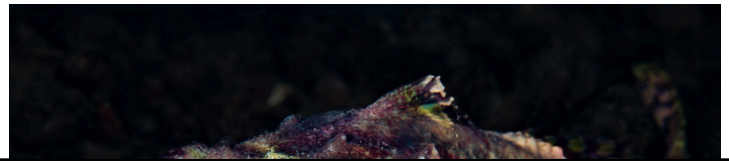
3.8: PATTERNS OF INHERITANCE: FLIP FOR SURVIVAL

Introduction

Our DNA is inherited from our parents. If we want to change DNA to make superheroes, we have to understand how we get our DNA in the first place, where comes from, and how the genes know what to do. You read in the article that some genes are dominant; they take charge, and some are recessive; they do



it

what dominant genes tell them. To learn how our DNA works, we need to understand what happens when we get various combinations of genes that code for specific traits. For example, what happens when we get both a dominant allele and a recessive allele for a gene? (Remember that alleles are different forms of a gene.) And how likely is it that two fish parents will have offspring with a certain trait based on the DNA of both the parents and the offspring?

To answer these questions, we'll take a look at a special gene found in some fish that live in very cold waters, like the shorthorn sculpin shown here. Some fish have a special gene that lets them survive in freezing waters—it makes antifreeze proteins (AFPs) that prevent ice crystals from forming in their blood. This trait is dominant (A), so even one copy will help them survive.

In this activity, you'll simulate fish breeding using coin flips and predict whether the offspring will survive the ice.

Flip for Survival: Will fish offspring survive the ice?

Materials:

- 2 coins

Directions:

Each coin represents one parent fish.

- Heads = A (Dominant; has antifreeze proteins)
- Tails = a (Recessive; no antifreeze proteins)

Both parent fish are heterozygous (Aa), which means they have antifreeze proteins. Now, let's find out what happens when these parents have offspring. Remember that offspring get one allele, or version of the gene, from each parent.

1. Flip one coin to determine which allele is passed to the offspring from Parent 1. Record this in the table below.
2. Flip the second coin to determine which allele is passed to the offspring from Parent 2. Record this in the table below.
3. Determine the genotype and phenotype of the offspring.
4. Determine whether the offspring will survive in icy waters.
5. Repeat for all 12 offspring.

Data Table:

Offspring	Allele from Parent 1	Allele from Parent 2	Offspring Genotype	Offspring Phenotype	Will it survive in icy water?
Example	a	a	aa	No AFPs	No
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Investigation Reflection

1. Use your data to calculate the percentage of offspring with each genotype.

Genotype	How many offspring does this genotype have?	What percentage of offspring have this genotype? (Round to the nearest whole number.)
AA	_____ / 12	
Aa	_____ / 12	
aa	_____ / 12	

2. What percentage of offspring have AFPs? What percentage of offspring do not have AFPs?

3. Imagine these two fish parents have 12 more offspring. Do you think most of the offspring would or would not have AFPs? Why do you think this?

4. If you wanted to increase the survival of the offspring, what two parent genotypes would you breed? In other words, which two offspring would you put together to create new offspring?