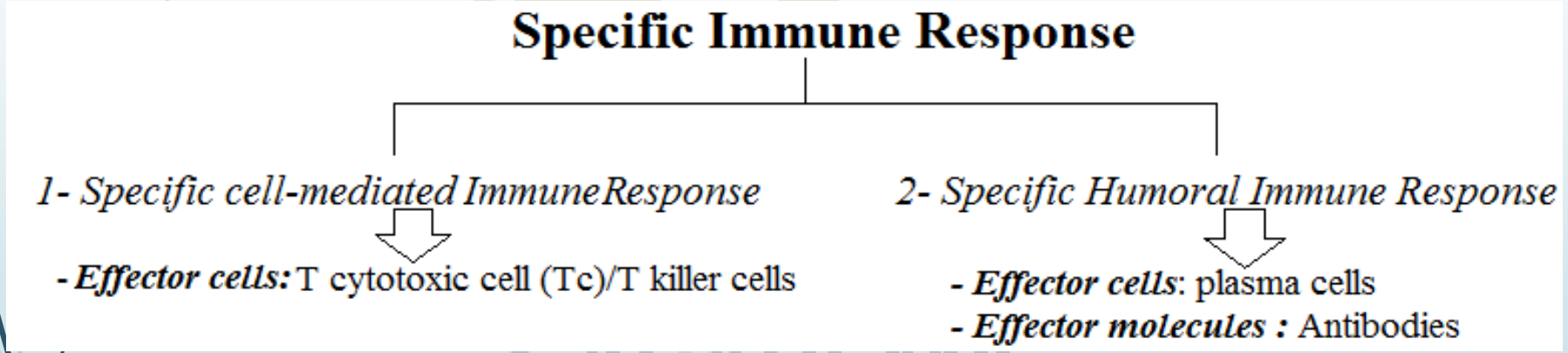
5- Explain why the hen died in experiment 3.

Analyze experiment 3….because KS provides immunity against salmonella only and not against cholera, where live cholera is fatal and causes death.

