

Exploring origins of the domesticated dog (canis familiaris)



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Known as “man’s best friend”, a dog can be a faithful companion and a loveable pet. Fact is that dogs are the oldest domesticated animal and the most widespread species of all animals under human care. In history, they have been used as “hunting aids, for pulling and carrying, as providers of meat, fur and other products, for guarding and watching, and as laboratory test animals” (Jensen 2007, p. ix). At present, animal rights activists have pushed to outlaw utilizing dogs as meat or being used in the laboratory.

Because they are increasingly popular as pets, friends and family members, and at the same time the importance of dogs to work with the police and rescue forces, most people support the fact that their loyalty and faithfulness to man should not be abused. To know the origins of the present domesticated dogs is very vital since dogs are so closely connected to human evolution and history. By understanding how, where and when dogs have developed and spread would help people understand our own background.

Another important reason in knowing the evolution of dogs is that their long coexistence with humans has led the dog to develop specific adaptations facilitating life with people, and the dog therefore provides an excellent model for studying how this relationship have evolved. Lastly, the increasing importance of dogs (as pets and working animals) calls for a deeper evolutionary knowledge of how these animals actually work.

This information can help us not only to train and shape dogs for specific tasks, but also to prevent and cure various behavioral disorders which may cause owners and animals large problems. In this paper, we will try to delve into the origins of how our present-day domesticated dogs came into being.

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We will discuss the theories made by experts and try to draw out clues which are vital to answer our questions with regards to the origins of dogs. Delineating the Dog Family Common day dogs belong to the family Canidae, which are an early lineage of carnivorans (order Carnivora).

The canids were the first to branch off from the dog-like predators that, in addition to canids, also include the bear family (Ursidae), the raccoon family (Procyonidae), the weasel family (Mustelidae), as well as the aquatic seals, sea lions and walruses (Pinnipedia) (See Figure 1). Living canids are some of the most successful predators, occupying all continents except Antarctica, and reign supreme as top predators in parts of northern North America and Eurasia. It is thus quite remarkable that domestic dogs, known for their loyalty to human masters, came from a dominant predator in the form of the grey wolf.

The history of domestic dogs occupies a tiny fraction of the long family history, and represents a “mere twig in a large family tree of more than 36 species of wild canids living today” (Wang et al. , 2004). Despite their impressive variety, all dogs came from a single species of wolves in the latest Pleistocene during the last Ice Age. Earliest fossil evidence of domestic dogs in archaeological sites dates around 12, 000-14, 000 years ago in western Eurasia, whereas genetic evidence suggests an East Asian origin around 15, 000 years ago or possibly as old as 100, 000 or more years ago (Leonard et al., 2002; Pennisi, 2002).

Often treated as a subspecies of the grey wolf, *Canis lupus familiaris*, domestic dogs bear numerous resemblances to their wild wolf ancestors both morphologically and behaviorally. Figure 1. The Canidae Family Tree.
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Branch colors identify the fox-like canids (red), the South American canids (green), the wolf-like canids (blue) and the grey and island fox canids (orange). Divergence time, in millions of years (Myr) is also indicated (Source: Lindblad-Toh, K, et al. , 2005). Three subfamilies of canids have been recognized.

The subfamily Hesperocyoninae includes the oldest and most primitive members of the family (Wang, 1994). This Oligocene to Miocene Age subfamily includes small to medium sized predators and lasted for over 20 million years. In the Middle Miocene, the Hesperocyoninae were replaced by Borophaginae, large bone-crushing dogs, that are often the most common predators in late Tertiary deposits but were extinct by the mid-Pliocene, about 4 million years ago (Wang et al. , 1999). The third subfamily, Caninae, includes all living representatives of the family and first appears in the late Miocene.

Although canids belong to an ancient lineage, they are all very closely related and diverged only about 12-15 million years ago. Based on mitochondrial DNA sequences, three distinct groups can be identified within the sub-family of Canidae, including the red fox-like canids (e. g. red, kit and Arctic fox, among others), the South American foxes (e. g. grey and pampas foxes), and the wolf-like canids (the domestic dog, grey wolf, coyote, African hunting dog, dhole, Ethiopian wolf and jackals). Bush dog and maned wolf are two very divergent South American canids that cluster with wolf-like canids (Wayne et al. , 1997).

The grey fox, raccoon dog and bat-eared fox represent long distinct lineages.

Ruvinsky (2002) revealed that: Evolutionary relationships are also suggested <https://assignbuster.com/exploring-origins-of-the-domesticated-dog-canis-familiaris/>

by chromosome similarity. Chromosome number and structure vary widely among canid species, from 36 metacentric chromosomes in the red fox to 78 acrocentric chromosomes in wolves, coyotes and jackals. However, the closely related wolf-like canids and South American canids all have high diploid numbers and acrocentric chromosomes. Similarly, the closely related fox-like canids have low diploid numbers and metacentric chromosomes and share a common ancestry (p. 5).

However, the real origins of domesticated species are still quite ambiguous. The number, timing and geographic origin of founding events may be difficult to determine from the patchy archaeological record (Vila et al. , 1997). The morphology and size of early archaeological dog remains suggest an origin from one of the small South Asian wolf subspecies rather than from the large North Eurasian and North American wolves, and the spread of the wolf, which has been limited to Eurasia and North America, excludes the possibility of an African origin (Clutton-Brock, 1995).

One bone feature of the jaw, diagnostic for dogs, is found also among Chinese wolves, but rarely in other wolves, indicating an origin from East Asia (Olsen, 1985). Based on the archaeological evidence, there have been two main theories for the origin of the domestic dog. The Middle East has been proposed, based on the earliest finds of dogs being found in Europe and the Middle East, and the small size of the local species of wolf. An origin from several different wolf populations has been suggested, based on the widespread occurrence of early finds of dog remains (Clutton-Brock, 1995).

