On the Trail of the Cat, Scientists Find Surprises

By Rob Stein
Washington Post Staff Writer
Monday, March 17, 2008; Page A10

If cat owners know anything about their pets, it's how enigmatic the creatures can be. But scientists have begun to pull back the feline veil, using the latest molecular tools to get a peek at their origins.

Tracing Kitty's Genes

"Cats are certainly more mysterious and complex than we would ever think," said Leslie A. Lyons, who studies cat genetics at the School of Veterinary Medicine at the University of California at Davis. "However, we're starting to get their story."

In one of the most comprehensive explorations of cats' origins to date, Lyons and her colleagues spent about five years collecting feline DNA, poking behind the whiskers of more than 1,100 Persians, Siamese, street cats and household tabbies around the world to swab inside their mouths. The genetic samples came from 22 breeds of fancy cats, mostly in the United States, along with an assortment of feral and pet cats in Korea, China, Kenya, Israel, Turkey, Vietnam, Singapore, Sri Lanka, Tunisia, Egypt, Italy, Finland, Germany, the United States and Brazil.

By analyzing 39 genetic signposts in the samples, the researchers were able to investigate a variety of questions, including which breeds are most closely related and where they most likely originated. The first thing the group did was confirm a report published last June in the journal Science that the domestication of cats about 10,000 years ago appeared to have occurred in an area known as the Fertile Crescent, which stretches from Turkey to northern Africa and to modern-day Iraq and Iran.

"Our data support the Fertile Crescent, specifically Turkey, as one of the origin sites for cats," said Lyons, who published her findings in the January issue of the journal Genomics. "Turkey was part of the Fertile Crescent and hence was one of the earliest areas for agricultural development." Cats probably started living close to humans when people evolved from nomadic herding to raising livestock and crops and started storing food, which attracted mice and other rodents. Cats found good hunting there, and humans surely appreciated the sly little predators' help protecting their stocks. "There was a mutual benefit," Lyons said. "There was a food source of mice and rats all around the grain. So it was beneficial for both cats and humans as the cats came closer to human populations and kind of domesticated themselves."

From there, domesticated cats started to radiate out to different parts of the world, often following humans on their migrations. Today cats can be divided genetically into four broad groups: those from Europe, the Mediterranean, East Africa and Asia.

But Lyons and her colleagues also made surprising discoveries about individual breeds. “We wanted to see whether breeds actually came from what was thought to be their geographical origins,” Lyons said. The Japanese bobtail, for example, does not seem genetically similar to cats from Japan, indicating the breed may have originated elsewhere. “Either it didn’t originate in Japan or there’s been so much Western influence that they have lost their initial genetic signal,” Lyons said.

Despite its name, the Persian, the oldest recognized breed, looks as though it actually arose in Western Europe and not Persia, which today is Iran. “If it came from Iran, you would think it would look like cats from Turkey and Israel,” she said. Instead, the Persian “looked more like a Western European cat.”

When the researchers examined the genes of what are thought to be distinct breeds, they were unable to find significant differences among many of them. “An example would be Persian and exotic shorthairs. When you look at those two breeds, you can’t distinguish them from one another” by their genes, she said. The same was true for the Burmese and the Singapura, as well as the Siamese and the Havana brown. While Havana browns are considered a separate breed in the United States, European cat breed associations consider them a color variation of Siamese. “Some people will say, ‘Ha, ha. I told you so.’ Some other people will be disappointed,” Lyons said.

Breeds look very different because of variations in a single gene, which is not enough to distinguish them genetically, she said.

The researchers also found interesting relationships that track human history. Italian and Tunisian cats, for example, are a mix of Western European and Mediterranean cats, probably reflecting the close historical ties between Tunisia and Western Europe. Cats from Sri Lanka and Singapore are a genetic mélange of cats from Southeast Asia, Europe and elsewhere, which could be a “relic of British colonialism,” the researchers wrote. The same goes for the Abyssinian.

The finding that cat lovers should be concerned about is that some breeds have become so inbred that the amount of genetic variation among them is getting dangerously low. That tends to lead to higher levels of illness, Lyons said. “That could have consequences for the cats’ health. The more genetic variation, generally the healthier the population will be. So some cat breeders need to be careful that there’s not too much inbreeding going on,” she said.

The Burmese and Singapura breeds had the least diversity, she said, while Siberians had the greatest, along with Norwegian forest cats, Maine coons and Japanese bobtails.

About half the breeds examined had genetic variation comparable to randomly bred cats, which is good, but the other half had less. “You don’t want to say they are in trouble, but it’s something we should note,” Lyons said. The findings could help guide breeders, Lyons and others said.

“This is new and very useful information,” said Susan Little, president of the Winn Feline Foundation, a nonprofit group that partially funded the work. “It helps improve the ability of breeders to reduce the prevalence of disease by developing a healthy breeding program. It’s extremely important.”

Despite the shrinking genetic diversity, purebred cats remain far more genetically diverse than purebred dogs, noted Marilyn Menotti-Raymond, who studies cat genetics at the National Cancer Institute. That’s because people have been breeding cats for about 200 years at most, and there is more interbreeding than among purebred dogs, she said.

“Everyone is aware of the problems that can occur from the small gene pool in some dog breeds,” said Menotti-Raymond, who, in the same issue of the journal Genomics, reported similar findings in a different sample of 611 cats representing 38 breeds. “I was actually surprised at the level of genetic diversity in cats, and that’s good.”