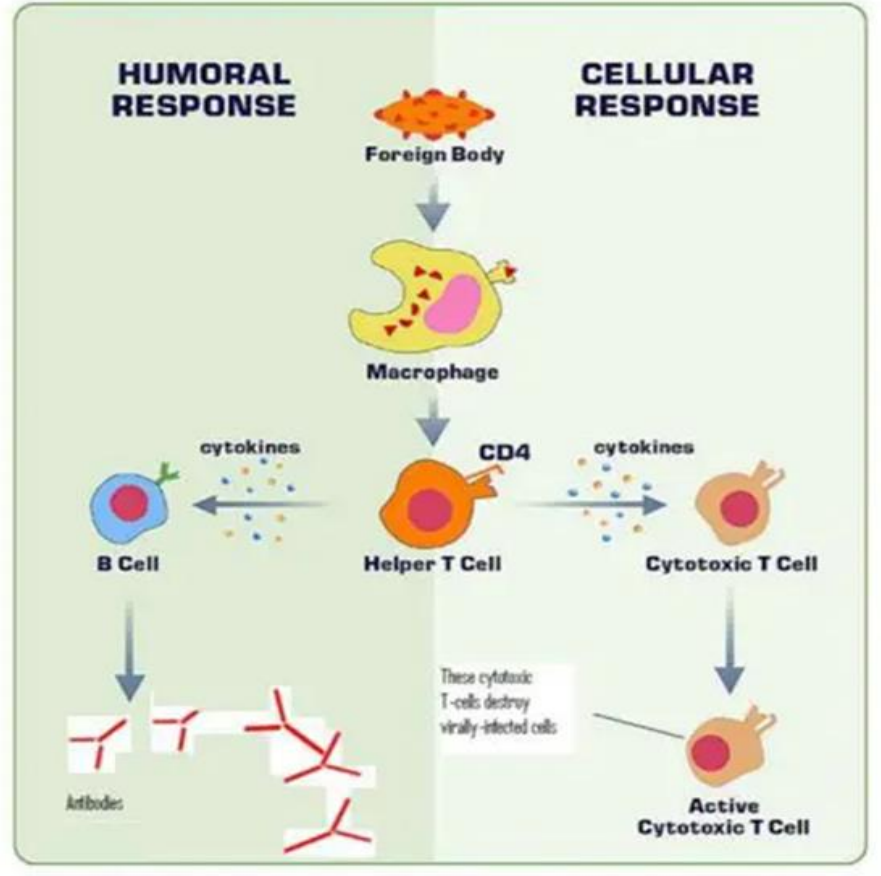


Doc.a *Induction of specific immune responses.*

II. Types of the Specific Immune Response



*Both Tc and B-cells are induced (activated) by T helper cells (TH).



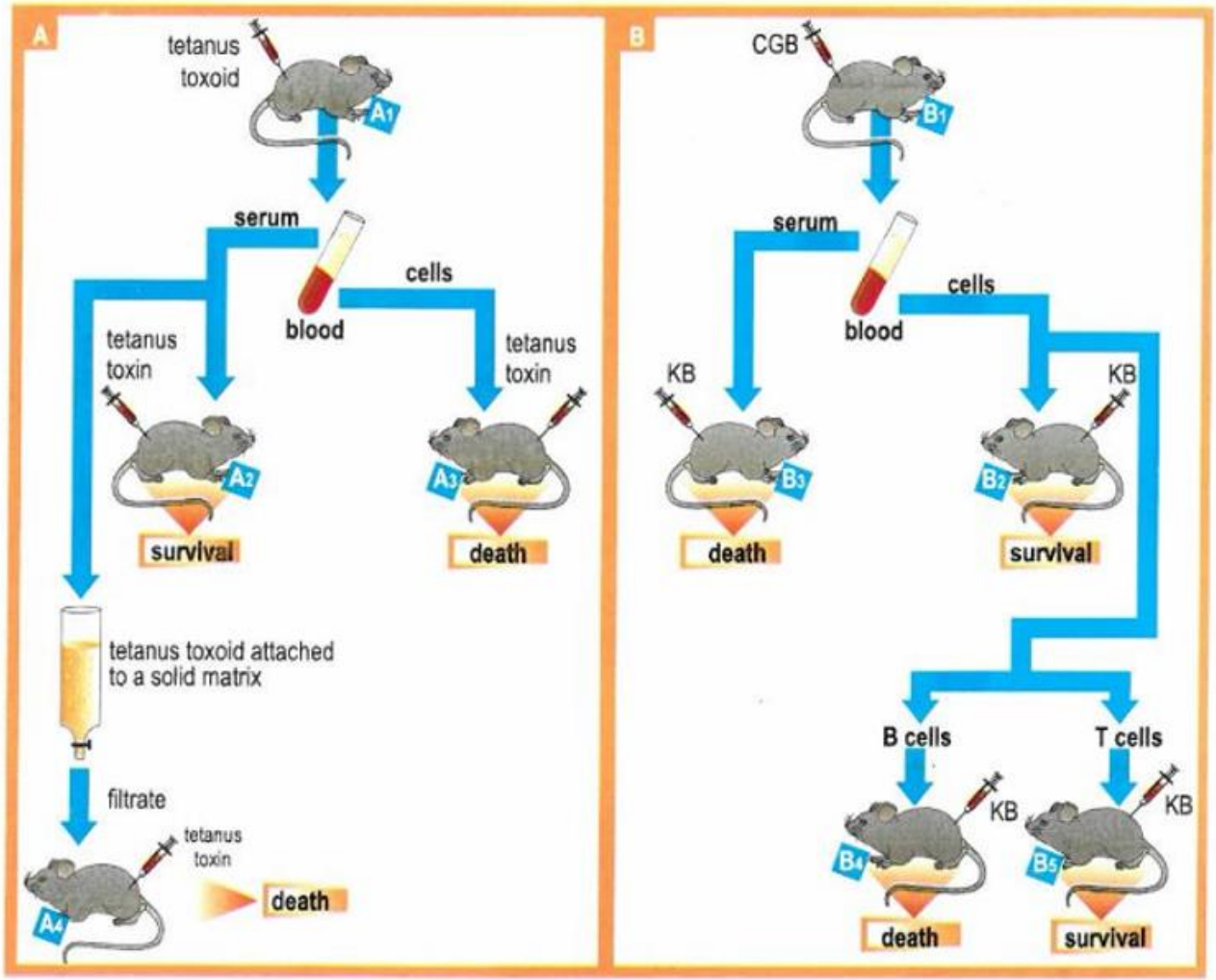
- Application 2:

