Siblings Can Have Surprisingly Different DNA Ancestry. Here's Why.

nationalgeographic.com

Siblings Can Have Surprisingly Different DNA Ancestry. Here's Why.

When it comes to tracing your roots through your genes, biological siblings may have less in common than many people expect.

Last fall, siblings Kat and Eddy Abraham decided the best birthday gift for their dad involved a couple vials of spit.

“He’s the historian of the family,” Kat says, so the brother and sister duo thought he’d enjoy seeing the results from a genetic ancestry test. Knowing that their father’s side of the family is Lebanese and their mom’s family is, as Kat describes her, “some variety of white Canadian,” they expected the results would show that they are both half Middle Eastern and half European.

For the most part, that’s what they found. But the siblings were at first surprised to see that their results were not entirely the same. Kat, for example, has 13 percent genetic ancestry from Italy and Greece, while Eddy has 23 percent, according to the tests. (By contrast, these six strangers have roughly the same genetic ancestry—find out why.)

It’s a common source of confusion for people who use tests like AncestryDNA, 23andMe, or National Geographic’s Geno kit. After all, children inherit half of their DNA from each parent: 50 percent from mom (through an egg), and 50 percent from dad (through sperm).

So how can biological siblings have different results?

The family mismatch (usually) isn’t due to skeletons in the closet and is instead because of slight variations in egg and sperm DNA.

When the body creates sperm or eggs, the cells engage in some reshuffling known as genetic recombination. This process cuts the number of chromosomes that normal cells have in half—from 46 to 23—so that when a sperm and egg combine during fertilization, they form a complete genetic package.

To do this genetic trimming, the chromosomes in cells line up in pairs and exchange bits of genetic material before forming an egg or sperm cell. Each mature egg and sperm then has its own specific combination of genes—which means offspring will inherit a slightly different set of DNA from each parent.

“It’s just a matter of biology,” says Megan Dennis, who studies human genetics at the University of California, Davis.

Most commercial genetic ancestry tests work by pulling out and analyzing selected chunks of DNA. Then they compare the results to the same DNA chunks from databases of people with confirmed roots in particular countries or continents and tell you where in the world people alive today have genes that most closely match your own. (Recently, genealogists created a 13-million-person family tree that yielded some surprising results.)

Because of recombination, siblings only share about 50 percent of the same DNA, on average, Dennis says. So while biological siblings have the same family tree, their genetic code might be different in at least

one of the areas looked at in a given test. That's true even for fraternal twins.

The more diverse your recent ancestors are, Dennis says, the more pronounced the effects of genetic recombination can be.

"If your maternal grandparents are biracial, for example, your mother will have a random mix of those ethnicities," she says. That leaves a more diverse set of genetic possibilities for her to pass down. "And you'd see a bigger effect if your great-great grandparents were from different places."

While sibling differences shouldn't necessarily make you mistrust your test results, there are other reasons to take genetic ancestry data with a grain of salt.

These tests calculate ancestry by comparing incoming results to databases of known samples. But for now, the majority of the samples tend to cluster around North America and Europe. For people from other parts of the world, there aren't as many points of comparison, and results tend to be less specific.

"It's been a problem with the databases used by all the major companies," says Miguel Vilar, science manager for National Geographic's Genographic Project. "We know so much about Europe and so little about everywhere else."

Closing the gap, he says, will require building relationships to pull in people living across the rest of the world, thus fleshing out the databases and improving the accuracy of results.

It's one reason Kat and Eddy, who have a Middle Eastern background, say that they're cautious about putting too much stock in their test results. But they did find it interesting, and overall, the gift was a success.

"Dad was surprised at how little we knew about our ancestry to begin with," Kat says. "But he liked it and was excited about what we found."