Dobi Studies, Teaches the Marvels of Genetics

Dr. Aldemaro Romero Jr.
College Talk

Photo by Shoval Tshuva

Dr. Dobi at her lab.

"When I was in third grade, a parent of one of the other students brought a number of cats to the library on a Saturday and talked about how there are all these different hereditary patterns that contribute to their coat colors and appearance, like spots, stripes, and white paws. I was just hooked because I loved cats, and I said this is what I want to do."

That's how Dr. Krista Dobi explains why she became a geneticist. A native of North Brunswick, New Jersey, Dobi received a bachelor of arts from Princeton University and a doctorate in genetics from Harvard. Today she is an assistant professor in the Department of Natural Sciences in the Weissman School of Arts and Sciences at Baruch College/CUNY.

Despite having had her interest in genetics awakened by cats, the organisms that Dobi studies are fruit flies. "Fruit flies have a really quick life-cycle. Within ten days you can get a new generation. They only have four chromosomes, and that makes them easy to study. My work is on muscle development, so I can see through the embryo and the larvae, and I can get really gorgeous pictures of the development of these organisms," she explains.

But fruit flies are not the only organism she studies. She also uses yeasts for her research. "My graduate advisor used to say that yeasts are a lot like people in their basic cellular processes, how cells make the decision to divide and how they then go on to divide. These are things that yeast cells and our cells share."

Not long ago people used to talk about "the gene for this or that," like "the gene for alcoholism," but things are not so simple. "The gene that is implicated in cystic fibrosis encodes a transporter in the lung that helps to regulate fluid in and out of the lung. So it's a gene for a transporter, but it's a mutant version of that gene or what we call an allele (a different form of the same gene) that causes cystic fibrosis," says Dobi.

Now that we see a number of companies offering to analyze your DNA, one wonders to what extent it makes sense to subject your children to those analyses. "This is something that each family has to decide for themselves, consulting with their physicians. I think going and signing up for a service without having a medical or scientific person to walk you through the data you get back is pretty challenging. But I do think it can be a helpful thing to do, particularly if you know that there's a history of something in your family."

But it's not all about genes. The environment also plays a role. "The classic example that we have in fruit flies is the gene for curly. In its wild-type form, you have straight wings, and when it's mutated, you have curly wings. But even when you have the curly-wing allele, if I keep those flies at a colder temperature, the wings will look straight. The degree to which we see the curly, what we call the "expressivity" of that phenotype or appearance, is completely dependent on temperature."

When asked why she has concentrated on studying the muscles of fruit flies, she has a very interesting explanation. "What makes the fly great to study is that, in your body, every muscle is a bundle to generate force, but in fruit flies one muscle is one cell. So when we make a genetic change and then look under the microscope and examine those flies on the cellular level, we can see a single cell and really understand the properties of that single cell in a very clear way."

And fruit flies and humans have more in common than most people think. "One of the genes that my students look at is a gene called runt. In vertebrates, it's called runx, and runx mutations in people lead to a syndrome called cleidocranial dysplasia, a condition that primarily affects the development of the bones and teeth. These genes are controlled by the same genes that regulate muscle patterning in the fly, and the process that leads to the specification of the muscles in your head and neck area is very similar to the genes that do this in flies," says Dobi.

But genetics as a science is not the only area of interest for Dobi. Women in science is another of her passions, and the science of heredity has many outstanding examples. "Barbara McClintock made a lot of discoveries, like the 'jumping genes' in corn that can move from one part of the DNA to another. This movement can change how the gene is expressed—turned on or off, or expressed high or low. That discovery was originally made in corn, because the kernels are such a great visual genetic organism to look at."

Another giant figure was Rosalind Franklin, whose photographs of DNA made a big difference in our understanding of its structure. Yet her contributions were partly dismissed just because she was a woman.

Dobi is working with her students to analyze the mutations that lead to the development of the head in fruit files. "For reasons that I don't understand, no one has looked at how these genetic factors pattern the head, even though they are shared with the human face and neck. My students and I are characterizing mutations that lead to head formation, and we are taking a real look at how changes in gene expression lead to cellular changes."

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