

The history of dog breeds: Victorians, genetics, and the importance of diversity

Note: there is an [interview with me](#) at the Huffington Post about this story.

Dog breeds are amazing creations. I can own a series of Golden Retrievers and predict with fair accuracy how each of them will look and act. (Look more than act, but the incredible variety of dog personalities is a story for another day.) Unfortunately, I can also predict with fair accuracy what diseases each of those dogs will have, because with the Golden looks and personality come the Golden genetic disorders. As a new dog owner years ago, I thought of these genetic problems as part of the package I was handed when I got a purebred dog: you choose the looks and personality, and you choose the diseases at the same time. But there's a lot more to the story of how dog breeds came to be saddled with particular genetic disorders than just happenstance: we made choices when we created breeds and we continue to make choices about their health today.

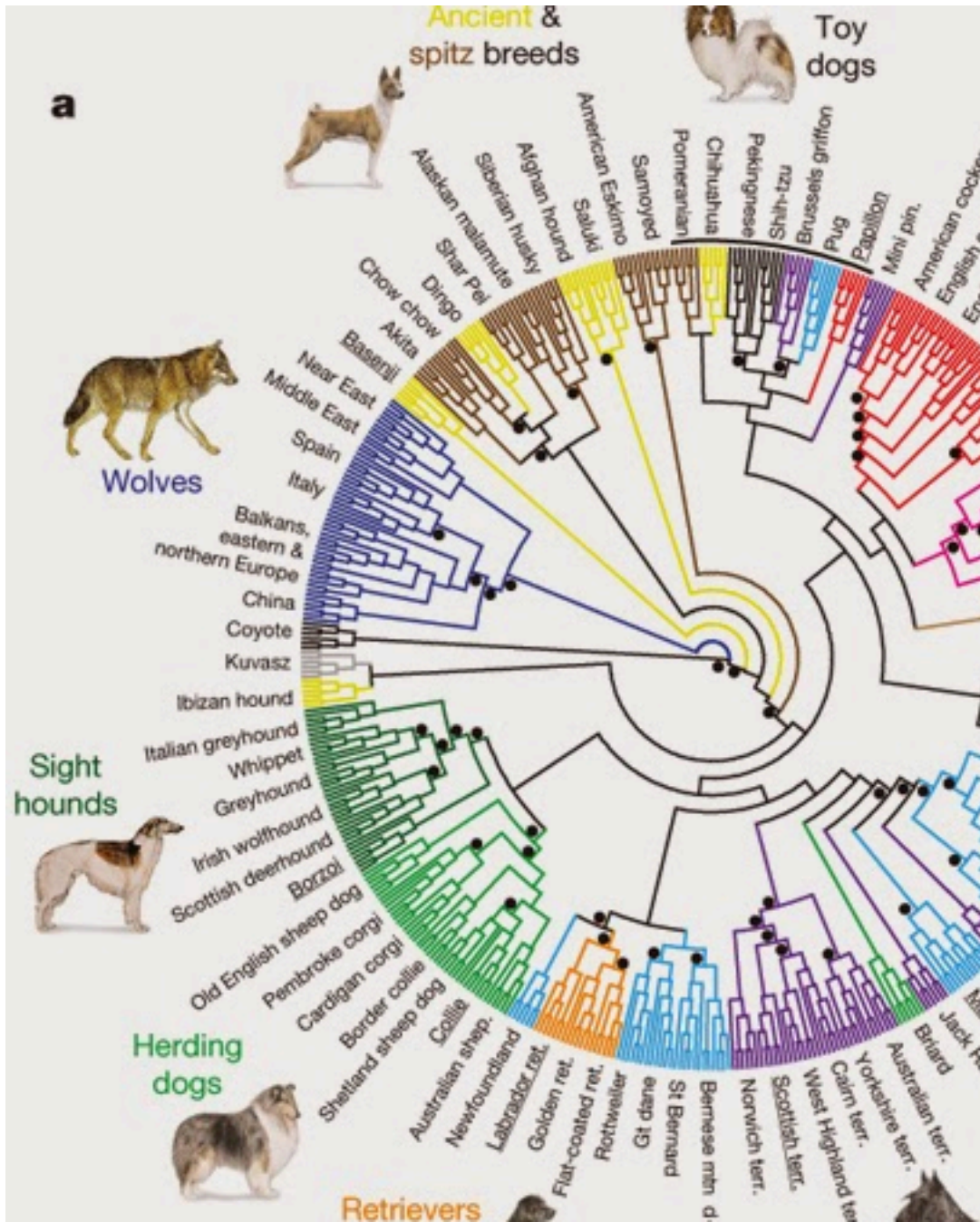


Figure from: Genome-wide SNP and haplotype analyses reveal a rich history underlying dog domestication *Nature*, Vol. 464, No. 7290. (17 March 2010), pp. 898-902, [doi:10.1038/nature08837](https://doi.org/10.1038/nature08837) by Bridgett M. vonHoldt, John P. Pollinger, Kirk E. Lohmueller, et al.

