VIDEO TRANSCRIPT

How Does Admixture Testing Work?

Link to video.

[**narrator**]: Daisy is interested to learn more about her ancestry, so she decided to buy an ancestry test and it arrived in the mail today. Out of the different types of ancestry tests that are available, she chose to do an admixture test, because she wants to get a better idea of where in the world her ancestors came from.

The instructions in the kit ask her to provide a spit sample. This spit sample contains Daisy's DNA, which will be analyzed to estimate her ancestry.

After Daisy fills the tube with enough spit, she packs it in a box and takes it to the post office. From there, her sample is sent to the ancestry testing company that she bought her test from. The company receives Daisy's box and starts the process of analyzing her DNA.

So how can a spit sample tell Daisy more about her ancestry?

DNA is found in nearly every cell in our bodies. You can think of DNA as a sort of cookbook, or a code, that interacts with the environment to create you, and me, and every other living being on this planet. Your DNA code is exclusive to you, and it is part of what makes you unique.

Daisy's spit sample contains her DNA. This DNA is a unique mix of the DNA from Daisy's biological parents. And in turn, Daisy's biological parents each have a unique mix of DNA from their biological parents, who are Daisy's biological grandparents. Because DNA is inherited in this way across generations, we can analyze it to explore someone's ancestry.

DNA is a code that consists of 4 letters: A, G, C, and T. Because more than 99% of the DNA in all humans is identical, the ancestry testing company only looks at the small regions in Daisy's DNA where variation between people is common.

For example, if we zoom in and look at a specific site in the DNA, we might see that some people have the code ATC. Other people might have a variation in the DNA code where the middle T is an A, or a C, or a G. We call these differences in code, variants. And these variants in our DNA code are one reason why people are not identical to each other. Because of this kind of variation, you might be taller than your friends or have a different eye color than your grandparents.

To understand how common a certain DNA variant is in the human population, we can plot a pie chart. Here we can see that the dark green variant is most common across all people. On the other hand, the variant represented by the lightest green color is much rarer.

We can also look at this variant distribution in smaller populations, grouped by their common ancestry. Here we show the distribution of this specific DNA site in people with Asian, African, or European ancestry. For admixture testing, the company uses the distribution of variants in these populations as a reference to estimate who Daisy most likely shares ancestry with.

Let's take a closer look at how this works. After analyzing Daisy's DNA code, the company found that she has the dark green variant at this specific DNA site.

Remember how Daisy inherited her DNA from both of her biological parents? This means that for each DNA site, Daisy has two variants - one from each of her biological parents. For the sake of simplicity, let's imagine that Daisy inherited the dark green variant from both of her biological parents.

The dark green variant is found in all three of our reference populations, so it is possible that Daisy shares ancestry with any of these groups. But since the dark green variant is more common in people with Asian ancestry, it is more likely that Daisy shares

ancestry with them. The company will need to look at more DNA sites to get a clearer picture.

For this second DNA site, Daisy received a yellow DNA variant from each of her biological parents. This DNA variant is present in all the reference populations, but more common in people with European ancestry. So, it is more likely that Daisy shares ancestry with them. However, the picture is still not clear.

So, let's look at a third DNA site. At this site, Daisy carries the light purple variant, which is present in all the reference populations. This variant is common in people with Asian ancestry, so it is more likely that Daisy shares ancestry with this group. But since the light purple variant is found in the African and European reference populations as well, it is also possible that she has ancestry in common with them. So, it is difficult to estimate Daisy's ancestry based on just a few DNA sites. Because of this, the ancestry testing company looks at hundreds of thousands of DNA sites to get a more reliable estimate of Daisy's ancestry.

Once all the data has been processed, Daisy can access her admixture testing results online. As we have seen in this video, her results are obtained by analyzing less than 1% of Daisy's DNA and by determining the most likely origin of her DNA variants. Although hundreds of thousands of DNA sites are analyzed to obtain a more reliable result, what these tests can provide is a probability of Daisy's ancestry, not a definitive percentage.

So, to summarize: How does Ancestry Testing work?

Ancestry testing starts when a person provides a DNA sample to the testing company. Because humans share more than 99% of their DNA, the company does not look at most of your DNA. Instead, they zero in on a tiny fraction of your DNA where variation is common. Your DNA is then analyzed to determine which variants you carry at specific DNA sites. For admixture testing, your DNA variants are compared to reference populations, to determine which population you are most likely to share ancestry with. After analyzing hundreds of thousands of DNA sites, companies use complex mathematical formulas to put together all the data and provide a probability of your ancestry.