

DNA and Breed I.D.

Advances in DNA testing illuminate the world of dogs.

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Can a dog be assigned to a particular breed by looking at its DNA? Can DNA be used to reconstruct the evolutionary history of domestic dog breeds? Can DNA settle issues of pure breeding? Until now, the answer has been no.

That's because previous analyses had to rely on mitochondrial DNA, a slowly evolving type of DNA that, unlike nuclear DNA, is found outside the cell nucleus and is inherited only from mother to offspring. Mitochondrial DNA is good for looking at evolution over long time periods, but it evolves too slowly to look at evolution over the relatively short period of time that most breeds have existed.

Instead, preliminary research has shown that microsatellite marker segments of nuclear DNA that vary greatly among different dogs, but tend to be the same in closely related individuals could be used to identify a few breeds and make inferences about their relationships. Extensive use of microsatellite markers had to wait until enough markers were mapped. Progress in mapping the canine genome has enabled the first wide-scale comparison using microsatellite markers.

Researchers at the Fred Hutchinson Cancer Research Center in Seattle compared 96 DNA microsatellite sequences from four to five unrelated dogs of 85 different breeds. They found that dogs from the same breed had microsatellite "signatures" so distinct that 99 percent of the dogs could be assigned to their correct breeds based on their DNA. Only four breeds—the Chihuahua, Presa Canario, German Shorthaired Pointer, and Australian Shepherd failed to form distinct breed DNA groups.

Several breeds, while retaining breed-specific microsatellite signatures, had very similar signatures to other breeds. In most cases this came as no surprise, since the breeds were already assumed to be closely related. Close pairs included the Alaskan Malamute and Siberian Husky; Collie and Shetland Sheepdog; Greyhound and Whippet; Bernese Mountain Dog and Greater Swiss Mountain Dog; Mastiff and Bullmastiff; West Highland White Terrier and Cairn Terrier; and, so close as to be indistinguishable, Belgian Tervuren and Belgian Sheepdog.