

## Dog Paternity DNA Testing

**There are many reasons to breed dams to more than one sire. Now DNA testing answers the paternity question.**

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Posted: Thu Mar 4 00:00:00 PST 2004

Maddie's liaison with three different stud dogs produced a single litter. No, Maddie isn't a street dog with promiscuous ways. Maddie is DC Gavril Blonde Ambition SC LCM3, an overachieving show and lure-coursing Borzoi whose breeder-owners, Michael and Shirley Rehberg and Rachel Rehberg Gongre of Lake City, Fla., carefully bred to three different sires. At once.

A decade ago this would be madness. True, accidental breedings to more than one stud happened more often than admitted. The AKC would not register the offspring of such multiple liaisons, so breeders either said nothing and guessed which one was the most likely sire, or sold the entire litter as unregistered pets.

DNA changed that. Just as DNA was used to settle human paternity suits, it could be used to settle canine paternity questions. By comparing the DNA of the dam, puppies, and each of the possible sires, each puppy can be attributed to its biological father. The AKC approved the use of DNA paternity testing for multiple-sired litters in 1998.

Here's how it works: A cheek-swab sample is collected from each dog and submitted to the AKC for DNA profiling. The DNA profile is a collection of genetic markers, which are segments of DNA that have many different forms in the dog population, and which are reliably passed from parent to offspring. Each parent has a pair of possible markers at each marker location, and each parent randomly contributes a copy of one of those markers to each offspring. This means each puppy also has a pair of markers, one inherited from the sire and one from the dam, at each location. One marker can easily be traced to the dam; the remaining marker must match one of the proposed sires or that male is unlikely to be the sire. Say the dam's markers at one location are AB, and the sire's are BC. Puppy 1 is AB, puppy 2 is BB, and puppy 3 is BD. Puppies 1 and 2 could have been sired by that sire, but puppy 3 could not have been because the sire had no C marker to contribute.

But not so fast. It's possible that puppy 3's D marker arose from a mutation, especially if the D marker is qualitatively similar to the sire's C marker. It's also possible that puppies 1 and 2 had the same markers as the sire through coincidence. Thus, decisions are never made on the basis of a single marker. That's why the AKC recently expanded its DNA profile to 14 markers. At least two non-matching markers must be present to exclude a dog as a possible sire, and that decision also depends on how qualitatively different the markers are.