Sickle Cell Inheritance

NAME:_____

Glossary

- **Sickle cell disease**: a genetic disease
- **Sickle trait**: a genotype with one sickle and one normal gene. People with sickle trait are immune to malaria.
- **Normal**: a genotype that does not have any potential for passing on a sickle gene
- **Allele**: a gene from one parent. One gene from each parent combined make the child have a complete set of genes.
- **Dominant**: a trait that only needs one copy of that gene in order to display
- **Recessive**: a trait that needs two copies of that gene in order to display
- **Inheritance**: getting traits from your parents
- **Homozygous**: the allele for the same gene came from both parents for the child
- **Heterozygous**: alleles for different genes came from each parent for the child

[Sample Answers]

Hypothesis:

We propose that given the model of the Punnet square and genetic inheritance, and assuming that the parents both have sickle trait, there is a 25% chance that their child will have sickle cell disease, a 50% chance their child will have sickle trait, and a 25% chance their child will be normal.

Materials:

Two paper bags, four balls: two of each color, a writing utensil, a data collection sheet, a calculator (optional).

Methods/Procedure:

First, we will ensure that there are two balls of different colors in each bag. Then, we will remove one ball from each bag without looking. We will record the color of each ball on the data sheet by its corresponding allele. Next, we will replace the balls to their respective bags. We will repeat this for a total of 20 trials. Finally, we will analyze the data we collected, we could use a calculator.

Data Collection

Baby number	Gene from Mother	Gene from Father	Result
1	A	A	AA:NORMAL
2	S	S	SS: SICKLE CELL DISEASE
3	A	S	AS:SICKLE TRAIT
4	S	A	SA:SICKLE TRAIT
5	S	A	SA:SICKLE TRAIT
6	S	A	SA:SICKLE TRAIT
7	A	S	AS:SICKLE TRAIT
8	S	A	SA:SICKLE TRAIT
9	A	S	AS:SICKLE TRAIT
10	A	A	AA:NORMAL
11	A	S	AS:SICKLE TRAIT
12	S	A	SA:SICKLE TRAIT
13	S	S	SS:SICKLE CELL DISEASE
14	A	A	AA:NORMAL
15	S	S	SS:SICKLE CELL DISEASE
16	A	S	AS:SICKLE TRAIT
17	A	A	AA:NORMAL
18	S	S	SS:SICKLE CELL DISEASE
19	S	S	SS:SICKLE CELL DISEASE
20	S	S	SS:SICKLE CELL DISEASE

Data Analysis

	Sickle Cell Anemia	Sickle trait	Normal
Number	6	10	4
Out of…	20	20	20
Fraction	$\dfrac{6}{20} = \dfrac{3}{10}$	$\dfrac{10}{20} = \dfrac{1}{2}$	$\dfrac{4}{20} = \dfrac{1}{5}$
Percent	$\dfrac{3}{10} \times 100\%$ $= 0.3 \times 100\%$ $= 30\%$	$\dfrac{1}{2} \times 100\%$ $= 0.5 \times 100\%$ $= 50\%$	$\dfrac{1}{5} \times 100\%$ $= 0.2 \times 100\%$ $= 20\%$
% deviation from expected	$\|25\%-30\%\| = 5\%$	$\|50\%-50\%\| = 0\%$	$\|25\%-20\%\| = 5\%$

Discussion of Results

There were more people with Sickle Cell Anemia than expected. There were as many people with sickle trait as were expected. There were less normal people than expected. This could be because we modeled the inheritance with only 20 babies. The results are pretty close, 5% deviation from expected is quite good. If we did this experiment again we would try to see what would happen if we did more babies so that the results would be closer to the expected results.