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Controversies of Origin of Domestic Dog - I - References of Evolution Factors of Wolf

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Review Article

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Abstract: There is no doubt about ancestor of dog which is wolf, but there are always arguments about time and place of domestication. There are three different place of domestication including Europe, Southeast of Asia and Middle East. The majority of the scientists from Belgium, Canada, Finland, France, Germany, Portugal, Russia and USA claimed that domestication happened in Europe but domestication time was not definite. Also some scientists from China, Sweden and USA claimed that the domestication happened in Southeast of Asia. At last one scientist from Israel claimed that possible origin of dog was Middle East. Altogether there is still no definite answer about place and time of domestication.
Keywords: *Canis familiaris, Canis lupus,* DNA analysis, Domestication, wolf

INTRODUCTION

The genus of *Canis* contains eight extant species including gray wolf (*Canis lupus*), red wolf (*C. rufus*), coyote (*C. latrans*), golden jackal (*C. aureus*), striped jackal (*C. adustrus*), black-backed jackal (*C. mesomelas*), Ethiopian wolf (*C. simensis*), and domestic dog (*C. familiaris*). The domestic dogs live in all countries except Antarctic because of international ban. IN the world there are also some feral dog population including the Dingo (*C. f. dingo*) of Australia and the New Guinea Singing dog (*C. f. hallstromi*) which are apparently extinct in the wild [1]. The domestic dog is phenotypically one of the most variable mammal species [2, 3] like horses and pigeons [4, 5].

The origins of the dog always have been debated among scientists [6-9]. It is quite understandable because there are more than 400 various breeds which range from tiny Chihuahuas to huge Saint Bernard [10]. Under intensity of human-animal relationship, three various pathways were offered as commensal, prey and directed domestication. Dog was accepted as a directed domesticated species together with cat, rat, mouse, guinea pig, chicken, pigeon, duck, turkey and possible pig [11].

Even though all scientists agree with that the dog was domesticated from wolf, the geographic origin and time of dog is uncertain. The purpose of this study is to review origin of dogs regarding with genetic relationship to other dog breeds and canids. Fossil dog bones which were unearthed from ancient archaeological sites were ignored in this review. Fossil dog bones and ancient dogs are going to be reviewed in another paper.

Wolf versus Dog

During historical evolution wolf and dog differed. The wolf places its hindlegs in the prints of its forelegs. Like foxes the legs move forward in a straight line and the trail stripe they leave is characteristically straight. On the other hand the dog places its hindlegs between its forelegs and leaves an undulating sinusoid-like trail. The wolf has upstanding, erect ear but the most breeds of dogs have drooping or lopping ears. Although the wolf has 40-45° of orbital angle, but it is 53-60° in the majority of dog breeds [12].

Harry Frank, a psychologist from University of Michigan, managed an observational learning ability study in malamute dog, malamute-wolf hybrid and purebred wolf. In the experimental study a latch on a door connecting the indoor and outdoor runs of Frank's research facility was relatively complex to operate. The malamute never learned to operate the latch despite observing people opening and closing it for six years. The malamute-wolf hybrid learned the task using his muzzle after watching people for only two weeks. The seven-month-old wolflearned the task after watching the hybrid only once. Also the wolf used her paws rather than her muzzle to perform the trick. This study did not meant to show that wolves were more intelligent than dogs. It seems that they have different kinds of intelligence. Frank spent six months attempting to train the seven-month-old wolf to sit in response to a verbal

command. Most dogs can perform this task after several trials, but juvenile wolf never the trick, whereas it exhibited one-trial observational learning when it came to opening a complicated door latch [13].

The Dogs and wolves were studied in two different experiments to clarify to show capable of finding hidden food. There were some previous studies that reported that hand-reared wolves failed to locate hidden food in response to similar points in the absence of extensive training. This experiment showed that wolves could use momentary distal human pointing cues to find food without training under given the right rearing environment and daily interaction with humans. On the other hand dogs tested outdoors and dogs at an animal shelter did not follow the same human points. The experiment also proved that the reported failure of wolves in some past studies might be due to differences in the testing environment. The study results indicated that domestication was not a prerequisite for human-like social cognition in canids, and showed the need for additional research on the role of rearing conditions and environmental factors in the development of higher-level cognitive abilities [14, 15].

Cranial morphology of domestic and wild canids was studied and the results demonstrated that the domestic dog was morphologically distinct from all other canids except its close relatives of wolf-like canids [16]. Scientists assumed that early domestic dogs might not have been phenotypically distinct from their wild relatives. The separation happened around 10-15.000 years ago due to more sedentary agricultural population centers might have imposed new selective regimes on dogs that resulted in marked phenotypic divergence from wild wolves [2].

Behavioural changes also agree with accompany physical alterations among dogs. Some experiments showed that foxes could be tamed after several generations, but is hard to say for wolf. A Russian geneticists ruled a long term experiments for interbred foxes. After about 20 generations they started to generate a usual amount of variability. Some foxes started to look more like dogs than foxes and actively sought contact with people, whines and wagged tails. Foxes were so playful and friendly as puppies. They also developed piebaldcoat colour, drooping ears and curled tails like dogs. Some of foxes also developed diestrus reproduction cycles like dogs [17].

John Paul Scott, an American etholojist, prepared a detailed ethogram. In the ethogram there were about 90 various specific species behaviour of domestic dog, 19 behaviours of 90 were also observed in wolves. The missing behaviours seemed to be minor activities that possible do occur in wolves but had at that time been recorded [10].

Li *et al*. enounced that genes showing population differentiation between wolves and native dogs based on the population genetics data showed brain-biased expression. Those results demonstrated that during the primary transition from wolves to ancient dogs, genes expressed in the brain evolved rapidly, driven by artificial selection, consistent with the evolution of dog-specific behaviours during domestication [18].