The beginning of dog breeds

Humans have been breeding dogs for thousands of years, but for most of our history with them, function was more important than appearance. Dogs were bred to work, and beauty was a side effect: long coats were for keeping warm, small size was for chasing tunneling vermin, long legs were for speed.

During the Victorian era, things changed, with the spectacular growth of dog fancy. Suddenly people were breeding and showing dogs for how they looked, not how they worked. Breeds were no longer loose groups of dogs who looked kind of similar and did a particular job; now for the first time purebred dogs had carefully maintained pedigrees. This was the era when the breed books closed, meaning that breeds were suddenly defined as the set of dogs whose ancestors belonged to a select list. If you wanted to make more Golden Retrievers, you could only breed dogs descended from that original list. If you bred in dogs with unknown ancestry, their offspring were considered mutts and could not be competitively shown, even if they looked just like purebreds.

What happens when you take a relatively small set of dogs and use them to breed a much larger number of dogs? It's like this small set of dogs is marooned on a desert island with no way to bring in new genetic diversity, and their pedigrees are what marooned them. Their descendants will look like them and act like them - and have their genetic diseases. The genetics from those few founders are all that's available to the descendants. When this reduced genetic diversity is severe, it can be a big problem.

Basenjis and Fanconi syndrome

Reduced genetic diversity is severe in the Basenji breed. This breed originated in Africa, but only the Basenjis descended from a small number of dogs imported to Europe in the 1930s are considered purebred. The diversity in this breed was so low in Basenjis in the Western world that in 1990, one in ten Basenjis suffered from exactly the

same genetic disorder, a kidney disease called Fanconi syndrome. One or a few of the founding dogs must have had this disease, and it was passed on to their descendants until a large percentage of Basenjis suffered from it.

The solution: bring in new Basenjis from Africa, breed them to the Western Basenjis, and declare that their offspring may be considered purebred, despite a lack of pedigree. This was done in 1990 and again in 2013, and the effects are still spreading through the Western Basenji population over several generations. (You can read about the [trip to the Congo to acquire African Basenjis](#).)

Dalmatians and urinary tract stones

But what if there isn't an ancestral population waiting to be harvested? Dalmatians also suffer from a genetic kidney disease, in their case stones in their urinary tract caused by high levels of uric acid. It's a painful disease and there was no way to breed out of it: at one point, every single Dalmatian in existence had uric acid levels above normal canine values.

The solution? The [Dalmatian Backcross Project](#), which began in 1973 with the breeding of a Dalmatian to a Pointer. The project husbanded along a line of Low Uric Acid (LUA) Dalmatians, also known as Normal Uric Acid Dalmatians, because what's low in a Dalmatian is normal in any other breed. Puppies from this original Dalmatian/Pointer cross were tested for uric acid levels, and those with normal levels were bred to purebred Dalmatians. This continued generation after generation until a line of Dalmatians had been bred which looked like Dalmatians, not Pointers, but had normal uric acid levels. As of 2011, LUA Dalmatians have been registered with the American Kennel Club and are now considered purebred Dalmatians. It remains to be seen how long the problem of high uric acid levels will remain common in this breed, but at least now there's a solution in sight.

What we're doing about genetic health in dog breeds

With these success stories, you'd think the problem would be solved. But these are the only two breeds so far to open their breed books to bring in new genetic diversity. *[ETA: readers note that a few other breeds have opened their books, including Border collies, Chinooks, Salukis, and Azawakh in the US, and several breeds in Europe. Fantastic!]* Both the Dalmatian and the Basenji had easy to diagnose, easy to understand health problems that were also easy to identify with genetic testing: problems controlled by a single gene. Such diseases are relatively

unusual. Take the case of the Golden Retriever, who is prone to developing cancer at greatly accelerated rates compared to most other breeds. Cancer is controlled by a lot of genes and is very hard to genetically test for - and therefore hard to breed away from.

While introducing new genetics into Golden Retrievers is very likely to improve the health of the breed, it's hard to convince breeders to take the leap. As was the case with the Dalmatian Backcross Project, such an undertaking would mean producing dogs that didn't look like Goldens for a few generations. They could still make great pets, but they couldn't be shown and they probably couldn't be sold for as much money as a purebred. And there's no guarantee that their descendants could ever be registered as purebreds - the fight to get LUA Dalmatians accepted was long and hard. I use Goldens as an example because I live with one, but many of the breeds we love suffer from low genetic diversity and associated genetic health concerns.

I believe we need as a society to get past our obsession with historical breeds. We can breed for appearance, but that has to take a back seat to breeding for health. We have a model with the Dalmatian Backcross Project. All we need is the will to improve the genetic health of more breeds.