EDVOTEK • P.O. Box 1232 • West Bethesda, MD 20827-1232

The Biotechnology
Education Company ®

Sci-On™ # S-50

Why Do People Look Different?

Storage:
Store this experiment in the refrigerator.

Educational Objective:

Students will learn basic concepts in Mendelian inheritance and DNA fingerprint analysis.

1-800-EDVOTEK • (301) 251-5990 • 24-hour FAX: (301) 340-0582
http://www.edvotek.com • email: edvotek@aol.com

EVT 907269AM

Major Section Headings

Experiment Components

Storage:
Store this experiment in the refrigerator.

All components are intended for educational research only. They are not to be used for diagnostic or drug purposes, nor administered to or consumed by humans or animals.

This experiment is designed for 10 groups.

Contents

A Mother's DNA sample
B Father's DNA sample
C Child #1 DNA sample
D Child #2 DNA sample
E Child #3 DNA sample
F Child #4 DNA sample

UltraSpec-Agarose™
50x Electrophoresis Buffer
Practice Gel Loading Solution
Transfer Pipets for Gel Loading

None of the experiment components have been prepared from human sources.

Duplication of this document, in conjunction with use of accompanying reagents, is permitted for classroom/laboratory use only.
This document, or any part, may not be reproduced or distributed for any other purpose without the written consent of EDVOTEK, Inc.
Copyright © 1996,1997, 1998, 1999 EDVOTEK, Inc., all rights reserved.

Experiment Requirements

- Electrophoresis Apparatus, M-12 or equivalent
- D.C. Power Supply
- Heat Source
- 500 ml Beaker or Flask
- Hot Gloves
- Tape
- Foil
- Distilled Water (used to make buffer solutions)
- Balance

Duplication of this document, in conjunction with use of accompanying reagents, is permitted for classroom/laboratory use only.
This document, or any part, may not be reproduced or distributed for any other purpose without the written consent of EDVOTEK, Inc.
Copyright © 1996,1997, 1998, 1999 EDVOTEK, Inc., all rights reserved.

BACKGROUND INFORMATION

Why Do People Look Different?

Human genetics follows the basic findings of Augustine monk Gregor Mendel, who studied plant genetics in the mid-1800's. Mendelian genetics predicts traits inherited by offspring are based on the inheritance of two alleles, or forms of the gene. These two alleles are inherited one from each parent. Alleles, and corresponding traits, can be either dominant or recessive. When a dominant allele is inherited, the trait coded by that allele will be apparent in the offspring. The presence of a dominant allele will, in effect, mask the trait coded by the recessive allele. To observe the recessive trait, it is required that both parental alleles be the recessive type. If both alleles are the same type, either both recessive or both dominant, the individual is said to be homozygous with respect to that trait. If an individual has one dominant and one recessive, the individual is said to be heterozygous for that trait.

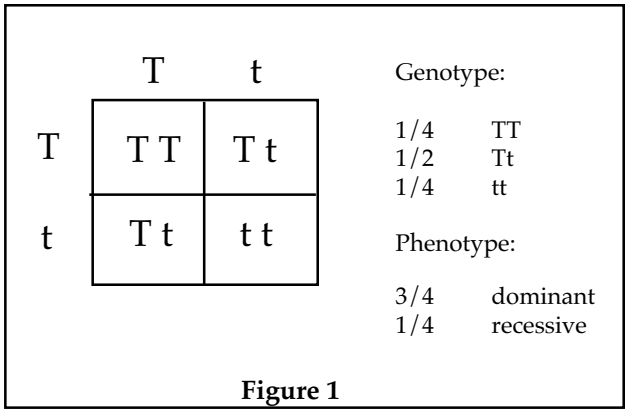


Figure 1

Mendelian inheritance can be demonstrated with a 2 X 2 matrix, as shown in Figure 1. Parental alleles are placed on the sides of the matrix, and the genotype (what is genetically inherited) and phenotype (the way we look) of the offspring can be predicted. By convention, the dominant allele is denoted by an upper-case letter and the recessive allele by a lower-case letter. For example, assuming both parents each carry one dominant allele and one recessive allele, we can predict that 3/4 of their children will have the dominant phenotype and 1/4 of their children will have the recessive phenotype. Genotypically, 1/4 of the children will carry two dominant alleles, 1/2 of the children will carry one dominant and one recessive allele, and 1/4 will carry two recessive alleles. Of course, these are only estimates of what is expected and actual observations may be different. If there are a large number of offspring from two parents, as in the case of insects or plants, actual observations come very close to what is estimated.

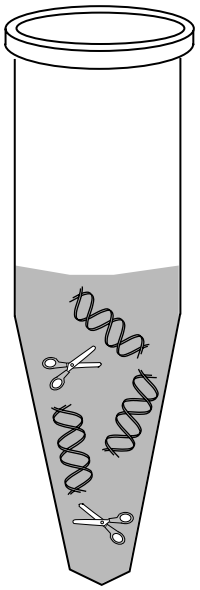
Some traits are easy to observe in offspring. In plants, they include pigmentation, plant height, seed coat color, and seed texture. In animals, they include coat color, hair texture, dwarfism, and size of certain body parts, such as wings. Eye color in humans is commonly used as an example in classroom situations where brown eyes are dominant and blue eyes are recessive.

Duplication of this document, in conjunction with use of accompanying reagents, is permitted for classroom/laboratory use only.
This document, or any part, may not be reproduced or distributed for any other purpose without the written consent of EDVOTEK, Inc.
Copyright © 1996,1997, 1998, 1999 EDVOTEK, Inc., all rights reserved. EVT 907269AM

BACKGROUND INFORMATION

Background Information, continued

Various genetic traits are now analyzed by digestion of DNA with special proteins, called restriction enzymes and individual fingerprints for parents and their children can be established. A process that is utilized for the analysis of DNA is agarose gel electrophoresis. In this procedure DNA that has been fragmented by restriction enzymes is separated based on size in an electrical field in which the agarose gel is placed. The fragments travel through the agarose pores, with smaller fragments snaking their way through the gel faster than larger fragments. The DNA can then be stained, detected, and analyzed. Everyone has a particular fragment pattern but each fragment in an individual's pattern must match a fragment in at least one of the parents. These fragments are called a DNA Fingerprint. Often individual genetic traits such as genetic diseases and the predisposition to certain diseases are determined by the mobility of specific DNA fragments that are identified to be associated with a particular trait.



In the experiment, simulated DNA samples from two brown-eyed parents and their children will be separated by agarose gel electrophoresis. The object will be to detect the alleles that are inherited by the children. To simplify the discussion, we will use eye color, with brown as dominant and blue as recessive, as the trait to be analyzed. One should remember that the eye colors could easily be genes that determine whether an individual will have a disease, or be a carrier of one. Examples of genetic diseases include cystic fibrosis, Huntington's Disease (a form of muscular dystrophy), and some types of cancer.

Duplication of this document, in conjunction with use of accompanying reagents, is permitted for classroom/laboratory use only.
This document, or any part, may not be reproduced or distributed for any other purpose without the written consent of EDVOTEK, Inc.
Copyright © 1996,1997, 1998, 1999 EDVOTEK, Inc., all rights reserved.