In experiment A ***(Doc.b)***, we study the immune response against tetanus toxin that is secreted by the bacteria *Clostridium tetani*. The toxin is responsible for tetanus, which can be fatal. Laboratory manipulations eliminate the harmful effects of the toxin without altering its antigenic determinants. The neutralized toxin is called a toxoid.

In experiment B, we study the immune response against the *Koch bacillus* (KB), which is responsible for tuberculosis. KB causes intracellular infections in the lungs and other organs that might lead to death. Calmette and Guerin bacillus (CGB) is a harmless bacterium that shares common antigenic determinants with KB.

- Toxin is fatal, virulent or lethal.

- Toxoid is non-fatal, attenuated and not lethal antigen that causes an immune response. It is non-pathogenic (doesn't cause disease) and can be used as vaccine.

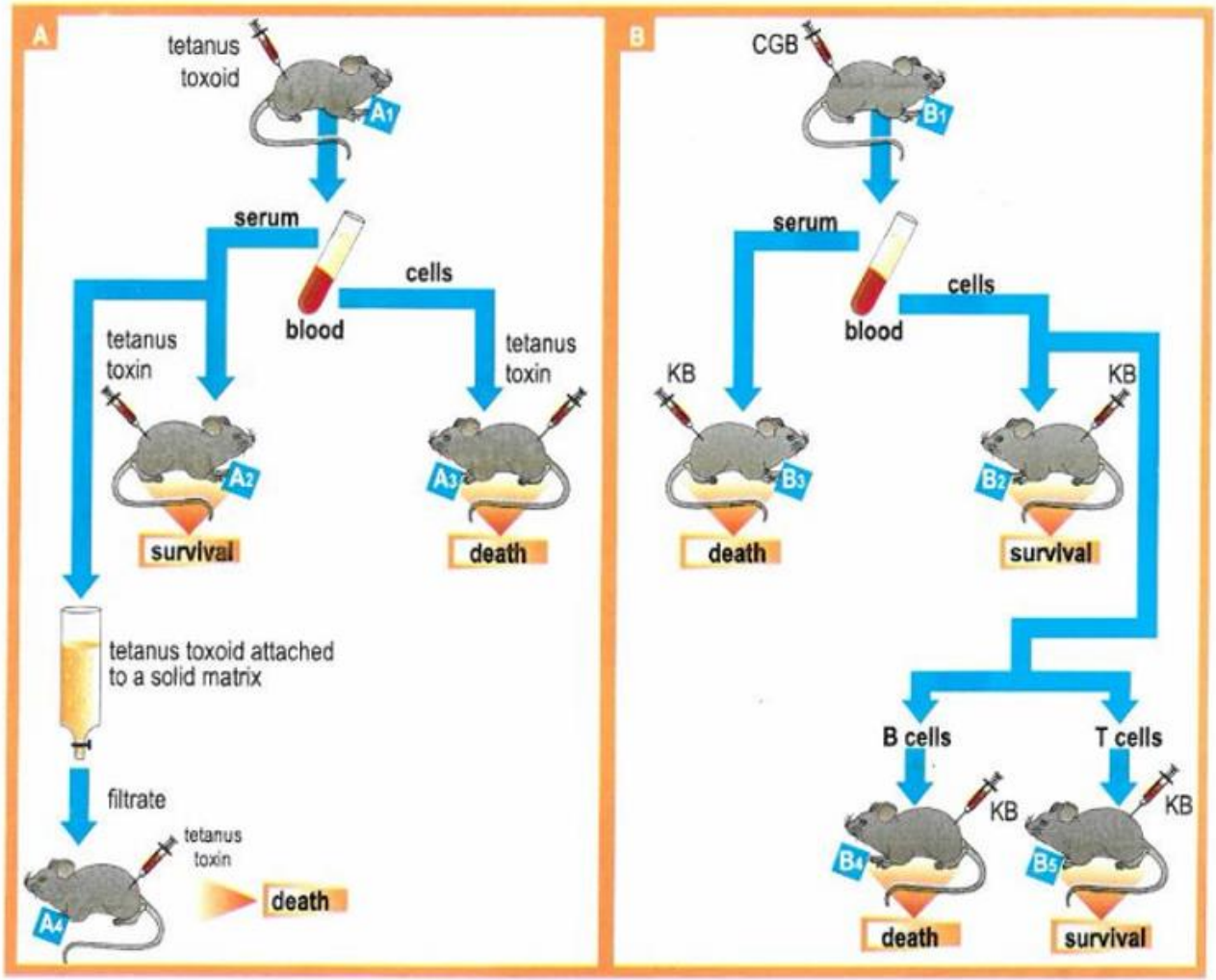


Doc.b *Humoral and cell-mediated specific immune responses.*

- Referring to Experiment A, Doc.b, p.141, answer the following questions:

1- Name the molecule found in the serum obtained from mouse A1.

Anti-tetanus antibodies.



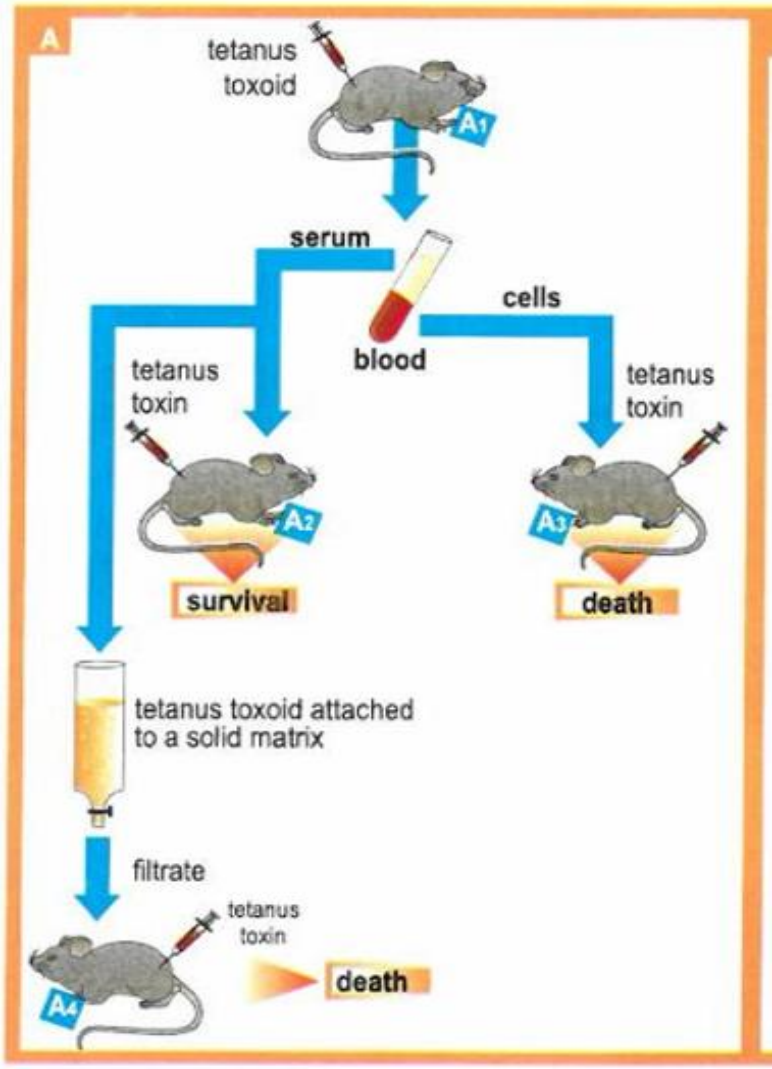
Doc.b *Humoral and cell-mediated specific immune responses.*

