

Of Wolves & Dogs: Dispelling the Myths

By Kim Miles, FLA Director & Editor

The general public continues to see a vast chasm between the wolf and the dog. Conversely, canid geneticists are determining a much closer relationship between wolves and dogs than was previously thought.

Genetic Relationships

Dr. Robert K. Wayne (1993), canid evolutionary biologist and geneticist at UC-Davis, came to the following conclusion regarding the genetic relationship between wolves and dogs: "Dogs are gray wolves, despite their diversity in size and proportion."

Wayne's genetic studies on wolves and dogs show, quite clearly, that "[t]he domestic dog is an extremely close relative of the gray wolf, differing from it by at most 0.2% of mtDNA sequence.... In comparison, the gray wolf differs from its closest wild relative, the coyote, by about 4% of mitochondrial DNA sequence" (Wayne, 1993).

Based on genetic studies, the 1993 edition of *Mammal Species of the World*, published by the American Society of Mammalogists and the Smithsonian Institution in Washington, D.C., reclassified the dog from *Canis familiaris*, its own species, to *Canis lupus familiaris*, a subspecies of gray wolf (Wilson & Reeder, 1993).

Wolfdogs: Wild or Domestic?

While wolves require federal and state permits to own, the ownership of dogs and crosses between dogs and wolves does not require such stringent federal regulations in most states or areas. The obvious key difference that separates a wolf from a dog and mandates the federal restrictions of the former is that wolves are wild and dogs are domestic animals. But

where does that leave the crosses of these two genetically similar animals?

The *Title 9 Code of Federal Regulations* stipulates that "[c]rosses between wild animal species and domestic animals, such as dogs and wolves or buffalo and domestic cattle, are considered to be domestic animals" (9CFR1.1). Therefore, the federal government posits that wolfdogs are domesticated in the legal terminology of the word "domestic." *Note: The term "domestic" can have different definitions in the legal realm compared to the scientific realm.*

The Process of Domestication

Dr. Temple Grandin, animal behavioral geneticist at Colorado State University, claims that domestication is best defined as "a process by which a population of animals becomes adapted to man and the captive environment by some combination of genetic changes occurring over generations" (Grandin & Deesing, 1998).

Upon domestication, an animal undergoes genetic changes that often result in morphological¹ and physiological² changes. Examples of the former are shortened snouts, broader heads, and smaller cranial capacity, while examples of the latter include altered hormone levels, variations in estrus cycling, and moderating effects on behavior.

The long-standing and most widely accepted hypothesis is that dogs were first domesticated around 14,000 years ago, as evidenced by fossil records. However, some researchers question whether domestication could have begun earlier—around 100,000 years ago—due to the extensive morphological diversity found in dogs (Wayne, 1993; Vila *et al.*, 1997; Vila *et al.*, 1999).

Dr. Carles Vila, canid evolutionary biologist and geneticist, and his colleagues hypothesize that "if dogs

originated from a large population of wild canids and have interbred with them throughout their evolutionary history, then the influx of genetic variation from wild populations may be an important reason why domestic dogs are morphologically so diverse" (Vila *et al.*, 1999).

Although there is some debate in the scientific community as to when dogs were first domesticated, most agree that the divergence of the dog occurred at numerous and various times and places, a theory that is commonly accepted in today's scientific community and that is rapidly usurping the older 'one-main-divergence' theory.

The 1998 Texas court case *James Trivitt vs. The City of Arlington, TX* focused on the issue of a man being allowed to own an "exotic wolf hybrid." Lawyers relied upon expert testimony to clarify the classification of dog, the term "hybrid" and the "domestication" issue surrounding wolfdogs.

Dr. Raymond Pierotti, behaviorist and ecologist at the University of Kansas, was one such expert witness. In his testimony, Pierotti explained that the older classification of dog is erroneous: "*Canis familiaris* is not a good classification and one ... that science has moved away from" as evidenced by the 1993 reclassification of dog under the taxonomic umbrella of *Canis lupus*; the dog is the "same genus and species as the wolf" (Trivitt vs. Arlington).