Domestication Purpose

One theory suggests that dogs were domesticated for food [19] or dogs are domesticated as man and dog joined to form a hunting team [20]. Another theory that the wolf was domesticated for its use as a source of food rather than for hunting, guarding, or companionship as mostly suggested, perhaps under influence of a European non–dog eating perspective. China had two centres of plant domestication and early agriculture, of millet by the Yellow River and of rice in the Yangtze River area, both at least 8,500 years ago. Rice domestication probably started to develop first, at least 9,000 years ago but possibly as early as 11,500 years ago. There was also evidence for pottery by 14,000–11,200 years ago in southern China. It was possible that the dog originated in this cultural context of increasingly sedentary hunter-gatherers or early rice farmers [21]. There are other views including that wolves began associating with humans as opportunistic, commensal scavengers. Later then this casual association gradually evolved because of human tolerance and recognition of the dog's potentially useful role as a garbage collector, watchdog, and occasional item food [10]. For the latter view the relationship man and dog can be called as hunting partnership but not commensalism which is commonly observed between man other domesticated animals [10, 20]. Some bones on which cut marks have been found at a number of late Paleolitic and Neolitic sites in Europe, West Africa, Central America, Korea, China, Southeast Asia and the Philippines [10]. There was another opinion that dog breeds were created by human requirements. For example, although Keeshond dogs are excellent watchdogs, they only bark loudly to alert their owners of intruders, but they would not attack them, contrary to German shepherds, which are excellent guard dogs [22].

Origin Place

According to Dayan, Israel was the origin of domestication and the Geometric Kebaran wolves were domesticated to dogs [23]. Pennisi reported that Italian researchers had claimed that Italy was the origin of dog's first home [24]. Pang *et al*. enounced that the Yangtze River area was one of two centres of plant domestication and early agriculture at least 8,500 years ago. It was possible that the dog originated in the Yangtze River area due to this cultural context of increasingly sedentary hunter-gatherers or early rice farmers [21]. Tanabe suggested that origin of domestic

dog was East Asia. Serpell claimed that eastern Europe or western Asia was the origin of domestication because of archaeological evidences [20]. Wayne and von Holdt enounced that contrary to previous mtDNA analyses, the nuclear genome of dogs provided essentially from Middle Eastern or European wolves which was supported by more consistent with the archaeological records. Moreover the sequencing analysis of the IGF1 gene, which had been the target of size selection in small breeds, were further supports for this decision [25].

Possible Origin Species

Almost all scientists recently agreed with that the dog was domesticated from wolf [26] but Darwin and others once thought that dogs might have descended from a mixture of wild canids including Jackal [10, 27]. Dayan alleged that Geometric Kebaran wolves were domesticated to dogs [23]. Vila *et al*. reported that the first DNA analysis results showed that clearly that wolf was the ancestor of dog. Dog haplotypes D4, D3, D5, and D1 were found in 14, 14, 9, and 7 dog breeds respectively. None of dog sequence differed from any wolf sequence by more than 12 substitutions, whereas dogs differed from coyotes and jackals by at least 20 substitutions and two insertions which clearly showed that wolf ancestry for dogs [2]. Kim et al proposed that there was a closer genetic relationship between dog and seal than there was between either of these species and cat. Konrad Lorenz offered an origin alternative as golden jackal (Canis aureus), Charles Darwin, Tim Hugh Clutton-Brock, and Abra Brisbin suggested as hybrids of wild canids, Hellmut Epstein, Frederick E. Zeuner, Michael W. Fox, C. M. A. Baker and C. Manwell as wild Canis other than jackal or *C. lupus* [28]. Jackal ancestry of the domestic dog have been dismissed because of the large genetic distance separating the two by Robert K. Wayne and Stephen J. O'Brien. Although a hybrid origin (e.g., *Canissimensis or Cuonalpinus* with small subspecies of *C. lupus*), suggested by several authors to account for the sudden shift from wolf to primitive dog morphology, cannot be ruled out, currently no direct evidence supports this hypothesis [29]. Tanabe suggested that ancestor of domestic dog was Tibetan wolf (*Canis lupus chanco*) [20]. Some limited number of scientists also claimed that a hypothetical wild dog of Asia that is now extinct is origin of domestic dog [30].

Domestication Time

The domestication of dog is apparently a process rather than an event, therefore it is difficult decide the exact time and location although 500.000 years old fossil remains have been unearthed from sites. The domestication could be happened around 15.000 to 17.000 B.P. [10]. Vila *et al*. suggested that dogs could have originated between 76.000 and 135.000 years ago, although coyote and wolf diverged about one million years ago according to some fossil records [31]. Vila *et al*. latterly corrected the domestication time as 15.000 years BP because under new evidences based on mtDNA studies [10]. Wayne and Vila proposed that dogs were domesticated from wolves multiple times by beginning over 100.000 years ago [32]. Pang *et al*. claimed that dogs were domesticated from wolves from Yangtze River area 16.300 years ago, but they did give information about the time calibration which was not clear [21]. Gray *et al*. informed that small dogs originated about 12,000 years ago, even though they failed to indicate how they had arrived at this date [33]. Wang *et al*. recommended that a split happened between Chinese native dogs and wolves 32.000 years ago [34].

CONCLUSION

What was the purpose of the domestication? Food, hunting, guarding or companionship? How many times the domestication happened? One time or multiple times? Where the domestication happened? In China, Europe, Eurasia, or Middle East? When the domestication happened? 12.000 or 500.000 years ago? Despite many theories there was a general indisputable opinion of the origin of the domestic dog that they were all descendants of the wolf, in spite of the huge variation in size and shape for the lashings of dog breeds. At last it can be concludedt that there are still many challenges about processes of dog domestication.

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