2.1- Interpret the results of experiment A.

Interpret =Analyze +specific conclusion

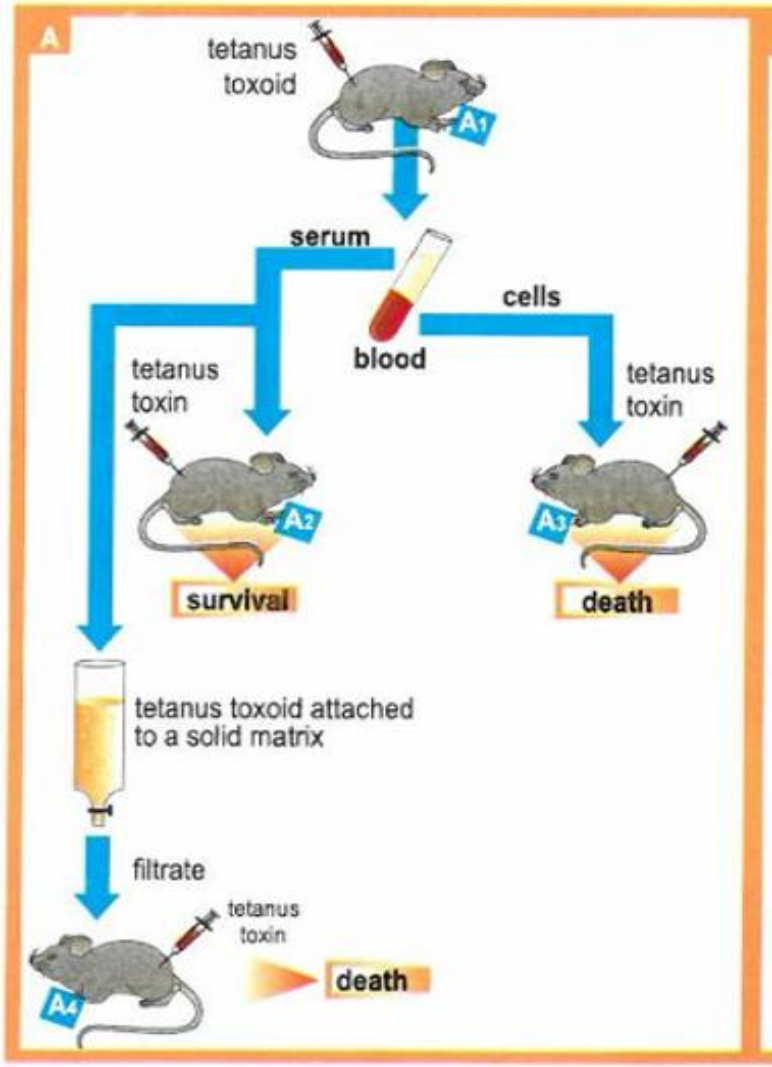
Upon injecting mouse A1 with tetanus toxoid and after blood separation, the serum obtained was injected into mouse A2 followed by injection of tetanus toxin, it survived. While upon introducing the serum into a solid matrix containing tetanus toxoid followed by collecting the filtrate and injecting it into mouse A4 followed by tetanus toxin injection, it died. However, upon injecting the cells of mouse A1 into mouse A3 followed by tetanus injection, mouse A3 died.