When asked if the domestication of the dog was a singular event in history, Pierotti asserted that the "[domestication of the dog] has happened repeatedly. In fact, it's still happening today" (Trivitt vs. Arlington). Upon being asked if a scientist can tell when an animal is domesticated, Pierotti replied as follows:

My personal inclination is that after two or three generations of selective breeding, an animal should be considered domesticated because humans have been selecting it for features they like, not the features that would function best in the natural world. As a consequence, you end up with an animal that probably could not survive well in nature.... [W]e know that in foxes, [domestication] takes

place in less than five generations because there have been breeders in Russia that were specifically selecting for friendliness in foxes and produced a very dog-like animal. Although it wasn't a dog, it had some similar features to some domestic breeds of dog that were essentially completely domesticated within five generations. Like I said, my personal feeling is that after two or three generations, you pretty much should start calling an animal domesticated. (Trivitt vs. Arlington)

The Russian fox study that Pierotti referred to above was conducted by a group of scientists headed by Dr. Dmitry Belyaev, geneticist and Director of the Institute of Cytology and Genetics in Novosibirsk, Siberia. Belyaev's study began in 1956, and by 1962, changes consistent with domestication were found in the tamed offspring (Figure 1). In 1969, "after only seven years of selective breeding" even greater changes were found, indicating that a domestication process was occurring (Belyaev, 1979).

It stands to reason that over time, the selective breeding of tamed wolves—those raised in captivity and descended from other wolves raised in captivity—would result in domestication changes similar to the foxes in Belyaev's study. In fact, Dr.



Figure 1: A fox in Dr. Belyaev's seminal study, exhibiting the morphological changes consistent with the domestication process.

Juliet Clutton-Brock (1992), with the Natural History Museum in London, asserted that domestication is not limited to a single, biological process; rather, it is a dual process that involves biological changes coupled with cultural changes.

The biological process of domestication resembles natural selection because the parent animals are forced to be reproductively isolated from the wild population. The small founder group of captive animals is, at first, very inbred; however, in time it will undergo a process of genetic drift, which is an accumulation of random mutations that occur in small populations. Over successive generations, the domesticated animals will also undergo genetic changes in response to their new, human environment (Clutton-Brock, 1995).

The cultural process of domestication in wolves began when the animals became integrated into the social structure of the human society. The original tamed wolves became less and less like their wild progenitors because “inherently variable characters such as coat colour, carriage of the ears and tails, overall size and the proportion of limbs...ha[d] been altered by the combined effects of artificial and natural selection” (Clutton-Brock, 1995). In this way, the wild wolf became a tamed wolf, which then became a domesticated wolf—the dog. This process of domestication is exemplified in Belyaev’s fox study over a rather short period of a few generations as opposed to thousands of years.

Dr. N. A. Iljin (1944), canid geneticist and Director of the Institute of General Biology at the First Institute of Medicine in Moscow, Russia, performed the most intensive study ever conducted on wolfdog genetics; this study offers further support that domestication events can occur quite rapidly.

Iljin bred a wolf to a German sheepdog and studied the genetic effects of their descendants through several generations, noting changes in the offspring that were consistent with animals undergoing domestication. For example, within two generations the monoestrous cycle³ began changing to a diestrus cycle⁴ or to a monoestrous cycle that deviated from the annual spring cycle; the animals

also began exhibiting phenotypic⁵ characteristics consistent with dogs (*e.g.*, larger ears, shorter legs, floppy ears, shorter or longer coats, etc.).

Wolfdogs Today

Some people still suffer under the assumption that many of today’s wolfdogs are the products of pure wolves and pure dogs—an assumption that is, unfortunately, reinforced by those erroneously claiming that they have a den-robbed wolf pup (a federal offense and, in almost every case, a lie) or that their dog wandered into the woods (irresponsible owner) and was impregnated by a wolf or some other such outlandish and equally unbelievable story.

Because wolves are so strictly regulated, requiring a USDA license and/or a state wildlife permit, there is a very limited number of people who own and breed pure wolves even though there are many boastful claims to that effect—misrepresented claims that cloud the wolf and wolfdog issue even further.

