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Prelab 6 - Sickle Cell SLS44-09/Period 4,5

1. The hemoglobin macromolecule is a somewhat spherical macro protein with quaternary structure composed of 2 alpha and 2 beta globin molecules that contains heme molecules.

2. Sickle hemoglobin is different from normal hemoglobin in that normal hemeglobin is spherical and generally separate while sickle hemoglobin will form strands of itself after being deoxygenated.

3. An autosomal disease is a genetic disorder caused by a changed gene in a non sex-chromosome while a sex-linked disease is a genetic disorder caused by a changed gene in a sex chromosome. Sickle cell is an autosomal disease.

4.A mutation in both beta globin genes in chromosome 11 causes sickle-cell disease. The beginning of the sequence for beta globin is usually GAG, but in those with sickle-cell disease, it is GTG.

5. This mutation manifests itself by coding for valine instead of the usual glutamate amino acid. This causes an end a beta globin molecule to become prone to sticking to other molecules after oxygen leaves the macromolecule. This sticking behavior results in hemoglobin sticking to each other.

6. The symptoms of sickle-cell disease are caused by the irregular shape of red blood cells as a result of the hemoglobin's tendency to form strands. This causes the red blood cell to have a sickle-like, rigid shape. This shape results in the red blood cell getting stuck in blood vessels and not transporting oxygen efficiently, resulting in pain and damage to organs. This may result in episodes of pain, called crises, permanent organ damage, delayed growth, strokes, juandice, diminished immune system performance, and a shortened lifespan. Sickle-cell disease is usually treated by daily doses of penicillin to prevent infection, intake of folic acid to help build new blood cells, rest, increased intake of water, avoiding too much physical activity, occasional bloody transfusions, and bone marrow transplants in severe cases.

7. The life expectancy of those who have sickle-cell disease and live in the United States is at about the mid 40s, where as in underdeveloped areas, lifespan can be shortened down to even six to eleven months.

8. The frequency of sickle-cell disease in the United States is about 70,000 people with 1,000 newborns with this disease born every year.

9. Malaria is caused by a plasmodium parasite transferred to humans by female mosquitoes when they suck blood from humans. When the parasite first enters the human body, it infects liver cells. Then it moves onto infecting red blood cells, after which successive broods of the parasite, now called merozites, will continue infecting red blood cells. Some of the parasites will become gameotocytes, where they may reproduce sexually. A mosquito that takes in blood infected with gameotocytes will have the parasite develop within the mosquito for about 10-18 days into an oocyst. When it ruptures, sporozites are released. Some of the sporozites will be released into a human when the mosquito infects another human, starting its life cycle again.

10. The relationship between sickle-cell disease and malaria is that those with sickle-cell disease are immune to malaria. Carriers of sickle-cell disease are resistant to malaria as well since some sickle cells can be synthesized. This has led to natural selection to favor those who are carriers of sickle-cell to live longer than those without it in regions with prevalent cases of malaria, such as Sub-Saharan Africa.

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