

OneZero: Reengineering Life

CRISPR Could Finally Make the First Truly Allergy-Free Cat

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[Reengineering Life](#) is a series from OneZero about the astonishing ways genetic technology is changing humanity and the world around us.

If you're among the 10% of people who are allergic to cats, you can blame a protein found in cat saliva and skin. The pesky protein spreads when cats groom themselves and shed their hair and dander around the home.

Scientists and immunologists have been interested in this protein, known as Fel d 1, for decades because of its role in cat allergies. If they could figure out a way to stop cats from producing this protein, they could put an end to the sneezing, wheezing, and sniffing once and for all.

Currently, the options for would-be cat owners with allergies are limited: Certain breeds of cats deemed “hypoallergenic” are not completely allergen-free, and allergy shots aren't effective for many people.

But the gene-editing tool CRISPR has opened up new possibilities for the future of hypoallergenic cats. Scientists at one Virginia company, Indoor Biotechnologies, have [successfully used CRISPR](#) to delete the gene that tells the body how to make Fel d 1. Not to worry — no animals were harmed in the process. The team experimented on feline cells, not live cats, but the researchers say the method shows promise for real pets.

“We've been hypothesizing about what would happen if you could delete the gene from cats,” Martin Chapman, the CEO of Indoor Biotechnologies and a former professor of medicine and microbiology at the University of Virginia, tells *OneZero*. “What we hope will ultimately come out of this is a cat that is genetically modified so that it doesn't produce Fel d 1.”

There's been hope for hypoallergenic cats before. In the mid-2000s, biotech company Allerca claimed to sell hypoallergenic cats bred to produce less Fel d 1. But a 2013 [ABC News report](#) revealed that the cats — which cost between \$4,000 to \$28,000 — had similar levels of the

protein as normal cats. One woman, who spent thousands of dollars on Allerca cats, told *ABC News* her children were so allergic to them that she had to give the cats away.

Unlike Allerca, Indoor Biotechnologies says it's not interested in breeding new, genetically modified cats. Instead, its goal is to develop a CRISPR-based drug to edit the DNA of cats that people already have. If the drug proves to be safe, pet owners could bring their cat to the vet's office for an injection and leave with a cat that won't cause allergies.

To conduct the CRISPR experiments, Indoor Biotechnologies worked with a local arm of the Society for the Prevention of Cruelty to Animals to obtain tissue samples from 50 cats.

Nicole Brackett, a postdoctoral scientist at the company, extracted DNA from those samples then isolated and sequenced the Fel d1 gene in each of them. She was looking for similarities in the gene across all 50 cats, in hopes of finding a good section of DNA to target with CRISPR. For a CRISPR drug to work, it would need to target a genetic sequence that appears in the vast majority of cats.

Zeroing in on a particular genetic sequence, Brackett built a CRISPR system to target it. CRISPR consists of two parts: a cutting protein and a guide molecule, which can be programmed to find any part of the genome. Once it gets there, the cutting protein does its job, slicing out that specific genetic sequence.

The research is the first step toward a CRISPR-based therapy for cats, and Indoor Biotechnologies has filed a patent for the approach. Next, the company is planning to edit out the gene in cat tissues in the lab to observe whether it stops producing the allergy-causing protein.

Though the early results are promising, it's possible that the Fel d 1 protein serves some essential function other than producing allergens and that deleting it could have harmful effects on the cat. Martin and Brackett have considered that possibility, and they say the only way to find out will be to do experiments on actual cats. One approach would be to delete the protein-producing gene in cat embryos, transfer the embryos to the womb of a female cat, and see if the resulting kittens are born with any medical problems.

Others are working on less invasive approaches. Researchers at Nestlé Purina PetCare [have developed a cat food](#) containing a naturally occurring protein found in eggs that they say can reduce Fel d 1 levels in saliva. But it doesn't completely eliminate the allergen.

If CRISPR works and doesn't have any major side effects for our feline friends, it could eliminate nearly all cat allergies. If you're allergic to cats, however, you probably shouldn't go out and get one now in the hopes that your allergies will be cured soon. A CRISPR fix is still likely several years away.

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