Biology Video 7 - Predict Monohybrid Crosses
(6)(F) predict possible outcomes of various genetic combinations such as monohybrid crosses

Hey, everyone, it's your girl Angela again. I was just texting my friend Neto in El Paso. We were talking about his dog. Neto's dog just had puppies. Four of the puppies had dark eyes, but one of them had light eyes. What he was wondering is how it's possible that two parents with dark eyes have a puppy with light eyes. Y'all wanna hear what I told Neto?

Well, it all goes back to this, like, monk, guy, or priest, named Gregor Mendel who was living in Austria a long ways back. In fact, while we were busy having our Civil War here in America, ol' Padre Gregor was figuring out how traits are passed from one generation to the next.

Instead of using mice or rabbits, he studied the pea plants that grew in the garden of the monastery. Aww, he looks so happy, doesn't he? There's a big long story about how he did his experiments and the way he recorded his results, but why don't we just cut to the chase and talk about his rules of genetics that we use today?

Well, since this is Biology, we gotta start speaking Greek and Latin, right? We already have one word to talk about: trait. A trait is just any characteristic about a plant or animal that's passed on through the DNA. So let's keep in mind the big picture here: genetics is just explaining how traits get passed from one generation to the next. From Neto's dog to his puppies, from plant to seed. That's all we're doing.

First things first. For any one trait, you get two instructions: one from mom and one from dad. For example, dad might give you the instructions for red eyes, and mom might give you the instructions for red eyes. By the way, you're a fruit fly in this scenario, okay? Also, mom and dad might both give you the white-eye instructions. That makes sense. And when I say instruction, I'm talking about alleles. That's all allele means: a version or form of a trait. So for one trait, like eye color or whatever, there could be a bunch of different alleles. For fruit flies, there's, like, the red-eye allele, the white-eye allele, some might even have yellow eyes. That's pretty awesome. And a little gross.

But what about this? What if dad gives you one allele, and mom gives you another? What if dad says, "Hey, kid, have yellow seeds," and mom's all, "no, *mijo*, have green seeds." Who do you listen to?

Well, the first thing you gotta know is that some traits are dominant and some are recessive. Let's rock out a T-chart!

So dominant traits are what they sound like; they dominate. So if yellow seeds dominate green seeds, that means the yellow seed instructions are always gonna be followed by the offspring. The only way to have green seeds is to get green seed instructions from mom and the green seed allele from dad. Something else is that we give dominant traits a capital letter and recessive traits little baby letters. So finally, I think of dominant traits as "bullies" because even if there's a little-letter set of instructions, the dominant instructions will dominate. It's like recessive traits are pushovers.

We're almost done speaking Greek, then we can finally answer Neto's puppy question.
If the offspring inherit the same instructions from both parents, we say he's "homozygous" for that trait. If the baby gets one set of instructions from dad and a different allele from mom, then she's "heterozygous."

Look, I think if I just put it this way, it'll be way easier to understand. Homozygous is gonna be, like, a big H with another big H, or a little t with a little t. So what's heterozygous gonna be? Totally. Big H with a little h or Big T with a little t. Or even more simple. Homozygous could be two stars or two smiley faces. So what's heterozygous gonna be? Yea, like a star with a circle or one smiley face with an angry face. That's it. That's all homozygous and heterozygous means. Remember the Greek prefix "homo" means the same and "hetero" means different.

Alright, let's start to figure out Neto's puppy situation. We can make one of those awesome Punnett squares to help predict the combinations of the genes in the daddy dog's sperm and the mama dog's eggs.

Remember, both of the parents had dark eyes and somehow, one of the puppies had light eyes. Let's figure out how. Let's guess for now that dark eyes is dominant and light eyes is recessive. So "big D" is dark eyes, and "little d" is light eyes. So that means the puppy has to be "little d, little d" in order to have light eyes because just one "big D" will give him dark eyes.

Since both of Neto's dogs had dark eyes, maybe they were both homozygous dominant; they were both "Big D, Big D." Let's fill out this Punnett square to see if this could be right.

Well, if daddy dog is "big D, big D," that means half of his doggy sperm are gonna have the "big D" allele and the other half are gonna be "big D," so let's put a "big D" up here and a "big D" up here. It's gonna be the same with mommy dog's eggs. A "big D" here and a "big D" down here. Let's use pink for the mom's alleles. So now we just match up each square to see what the outcome would be for each sperm fertilized with each egg. And remember: we're trying to get a "little d, little d" puppy.

So if this "big D" dad meets up with this "big D" mom, what do we get?

"Big D, Big D." That's a dark-eyed puppy.

What if *this* sperm fertilizes this egg? We get "Big D, Big D" again. Hey, y'all, are we ever gonna get a "little d, little d"? No way! We gotta go back to the drawing board and come up with a Punnett square that makes sense.

How 'bout this. Instead of both the parents being homozygous dominant, maybe both of Neto's dogs are heterozygous. Maybe they were both "big D, little d." So let's change this.

So for our Punnett square, let's make both of the dogs "Big D, little d." Half of the daddy doggy sperm will have the "dark eyes" instructions, the other half will have the "light eyes" allele. Same with mommy doggy's eggs. "Big D" up here, and "little d" down here. Are we gonna wind up with a puppy that's "little d, little d"?

Okay, this sperm fertilizes this egg. Again, we get "Big D, Big D." So let's try here. What if this sperm fertilizes this egg? Well we get a "Big D, little d." That's still a dark-eyed puppy because dark eyes dominate, remember?

We're gonna get that again right here. "Big D" dominates, so that's a dark-eyed puppy. But wait a minute. What do we get here? "Little d, little d"! That's a light-eyed puppy dog. That's Neto's puppy

with light eyes! He's gonna be homozygous recessive, and both parents are heterozygous! That's the beauty of genetics, y'all! Just rock out a Punnett square, and you'll figure out how the trait got passed!

'Til next time, it's your girl Angela saying, "Those *genes* look good on you, girl!"