

Preface

Whenever a cell is ready to replicate and divide, our DNA is stored in the compact form called chromosomes. There are a total of 46 chromosomes in most cells of the human body, except for our sex cells, which have half that amount. Each person inherits one chromosome from their mother and one from their father at fertilization, when the egg cell from the mother, which contains 23 chromosomes, fuses with the sperm cell from the father, which also contains 23 chromosomes. Therefore, our body cells contain 23 pairs of chromosomes.

Sickle cell disease is a genetic disorder that is passed on chromosomes from parents to child. It occurs when a person inherits defective beta-hemoglobin genes on both chromosomes and is therefore unable to produce normal hemoglobin. In most cases the defect is due to a mutation that caused a single base substitution in the beta-hemoglobin gene which in turn caused an amino acid substitution in the beta-hemoglobin protein. The beta-hemoglobin gene is on chromosome 11. Because the gene is on an autosomal chromosome and two copies of the mutated gene are required for expression of the disease, sickle-cell disease is passed through generations as a non-sex-linked recessive trait. In this lesson students will study how genes are passed from parent to child. They will create chromosome spreads to examine human chromosomes, create and analyze family pedigrees, and calculate the probability of a child inheriting a trait.

Understandings

1. Chromosomes transfer genetic material from cell to cell as well as from generation to generation, in processes called mitosis and meiosis.
2. There are often several forms of each gene, some being dominant over the others.
3. There are many moral, ethical, and legal considerations surrounding the right to a person's tissues and organs.

Knowledge and Skills

It is expected that students will:

- Recognize that in order for cellular division to occur, exact copies of the DNA must be transferred to the resulting daughter cells.
- Recognize that chromosomes in reproductive cells contain numerous genes that carry traits through the generations.
- Demonstrate the processes of mitosis and meiosis.
- Model the inheritance of genetic diseases.
- Analyze genotype to determine phenotype.
- Use proper techniques to examine, count, and measure chromosomes.
- Appraise the rights a person has to the use of his or her tissues and/or organs.

Essential Questions

1. How is DNA passed to new cells during cell division?
2. What is a chromosome?
3. How are traits passed through the generations?
4. Should a person have rights to their organs and tissues? (Optional)