

# REEBOPS

## Purpose

ReeBops are small organisms that live in discarded soda cans. Chances are you have never seen one as they are extremely fast little organisms. Chromosomal analysis of ReeBops has revealed that they have 7 pairs of chromosomes for a total of 14. In this activity, you will assist in the reproduction of new ReeBops. As you work, notice the differences among all of the offspring!

## Background

Animals like humans, dogs, cats, fish, and reebops are complex organisms. Think about all the different parts of a dog. Dogs have fur, eyes, legs, lungs, etc. Dogs are made up of many parts. Think about humans. We have lots of different parts. But do all humans look the same? Do all dogs look the same?

Why is there so much *variation* or differences among species of animals? A chihuahua is a dog, but so is a Great Dane. How does a baby chihuahua grow into such a small dog, but a Great Dane grow into such a large dog?

Even though both the chihuahua and the Great Dane are dogs, they have many different traits. Their basic body type is similar. They both have 4 legs, they both have two eyes. But the similarities end there. Different dogs have different traits. Great Danes are gigantic. They have short fur. Sheep dogs have long shaggy fur. Some dogs have big wrinkly skin. Some dogs have smooth tight skin. Think of different dogs and their various traits.

So what determines which dogs are small and which dogs are tall? What determines whether humans have blue eyes or brown eyes? What determines the various traits of different organisms? The answer is DNA (deoxyribonucleic acid), a very big and complicated molecule.

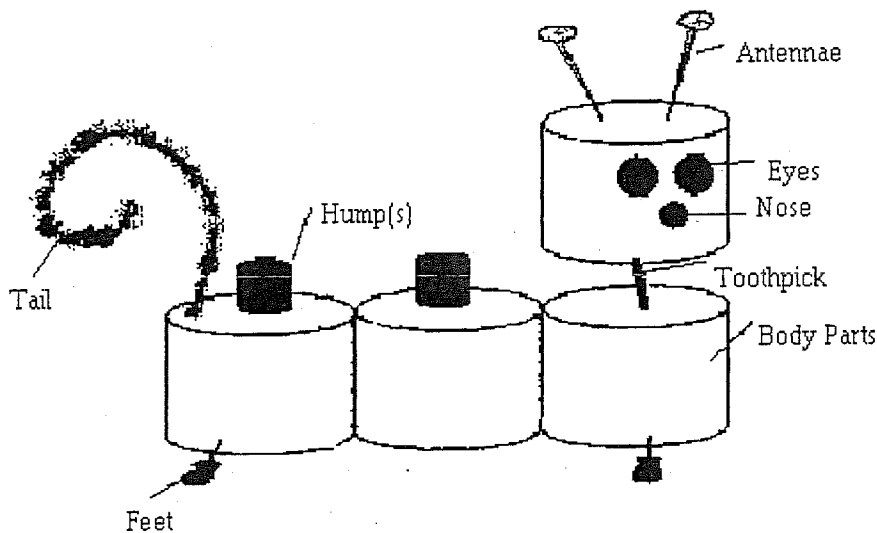
DNA is humongous. DNA is gigantic. DNA enormous. But it all fits inside one single cell. In fact, every cell in your body contains all of its DNA. Each cell is a blue print for your entire body. HOW COOL IS THAT!??

So the human body is very complex, so that means that you have a lot of DNA. In order for your body to be able to use it, it must organize the information. It's just like a library. If a library didn't organize any books, how would you be able to find a specific book? Think of DNA like a gigantic library. If your body needs to find out how to repair something, how will it be able to find it in the gigantic mess of DNA? Your body organizes DNA into structures called chromosomes. Depending on how much DNA you have depends on how many chromosomes you have. Humans have 46 chromosomes. We have a lot of DNA. But 46 chromosomes is still a lot of DNA to manage, so your body organizes it even further. Each chromosome is organized into a pair. Humans have 23 chromosome pairs.

**BUT WHERE DOES ALL OF THE DNA COME FROM?** Well, that's a pretty easy question. Half of your DNA comes from your mother and half of your DNA comes from your father. That means that 23 chromosomes came from your mom, and 23 chromosomes came from your dad. Each of the chromosomes pair up to form your 46 chromosomes.

You should think of DNA like a secret code. Each chromosome contains different parts of the code. Some chromosomes determine what color hair you have, some chromosomes contain the information to tell you what color your eyes will be, etc. A gene is the part of a chromosome that carries the DNA that controls a trait.

Reebops have 14 chromosomes. That means that 7 chromosomes come from the female reebop and 7 chromosomes come from the male reebop. There are seven traits (one for each chromosome pair) for each reebop.



