

# ***DNA Suggests Beginnings of Basenji Breed***

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## **Genetic Structure of the Purebred Domestic Dog**

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*We used molecular markers to study genetic relationships in a diverse collection of 85 domestic dog breeds. Differences among breeds accounted for (30% of genetic variation. Microsatellite genotypes were used to correctly assign 99% of individual dogs to breeds. Phylogenetic analysis separated several breeds with ancient origins from the remaining breeds with modern European origins. We identified four genetic clusters, which predominantly contained breeds with similar geographic origin, morphology, or role in human activities. These results provide a genetic classification of dog*

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The domestic dog is a genetic enterprise unique in human history. No other mammal has enjoyed such a close association with humans over so many centuries, nor been so substantially shaped as a result. A variety of dog morphologies have existed for millennia and reproductive isolation between them was formalized with the advent of breed clubs and breed standards in the mid-19th century. Since that time, the promulgation of the "breed barrier" rule—no dog may become a registered member of a breed unless both its dam and sire are registered

members —has ensured a relatively closed genetic pool among dogs of each breed. At present, there are more than 400 described breeds, 152 of which are recognized by the American Kennel Club (AKC) in the United States (1).

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Having demonstrated that modern dog breeds are distinct genetic units, we next sought to define broader genetic relationships among the breeds. We first used standard neighbor-joining methods to build a majority-rule consensus tree of breeds (Fig. 2), with distances calculated using the chord distance measure (26), which does not assume a particular mutation model and is thought to perform well for closely related taxa (27). The tree was rooted using wolf samples. The deepest split in the tree separated four Asian spitz-type breeds, and within this branch the Shar-Pei split first, followed by the Shiba Inu, with the Akita and Chow Chow grouping together. The second split

separated the Basenji, an ancient African breed. The third split separated two Arctic spitz-type breeds, the Alaskan Malamute and Siberian Husky, and the fourth split separated two Middle Eastern sight hounds, the Afghan and Saluki, from the remaining breeds.

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At first glance, it is surprising that a single genetic cluster includes breeds from Central Africa (Basenji), the Middle East (Saluki and Afghan), Tibet (Tibetan Terrier and Lhasa Apso), China (Chow Chow, Pekingese, Shar-Pei, and Shi Tzu), Japan (Akita and Shiba Inu), and the Arctic (Alaskan Malamute, Siberian Husky, and Samoyed). However, several researchers have hypothesized that early pariah dogs originated in Asia and migrated with nomadic human groups both south to Africa and north to the Arctic, with subsequent migrations occurring throughout Asia (5, 6, 30).

## New Genetic Study Gives Nod to Basenjis as One of Few Remaining Ancient Breeds

This review of the article was written by Karla Schreiber

A recent study by top canine and human geneticists\* supports the premise that Basenji fanciers have believed for many years: Our dogs are different from most other breeds, and have a unique and ancient genetic origin that is revealed through a careful study of canine DNA.

The study, published in May, 2004, compared the DNA of eighty-five purebred dogs to one another, and determined that contrary to prior belief, individual members of each breed cluster together in the vast majority of instances. Modern breeds are, per the study, more genetically distinct than previously believed. In fact, the degree of genetic diversity across all breeds included in the study was as great as the genetic diversity of the human population as a whole. However, genetic diversity within breeds is very limited due to closed gene pools, or what the study calls “the breed barrier rule” – which discourages out-crossing between breeds. As a result of years of inbreeding on common ancestors, most breeds existing today can be specifically identified as distinct from any

other breed by virtue of current canine DNA testing.

Of greatest interest to Basenji fanciers, the study also compared the DNA of purebred dogs (including Basenjis) to an amalgam of DNA samples of eight gray wolves from China, Oman, Iran, Sweden, Italy, Mexico, Canada and the United States in an effort to determine which breeds are most highly related, genetically, to existing wild canids. The results of this aspect of the study were surprising. The breeds with DNA most identical to the wolf DNA are Shar-Peis, Shiba Inu, Akita, and Chow Chow. These four breeds clustered together and are genetically similar. The next “break out” breed was the BASENJI, standing alone. Following the Basenji, are the Alaskan Malamute and the Siberian Husky, clustered together, followed by the Afghan and Saluki, clustered together. Other ancient breeds, according to the study, included the Samoyed, Tibetan Terrier, Lhasa Apso and Pekingese

All other breeds included in the study are significantly different, genetically, from these “ancient” breeds, and are more similar to one another than to any of the breeds with DNA more closely resembled wolf DNA.

A quote from the study puts these findings into perspective:

“A subset of breeds with ancient Asian and African origins splits off from the rest of the breeds and shows shared patterns of allele (genetic) frequency. At first glance, it is surprising that a single genetic cluster includes breeds from Central Africa (Basenji), the Middle East (Saluki and Afghan), Tibet (Tibetan Terrier and Lhasa Apso), China (Chow Chow, Pekingese, Shar Pei), Japan (Akita and Shiba Inu) and the Arctic (Alaskan Malamute, Siberian Husky and Samoyed). However, several researchers have hypothesized that early pariah dogs originated in Asia and migrated with nomadic human groups both south

to Africa and north to the Arctic, with subsequent migrations throughout Asia.”

The study also provided some startling information about breeds that, until now, have been considered ancient – the Pharaoh Hound, Ibizan Hound and Norwegian Elkhound. DNA analysis does not support this conclusion. These breeds have been “... recreated in more recent times from combinations of other breeds. Thus, although their appearance matches the ancient (hounds), their genomes do not.”

As Basenji fanciers have known from the outset, our little native African dogs are ancient and unique – and now the science of genetics shows us just how ancient and unique they are. It is a privilege and a challenge to act as guardians of an ancient breed – a breed that pre-dates the vast majority of “purebred dogs” and harkens back to the earliest years of human civilization. And with that privilege and challenge, comes increased responsibility, for breeders and owners alike.

\*Genetic Structure of the Purebred Domestic Dog, *Science*, Vol. 304, Issue 5674, 1160-1164, 21 May 2004, by H. Parker, L. Kim, N. Sutter, S. Carlson, T. Lorentzen, T. Malek, G. Johnson, H. DeFrance, E. Ostrander, and L. Kruglyak.

\*\*Read the *Science* article in its entirety at: <http://www.akcchf.org/news/press/releases/2004/dogbreeds.pdf>