This could also to some extent offer an explanation for the extreme morphological variation among dog breeds. There is also very little known

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about the early history of different dog breeds, and even for the large number of breeds which have been developed in the last few hundred years, the exact origin is mostly unknown (Clutton-Brock, 1995). The only criterion used to differentiate between dog and wolf remains from archaeological sites is skeletal morphology. Most modern dogs are morphologically differentiated from both wolves and jackals (Olsen, 1985).

These differences were used to discriminate between species in archaeological sites, but consequently, only morphologically differentiated dogs could be distinguished and the initial stages of dog domestication, when the morphological differentiation was small, might have passed unnoticed. Even for the several hundred extant dog breeds that have been developed in the last few hundred years, the specific crosses that led to their establishment are often not known (Dennis-Bryan and Clutton-Brock, 1988). Knowing the genetic diversity of the founding population is essential for understanding the immense phenotypic diversity of dogs.

A heterogeneous origin would suggest that gene diversity is critical to the evolution of domestic dogs, whereas limited origins of its population would imply that developmental variation is more important in breed diversity. From the Wild to Domestication The archaeological record suggests that dogs were present in the Middle East and Central Europe about 14, 000-15, 000 years ago (Olsen, 1985; Sablin and Khlopachev, 2002). Early dogs were morphologically distinct from grey wolves. They are often identified by their smaller body size and wider head skulls, a more prominent stop on the face and a shortened, crowded jaw (Morey, 1992).

The identification of these bones as belonging to dogs and not to wolves implies that the animals had been living with humans for a time period sufficiently long to allow some morphological differentiation from their wild ancestor. The small body size of Asian wolves and the shared presence with early dogs of some traits led to the suggestion that Asian wolves are the direct ancestor of the dog (Olsen and Olsen, 1977). However, Leonard et al. (2002) has shown that American dogs clearly had Eurasian origin, implying that they arrived in the Americas with the first humans.

Since all these dogs in Europe, Asia and America shared a common origin, we can presume that the domestication of the dog had to take place significantly before 15, 000 years ago to allow their expansion over three continents. As dogs were domesticated from the grey wolf, the place of domestication must be somewhere in the range of this species. Grey wolves are naturally distributed across Europe, Asia and North America, so those are the initial possibilities.

Very little phylogeographic patterns have been found in grey wolves worldwide, but American and Eurasian animals do not share haplotypes (Vila et al., 1999) and dog haplotypes are more closely related to Eurasian wolf haplotypes than American wolf haplotypes (Vila et al. , 1997; Leonard et al. , 2002). This narrows the range of possibilities to Eurasia. Within Eurasia, divergent lineages have been found in the grey wolves of the Himalayas and Indian subcontinent, which are quite divergent from those found in any dogs (Sharma et al. , 2003). This excludes this region as a possible center of domestication. This narrows the geographic range of domestication to somewhere in Eurasia except India or the Himalayas.

Ultimately, the study of Leonard et al. (2002) showed that modern purebred American dogs are very different from the dogs that existed there a few centuries ago. Human history, demography, migrations and even fashion have clearly affected the composition of modern dog populations and the information about past patterns of diversity are blurred. Consequently, the study of modern dogs may not be the best way to study the place of origin of dogs, and studies of ancient dog remains as well as extensive archaeological research may be needed to provide a final answer to the questions about the number of domestication centers and the place of origin of all modern dogs.

However, the answer to this question may not be simple, and recent genetic studies suggest that the separation between wild and domestic lineages may not have been clean cut during part of the dog's history. Presently, the World Canine Organization (Federation Cynologique Internationale, FCI) currently recognizes about 347 breeds of dogs, classified in ten groups according to their function and, to a lesser degree, area of origin. Each one of these breeds is characterized by a quite unique morphology and often also behavior, which makes them easily recognizable.

The genetic basis of these morphological traits is evident since breeds breed true (e. g. the offspring of two dalmatians looks like another dalmatian, and the offspring of a couple of boxers will look like another member of the same breed). Similarly, some breed-characteristic behaviors are also inherited (Schmutz and Schmutz, 1998). This uniform typology for each breed is very often seen as the result of a long period of isolation. In fact, many dog breeders believe that their breeds had an origin that dates from several centuries or millennia ago (Crowley and Adelman, 1998).

For example, archaeological evidence from ancient Egypt suggests that several types of morphologically differentiated dogs similar to mastiffs and greyhounds existed there 4000 years ago and Romans may have been the first people to develop dog breeds in Europe (Clutton-Brock, 1999). Also, pottery from the Colima culture (250 BC- AD 450, Western Mexico) clearly represents Mexican hairless dogs (Cordy-Collins, 1994). This breed was also found by the Spanish conquistadors on their arrival to Mexico in the 16th century.

Furthermore, dogs depicted in European paintings during that time could be easily recognized today as spaniels, mastiffs, and hounds. Conclusion An understanding of the origin and evolution of the modern domesticated dogs is important to understand their traits, genetic origins, morphological structure and behavioral variation (Wayne and Ostrander, 1999). However, our current knowledge about the origin of dogs and about the process by which breeds were formed which led to the astonishing diversity of modern-day dogs is not yet complete and need further investigation.

As the second dog genome sequence of the domestic dog (*Canis familiaris*) was completed in 2005 (Lindblad-Toh et al. , December 2005), this will certainly promote our understanding of the diversity of dogs, push more scientists to do intensive research and we should expect many answers to our questions during the next few years. In the end, when armed with a good knowledge of their evolution, we will fully understand and know how to take care of this human friend that gave us unwavering loyalty and love that dates back a thousand years.