My Genetic Profile

The individuals of every population have a variety of phenotypes. These variations are a result of genotypic variance caused by the inheritance of different alleles. The presence or absence of an allele inherited according to the Mendelian laws of inheritance can be followed through many generations with a pedigree chart.

In this activity you will identify your phenotype for eight characteristics and use these observations to try to determine the associated genotypes. Then you and a partner will determine the phenotypes and genotypes for possible first- and second-generation offspring and construct a pedigree chart.

Purpose

To determine your phenotype and genotype for a characteristic and to track allele inheritance through three generations

Equipment and Materials

- coin

Procedure

SKILLS HANDBOOK A2.4

Part A: Determining Your Genotype

1. Copy Table 1 into your notebook.

Table 1 Genotypes for Some Common Human Phenotypes

Characteristic: dimples

Dominant phenotype: present (D)

Recessive phenotype: absent (d)

Characteristic: earlobes

Dominant phenotype: freely hanging (F)

Recessive phenotype: attached (f)

Characteristic: hair on mid-finger

Dominant phenotype: hair present (H)

Recessive phenotype: hair absent (h)

Characteristic: 2nd toe longer than big toe

Dominant phenotype: longer (L)

Recessive phenotype: shorter (l)

Characteristic: hairline

Dominant phenotype: widows peak (W)

Recessive phenotype: straight (w)

Characteristic: tongue roll

Dominant phenotype: roller (R)

Recessive phenotype: non-roller (r)

Characteristic: thumb flexibility

Dominant phenotype: bent back (T)

Recessive phenotype: straight (t)

Characteristic: thumb placement with hands clasped

Dominant phenotype: left thumb on top (P)

Recessive phenotype: right thumb on top (p)

2. Using the information in Table 1 as a guide, draw and complete a data table similar to Table 2 that lists all eight characteristics. If, for a particular trait, you do not know whether you are homozygous dominant or heterozygous, record your genotype as heterozygous.

Table 2 Determining Your Genotype

Characteristic: dimples

Phenotype:

Possible genotype(s):

Characteristic: earlobes

Phenotype:

Possible genotype(s):

Part B: The F1 Generation

Now you will work with a partner to simulate the passing on of genetic information to a single offspring. For this activity, ignore sex.

3. Copy Table 3 into your notebook, with rows for all eight characteristics.

4. To determine the genetic makeup of the offspring, you and your partner (parent 1 and parent 2) must each contribute a single allele for each characteristic. To choose each allele, you must make eight coin flips—one for each characteristic. If you flip "heads," you contribute the first allele of your genotype; if you flip "tails," you contribute the second allele. For example, if you flip heads for "thumb flexibility" and you are Tt, then you enter T under your parent column in Table 3.

5. After you have determined the alleles for each characteristic, complete the genotype and phenotype columns in your table.

Table 3 Genotype and Phenotype of F1-Generation Offspring

Characteristic: dimples

Allele from parent 1:

Allele from parent 2:

Genotype:

Phenotype:

Characteristic: earlobes

Allele from parent 1:

Allele from parent 2:

Genotype:

Phenotype:

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Part C: The F2 Generation

Now you will simulate the mating of your offspring with the offspring of another pair of students.

6. Repeat Step 4 to model the contribution of alleles from the two F1 offspring and determine the genotype and phenotype of their F2 offspring—your "grandchild" in this simulation. Record your data in a new copy of Table 3 titled "Genotype and Phenotype of F2-Generation Offspring."

7. Choose any single trait in your grandchild and draw a pedigree chart to track its inheritance over the three generations. Be sure to include all four grandparents and both parents in the chart.

Key

K/U: Knowledge and Understanding

T/I: Thinking and Investigation

C: Communication

A: Application

Analyze and Evaluate

(a) In this activity, which step(s) represent(s) an event in meiosis? Is this a true representation? Why or why not? T/I

(b) Use examples from the activity to explain your understanding of the terms "genotype," "phenotype," ‘`recessive," and "dominant." T/I C

(c) Look at your table of genotypes and phenotypes. How many of your eight traits are recessive? T/I

(d) Look at your partner's table. How many of his or her eight traits are recessive? T/I

(e) How did the number of recessive traits in your offspring compare with that of yours as "parents:' Did this surprise you? What factors might account for these differences? T/I

(f) Write a birth announcement for one of your offspring. List the baby's characteristics. T/I C