Most animals in today’s wolfdog community are the offspring of animals that have been raised in captivity for numerous generations—most often, other wolfdogs. The most famous of the “wolf-dog” lines go back at least a dozen generations, with no wild-caught wolves in the lines for thirty years or more. These lines are

- ◇ the Gordon K. Smith line, which was begun in the 1960s;
- ◇ the Ernie Kuyt Arctic line, started in the early 1960s;
- ◇ the Motts line, which grew out of the Motts Fur Farm in the 1970s;
- ◇ the Gabe Davidson line, which originated from the Gabe Davidson fur farm in the 1950s;
- ◇ the Bear Country line, which grew out of Bear Country Park in the 1970s.

Many people who oppose the ownership of wolfdogs do so simply because of the connotations surrounding the word “wolf,” not realizing that numerous breeds have arisen from backcrossing dogs to wolves in the last century or half century, including the von Stephanitz German Shepherds, the Saarloos Wolfhound, the Czechoslovakian Wolfdog, etc. (Note: *The North American Indian Dog and the Native American Indian Dog are not dog or wolfdog breeds, but are labels for canines that may have no or very little recent wolf inheritance or may be pure wolves or anything in between.*)

Although wolfdogs are not Golden Retrievers, they are also not the wild animals that some maintain. A wolfdog is merely a dog with more recent wolf inheritance than is typically found in most other dogs and, just like other dogs, many of them have been domesticated through selective breeding.

Are wolfdogs for everyone? No. Since they are large canines, potential owners should determine if such an animal is right for them. Just like a Rottweiler, Doberman, Shepherd, or Malamute, a wolfdog is not an appropriate companion for many dog owners; and they should **never** be obtained due solely to the exoticism of the “wolf” in the title “wolfdog.”

Literature Cited

Belyaev, D.K. and L.N. Trut. (1979.) Some genetic and endocrine effects of selection for domestication in silver foxes. *Journal of Genetics and Physiology* 416-426.

Clutton-Brock, J. (1992.) The process of domestication. *Mammal Review* 22:79-85.

Clutton-Brock, J. (1995) Origin of the dog: Domestication and early history. Ed. J. Serpell. *The domestic dog: Its evolution, behavior and interactions with people*. Cambridge University Press, Cambridge, UK.

Code of Federal Regulations, Title 9, 1.1 (9CFR1.1). (2015.) National Archives and Records

Administration's Office of the Federal Register, and the Government Printing Office.

Grandin, T. and M.J. Deesing. (1998.) *Genetics and the Behavior of domestic animals*. Academic Press, San Diego, CA.

Iljin, N.A. (1944.) Wolf-dog genetics. *Journal of Genetics* 42:359-414.

James Trivitt vs. The City of Arlington, TX and Robert Byrd and George Campbell in their official capacities only. (1998.) Case # 352-173599-98.

Vila, C., J. Maldonado, and R.K. Wayne. (1999.) Phylogenetic relationships, evolution, and genetic diversity of the domestic dog. *The Journal of Heredity* 90(1):71-77.

Vila, C., P. Savolainen, J. Maldonado, I. Amorim, J.E. Rice, R.L. Honeycutt, K.A. Crandall, J. Lundberg, and R.K. Wayne. (1997.) Multiple and ancient origins of the domestic dog. *Science* 276:1687-1689.

Wayne, R.K. (1993.) Molecular evolution of the dog family. *Theoretical & Applied Genetics* 9(6).

Wilson, D.E., and D.M. Reeder. (1993.) *Mammal Species of the World: A Taxonomic and Geographic Reference*, 2nd ed. Smithsonian Institution Press, Washington, D.C.

Footnotes

- 1 *Morphology* addresses the form and structure of an organism (*i.e.*, its looks).
- 2 *Physiology* addresses the function of the internal components of an organism (*i.e.*, organs, etc) .
- 3 A *monoestrous cycle* refers to the annual Spring estrus (*i.e.*, heat or reproductive cycle) of most wild mammals and some domesticated mammals.
- 4 A *diestrus cycle* is a “heat” cycle that occurs twice yearly and is found in many domestic animals.
- 5 *Phenotype* refers to the observable traits of an organism (similar to morphology). Phenotyping considers both behavior and looks.