

CBSE NCERT Solutions for Class 12 Science Chapter 12

Back of Chapter Questions

1. Crystals of Bt toxin produced by some bacteria do not kill the bacteria themselves because –
- (a) bacteria are resistant to the toxin
 - (b) toxin is immature;
 - (c) toxin is inactive;
 - (d) bacteria encloses toxin in a special sac.

Solution: (c)

toxin is inactive

Explanation: The crystals of Bt toxin is in an inactive form and when the insect attack the plant and if these crystals are ingested by it, then this toxin is activated in the gut of the insect due to alkalinity in the insect's gut that can solubilise the Bt crystals.

2. What are transgenic bacteria? Illustrate using any one example.

Solution:

Transgenic bacteria is the genetically modified bacteria, in which the desired gene is introduced into the genome of the bacteria. Now the bacteria containing the desired gene is produced on a large scale, and the product is modified for utilisation. One such example of transgenic bacteria is *E.coli*, which is used commercially for production of many products including Insulin, Hepatitis B vaccine etc., The *E.coli* bacterial genome is inserted with A and B chains of peptide sequence and grown separately, which are later combined to form the sequence of insulin.

3. Compare and contrast the advantages and disadvantages of production of genetically modified crops.

Solution:

Genetically modified (GM) crops are crops developed through modification in the genetic makeup of the particular crop to obtain desirable variety and crop quality.

There are several advantages of the production of genetically modified (GM) or transgenic plants.

- i) The pest resistance property in most of the GM crops helps increase the productivity of crops, hence there is the least dependency on chemical pesticides.

- ii) The GM crops increase the efficiency of usage of minerals in the soil and hence prevent loss of soil fertility.
- iii) In unfavourable abiotic conditions, the GM crops exhibit a high level of tolerance.
- iv) Golden rice is a transgenic variety of rice crops, enriched with Vitamin A, and it is a classic example of GM crops with enhanced nutritional quality.
- v) The post-harvest loss in the crops can be reduced with the use of GM crops.

Few of the disadvantages include:

- i) GM crops have been a topic of controversy in acceptance over the traditional crops.
 - ii) The process of pollination by honey bees will be affected, if the gene for Bt toxin is expressed in the pollen of the flower, therefore affecting the honey bees. This is one of the effects on the natural and native biodiversity of a region.
 - iii) The GM crops may affect human health since they possess certain allergens and antibiotic resistance markers, which is new to the human body.
4. What are Cry proteins? Name an organism that produce it. How has man exploited this protein to his benefit?

Solution:

Bacillus thuringiensis is the bacteria from which the toxin genes, Bt toxin is produced. The gene coding for Bt toxin is Cry. The proteins expressed by the Cry genes such as cryIAC and cryIIAb attack the cotton bollworms and protein expressed by cryIAb affect corn borer. The extensive use of Cry proteins in the production of pest-resistant Bt cotton or Bt corn has been a reason for the exploitation of this protein.

5. What is gene therapy? Illustrate using the example of adenosine deaminase (ADA) deficiency.

Solution:

