Case Study: A Case of X-linked Agammaglobulinemia

Case Presentation

Billy DeWitt was a normal, full-term baby at birth. Beginning at about 2 months of age, Billy suffered from a series of infectious processes such as sinusitis, otitis media (inflammation of inner ear), and pneumonia. All of these conditions were successfully treated with antibiotics, but within a few weeks of the resolution of one infection, another would occur.

Now at about 4 years old, Billy is examined by a pediatrician who notes that Billy lacks palatine tonsils, although he does not have a history of a tonsillectomy. Questioning of Billy’s mother reveals that she had two male relatives who died in infancy from infectious disease. The physician orders laboratory tests that reveal that the quantity of immunoglobulin in Billy’s serum is about 1/5 the normal level, and that there is a marked deficiency in the number of circulating B-lymphocytes in Billy’s blood. Tests to determine the functional state of Billy’s T-lymphocytes are all normal.

Billy is diagnosed with having a genetic disorder called X-linked Agammaglobulinemia. He begins a course of monthly intravenous injections gamma globulin which he will need to continue for the rest of his life. Billy should no longer suffer recurrent infections and should develop physically and mentally as a normal child. Aside from receiving monthly injections of gamma globulin, he should lead a normal life now that this course of treatments is in place.

Analysis: Answer the questions below using your textbook, lecture notes, and internet.

1. What are the differences between nonspecific (innate) and specific (adaptive) immunity?

2. In what tissue do B- and T-lymphocytes originate and what are the 2 steps involved in lymphocyte maturation?

3. Describe the two “arms” of immunity.

4. a. Define antigen: ______________________________________

   b. What type of organic molecule (carbohydrates, lipids, proteins, or nucleic acids) make the best antigens? Why?
5. Identify the 5 major types of antibodies?

6. What are the means by which antibody molecules exert a protective effect? In other words, how do antibodies protect the body?

7. What are the basic differences between active and passive immunity?

8. Billy was free of infections for the first few months of life. Why?

9. a. What is the function of the tonsils?

   b. Why did Billy lack tonsils?

10. Using the internet, answer the following questions:
   a. What is X-linked inheritance?

   b. Which parent is the child more likely to get the trait from (mom or dad)? _______________________

   c. Give an example of another type of X-linked inheritance. ________________________________