This means that, antibodies found the serum are the effector molecules involved in the defense against tetanus.



2.2- Conclude the type of the immune response involved against tetanus.

Thus, the immune response involved in the defense against tetanus is specific humoral immune response.



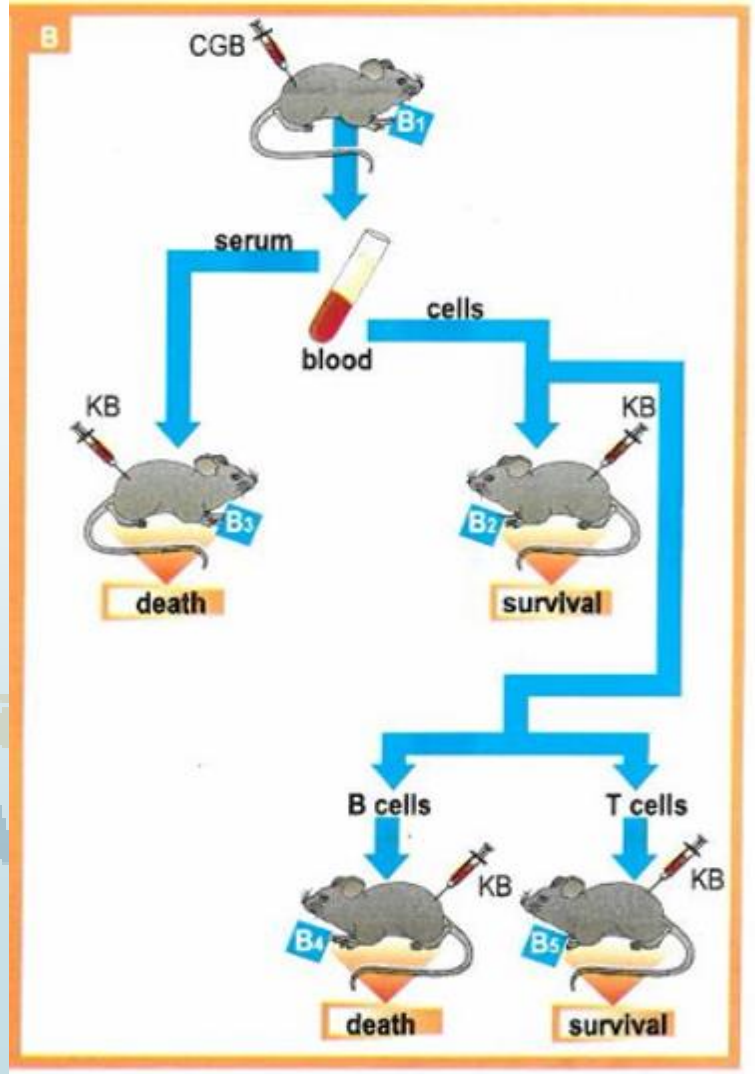
3.1- Interpret the results of experiment B.

Analyze Exp B….

This means that the T-cells are the effector cells involved in the defense against KB.

3.2- Draw out the type of immune response against KB.

Therefore, the immune response against KB is specific cell-mediated immune response.



- Probing the Documents p.141

Probing the documents

1. How do the experimental results of ***doc.a*** show that the immune response, developed 10 days after the injection of salmonella or *Vibrio cholera* is specific?
2. a. What can you deduce concerning the "effector" cells of the immune responses triggered against tetanus and tuberculosis?
   b. What is the type of the immune response triggered in each case?
3. What biological molecules present in the serum are bound to tetanus toxoid attached to the solid matrix?

2- a) In Exp A: plasma cells.

In Exp B: T cells.