

Solution Key- Section 14

Questions

1. Classify the following as totipotent, pluripotent, bipotent, unipotent or differentiated:
 - a) Cells that can differentiate into many cell types. *Pluripotent*
 - b) A zygote that is about to start cleavage. *Totipotent (it can form placenta also)*
 - c) Cells isolated from developing brain cortex that produce motor neurons or interneurons when provided with specific growth factors. *Bipotent*
 - d) Intestinal stem cells that replenish the differentiated intestinal crypt cells. *Unipotent*
 - e) A neuron. *differentiated*

2. Using intestinal cells, you do a pulse chase experiment by first putting the cells in a culture medium

containing radioactive dTTP for a short time and then allowing them to grow and divide in medium containing a lot of non-radioactive dTTP.

a) What is the rationale for performing this pulse chase experiment?

This experiment would help us to determine (i) the rapid turnover of the labeled cells and (ii) their migration and the fate that they acquire.

b) What is the relationship of the rapid turnover of a cell with cell division?

As the cells divide there will be more incorporation of unlabeled thymidine in the DNA with every replication event and this will dilute the labeled thymidine.

3. A patient has a rare recessive genetic disorder due to the loss of a specific gene function. This disease causes a decrease in immune function. The patient receives a bone marrow transplant which is successful in alleviating the symptoms of the disease, such that patient can lead a normal life.

a) Why does the bone marrow transplant relieve the patient's symptoms?

If the bone marrow transplant is successful, the bone marrow cells can proliferate to form the different blood cells that circulate in the patient's body and help them alleviate the signs and symptoms.

b) Your patient marries a man who happens to be carrier for the same genetic disorder. What is the probability that their offspring will inherit the disease if the couple had a child a) before and b) after any bone marrow transplant?

The patient is (aa) before the transplant and she marries a carrier (Aa). So the chance that the child will have the disease is $(aA, aa, aA, aa) = \frac{1}{2}$. The probability will remain the same even after bone marrow transplant since the gametes of this patient will still have the "aa" genotype.

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