Transcript
Testing Creosote Genetics (with kit)

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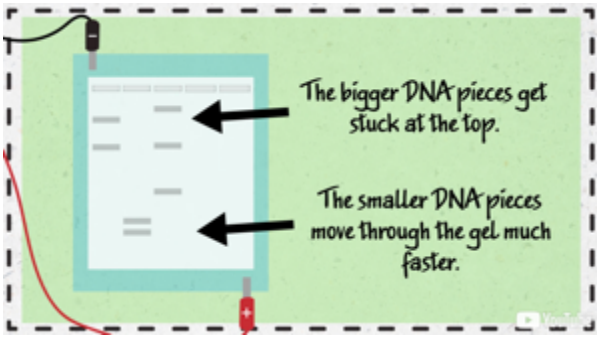
[Kelly] We're going to test the hypothesis that differences in a plant's DNA causes differences in the size of creosote bushes across the southwest. There are several ways that scientists analyze the genetic makeup of plants. One method is called gel electrophoresis, and it's used to compare the DNA of individuals. Today we're going to model gel electrophoresis to test our hypothesis. This is Dr. Michele Nishiguchi. Dr. Nish is a molecular ecologist at the University of California Merced.

[Dr. Nish] When we want to look at differences between people's DNA, what you have to do is an easy way to do it is you collect that DNA from different individuals and a lot of times people do cheek swabs, and they get the cells in your cheek and they break open those cells. And every one of your cells in your body has your signature DNA. And then what you do is you have to chop it up in little pieces, and oftentimes we use enzymes that actually can do that job. They're called restriction enzymes and they recognize certain DNA sequences and they'll cut up your total long stringy pieces of DNA.

Because DNA is all hooked together, they'll chop it up into little pieces, and then you can run that on a gel, okay. And the way a gel works, it's like a sieve. You got your DNA that you've chopped up in little pieces, okay. Let's say I load my DNA and your DNA and your buddy's DNA next to us, but they're all different, remember? We've used the same enzyme but the genetic signatures are different. And we put them in the gel and we run a current through that because DNA has a negative electric charge. When you run an electrical current through the gel, the negatively charged pieces of DNA are going to be attracted towards the positive electrode at the other end of the gel.

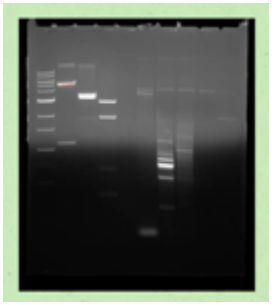


These pieces are all different sizes, okay, and they're going to go through the sieve of the gel and the smaller ones, because they're tiny, they're going to be able to slink through the gel much faster than the larger pieces. So the little pieces are going to go to the bottom of the gel much faster than the bigger pieces, and they're going to be stuck up more close, more close to the top of where you loaded the gel. But remember that my DNA, and your DNA, and your buddy's DNA are all different. So the pieces that were cut might be different sizes. So I'll have a profile, say, you know a couple big pieces and a couple small ones. You might have three or four more bigger pieces, but you know less smaller ones. And your buddy you might have a mixture of all those and so you can say aha look at this is Dr. Nish's, her bands, and this is my bands, and my buddy's bands, and they're all different.

[Kelly] Today you're modeling electrophoresis using paper, ink, and water. The paper represents the gel, ink represents the DNA sample, and water represents the electrical current moving through the gel. Get your DNA sample papers from the Asombro science kit. Cut out the sample label and keep them with the samples so you don't mix them up. Use tape or a paperclip to attach the top of your DNA sample paper to the popsicle stick. Hang the papers in the cup so they're not touching the bottom, and carefully pour a little bit of water in so that just the tip of the paper is in the water. Wait five minutes for the water to move through the paper. As the paper absorbs the water, you'll start to see the ink move too. After five minutes, compare the color patterns on the paper. Are they all the same? Which ones do you think are the most similar?

Remember our example with the Chihuahua and German Shepherd puppies? In our model, you would see results like this. Two similar DNA samples from the German Shepherds, and two similar DNA samples from the Chihuahuas.

In real gel electrophoresis, you would see results that look something like this. You have four DNA samples, two from the Chihuahuan Desert, one from the Sonoran Desert, and one from the Mojave Desert. If DNA determines the size of the creosote bush, different sized plants will have different DNA patterns. Remember that the average size of creosote bushes in each desert is different, so if the plants in the three deserts have different DNA, then DNA likely determines at least some of the differences in shrub size. If all the plants have the same DNA, then something else determines the size of the creosote.



Go ahead and start your experiment now. The steps to follow are also on the card in your kit. When you're done, go back to Canvas and answer the questions to analyze the data from your experiment. Do you think that the differences in the plants can be explained by the differences in their DNA?