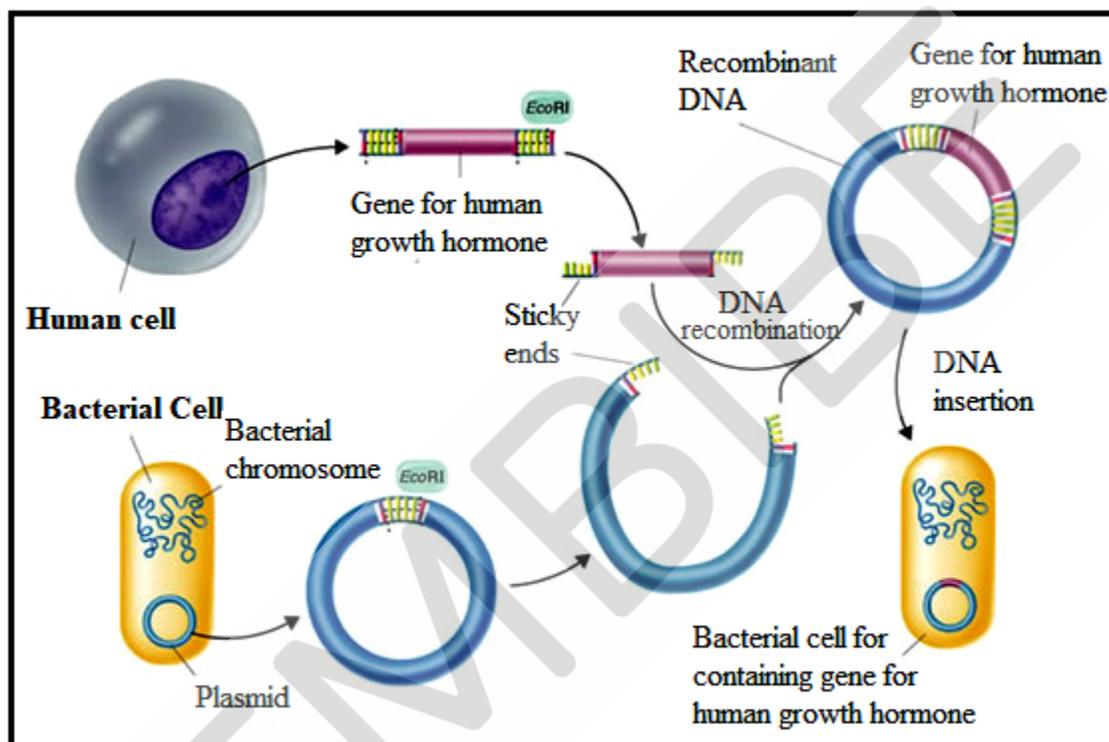
Gene therapy is a method of treating a genetic disorder by introducing the therapeutic gene into the site of a non-functional gene in the child or embryo. Adenosine deaminase (ADA) deficiency occurs due to the deletion of the gene coding for the enzyme Adenosine deaminase that is required for the functioning of the immune system.

This therapy was implemented to a 4-year old girl in the year 1990. There are methods like bone marrow transplantation or enzyme replacement therapy, which must be repeated since the treatment is given through the mortal cells. However, the therapy can be used for a permanent cure of a genetic disease if the ADA

producing genes are isolated from the bone marrow cells and introduced to the early embryonic stage cells.

6. Diagrammatically represent the experimental steps in cloning and expressing a human gene (say the gene for growth hormone) into a bacterium like E. coli?

Solution:



7. Can you suggest a method to remove oil (hydrocarbon) from seeds based on your understanding of rDNA technology and chemistry of oil?

Solution:

The oil is composed of glycerol and fatty acids. The oil can be removed from seeds by detecting the gene responsible for producing the fatty acids and glycerol and removing the gene using recombinant DNA technology.

8. Find out from internet what is golden rice.

Solution:

Golden rice is a variety of rice, having scientific name *Oryza sativa* which was developed through genetic engineering. It was studied that there was a deficiency in the Vitamin A in people for whom rice is a staple food and this led to the development of golden rice which is enriched with Vitamin A. Vitamin A is required to prevent blindness in children. Beta-carotene, a precursor to Vitamin A is found in the photosynthetic regions of the rice plant. However, it is not found in the endosperm of the rice. Hence, the beta-carotene gene is implemented into the

genome of a rice plant so that the requirements are fulfilled. The method of introducing golden rice as a source to supplement Vitamin A in people suffering from Vitamin A deficiency is found to be a cheaper method than consuming vitamin A supplements. However, there have been controversies over the regular usage of this rice and still not available for human consumption.

9. Does our blood have proteases and nucleases?

Solution:

No, our blood doesn't have proteases and nucleases. Proteases are the enzymes that act on proteins while nucleases act on nucleotide sequences. The blood carries several proteins, and the presence of the enzyme protease can destroy them. Hence there is a presence of protease inhibitors. The nucleic acids are absent in the blood. Hence nucleases are also not found in it.

10. Consult internet and find out how to make orally active protein pharmaceutical. What is the major problem to be encountered?

Solution:

It is not possible to make orally active protein pharmaceuticals since our stomach contains protease enzymes which digest or degrade these protein pharmaceuticals. The only way it can be orally administered is through encapsulating the active proteins in liposomes or using different formulations.

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