**REEBOP PARENT**

- The traits are sorted so that they are matched into same sized pairs and same letters of the alphabet. You should have 7 pairs of same size strips (chromosomes whose letters code for traits) for both the male and female.

The letters represent different traits.

“A” and “a” represent the number of antenna present

“M” and “m” represent the number of humps present

“Q” and “q” represent the nose type.

“T” and “t” represent the type of tail.

“E” and “e” represent the number of eyes.

“L” and “l” represent the number of legs.

“D” and “d” represent the number of body segments (3 or 4, including the head).

## Experiment

Tell the students to take the longest pairs of orange (male) and red (female) chromosomes and place them FACE DOWN on their desks so that they cannot see the letters.

WITHOUT TURNING THE CHROMOSOMES OVER, one of the partners picks one ORANGE chromosome of the longest size, and one RED chromosome of the longest size. Take these as one new pair. The other partner takes the remaining pair for his/her ReeBop baby.

- Continue doing this, taking one from each pair from longest to shortest matching the ORANGE with the RED. The partners should each end up with seven new traits, each pair is one ORANGE chromosome and one RED chromosome (strip).
- Turn over the chromosomes that you have chosen. These represent a new "baby" ReeBop! On the DATASHEET, record the letter found on the ORANGE chromosomes in the Male Gene column. Record the letter found on the RED chromosomes in the Female Gene column. Be sure you copy the letters exactly, **uppercase or lower-case**. THIS IS IMPORTANT!
- After filling out the DATA SHEET, return all chromosomes to their proper bags.
- Determine the GENOTYPE by combining the 2 letters.
  - Determine if the trait is dominant or recessive.
- Record the PHENOTYPE for each characteristic, using the KEY provided. Record this on the ReeBop Worksheet.

## Materials (for 30 students)

- Body Parts (3 or 4) - 3 bags of Large marshmallows
- Humps (2 or 3) – pink small marshmallows
- Tail (1) - 30 Sour Worms
- Feet (4 or 6) - 180 Spice Drops
- Antennae (1 or 2) - 60 pieces of Twizzlers
- Eyes (2 or 3) - 90 Jelly Beans
- Nose – yellow or orange small marshmallows
- 3 boxes of Toothpicks
- 15 sets of trait strips (28 strips in each set)
- 30 Data Sheets
- 15 Reebop Keys (in sheet protectors)
- 30 Reebop Worksheets

## Information

Each pair should each have a set of ~~YELLOW~~ chromosomes and a set of RED chromosomes.

- One set of strips represent the chromosomes from the mother (female) Reebop. The other set of strips represents chromosomes from the father (male) Reebop.

Each STRIP represents a CHROMOSOME. Each strip has a letter, – either uppercase or lowercase. The uppercase letters represent a DOMINANT form of the trait and the lowercase letters represent the RECESSIVE form.

- Each PAIR of letters codes for a TRAIT (or, scientifically, an ALLELE). A DOMINANT trait will be present if the UPPERCASE letter is present. A RECESSIVE trait occurs only when BOTH lowercase letters are chosen.

Have everyone in the class try and roll their tongues. Have the people who cannot roll their tongues raise their hand. Explain to the students that, like scientists, we can attach the letter “A” to the gene for tongue rolling. Those students whose hands are raised have the recessive trait, which is represented by “aa”, and those who do not have their hands raised have the dominant trait, which can be labeled as either “Aa” or “AA.”

Now have the students look at their earlobes. If the bottom of the earlobe is not attached (the bottom of the ear sort of dangles), the student has the dominant gene, “BB” or “Bb”. If the earlobe is attached, the student possesses the recessive gene, “bb.”

- Now assemble the baby ReeBop using the ReeBop Key.

### ReeBop Key

Phenotype	Genotype
2 antenna	AA or Aa
1 antenna	aa
1 hump	MM or Mm
2 humps	mm
Orange nose	QQ or Qq
Yellow nose	qq
Curly tail	TT or Tt
Straight tail	tt
2 eyes	EE or Ee
3 eyes	ee
4 legs	LL or Ll
6 legs	ll
4 body segments	DD or Dd
3 body segments	dd

## ReeBop Worksheet

### Data Sheet

Male Gene	Female Gene

Trait	Genotype	Phenotype
Body segments (D/d's)		
Antenna (A/a's)		
Humps (M/m's)		
Nose (Q/q's)		
Tail (T/t's)		
Eyes (E/e's)		
Legs (L/l's)		

### Analysis/Questions

- Compare your ReeBop to other ReeBops around the room. What differences and similarities do you see?
  
- How do you explain all of the differences, even though the ReeBops all had the same set of parents?