

## POSSIBLE GENETIC RESEMBLANCE AMONG WHITE COATED SHEPHERD DOGS SUCH AS TURKISH AKBASH SHEPHERD, POLISH TATRA, KUVASZ, CHUVACH, AND CENTRAL ASIAN SHEPHERD DOG

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### ABSTRACT

According to scientists, the dog was domesticated in Asia and spread to other parts of the world from this continent. Turks are also from Central Asia. It is believed that the homeland of the Turkish Akbash Shepherd Dog is Central Asia. The Turks may have taken these white-skinned shepherd dogs to other parts of Europe as well. It is also believed that the Hungarians came from the Hun Turks, one of the ancient Turkish tribes. When the ancestors of the Hungarians came to this region, they may have brought white-skinned dogs, which are now called Kuvasz Dogs. Hungary, Slovakia and Southern Poland are in the same basin and dogs called Kuvasz, Chuvach and Tatra are bred in the countries of this basin, respectively. Kuvasz, Chuvach and Tatra were brought by the Hun Turks and may be dogs of the same origin. This paper claims “All white-skinned shepherd dogs are descended from the Central Asian Shepherd Dog, which was taken by the Turks from Central Asia to other countries.” If this hypothesis can be proven as a result of genetic analysis, the results of this research will not only serve animal science, but also anthropology for humanity.

**Key words:** *Canis familiaris*, guardian dog, genetic relationship, Akbash Shepherd, Tatra, Kuvasz

### INTRODUCTION

The dog is the first domesticated animal [Clutton-Brock 1996]. The Turks came to Country of Turkey in the 11th century as a result of the expansion of the Turkish Empire in Central Asia. When they came, they brought shepherd dogs with them to protect the flocks of animals with them. Many dog breeds have emerged in Anatolia (Turkey’s remaining territories in Asia) and Thrace (Turkey’s remaining territories in Europe), where Turks migrated in the past 1,000 years. The general characteristic of shepherd dogs is that they have large, strong and white or almost white light colored coats [Yilmaz 2012, Yilmaz and Ertugrul 2015].

The way the dog breeds originated and spread around the world has always been among the topics that scientists have been curious about. A group of scientists

found a 3,000-year-old kurgan in Northeastern Anatolia. In the kurgan, man, horse and dog were buried together in the same grave. The claim of the scientists is that this type of burial tradition is the Central Asian Turkish Tradition, and this proves that the Turks came to Anatolia not 1,000 years ago, but 3,000 years ago. This research shows that sometimes scientific evidence about animals can also contribute to the human sciences [Yilmaz and Ertugrul 2013, Yilmaz et al. 2015a, Yilmaz et al. 2015b, Yilmaz et al. 2015c].

A website for dog breeds mentions that the Greek Sheep Dog is very similar to the Turkish Akbash Dog, possibly of the same origin, as immigrants brought with them shepherd dogs centuries ago [Anonim 2022b].

The variance of 19 microsatellite loci in Greyhound, Labrador and German Shepherd pure breeds was investigated within and between breeds. According to the

observed results, Hardy-Weinberg Equation could not be achieved in any of these races. The results again showed that genetic differentiation between Greyhound and German Shepherd Dog occurred more recently than in other pairwise comparisons [Zajc et al. 1997].

Zajc and Sampson [1999] studied canine microsatellites using blood samples from 53 Greyhounds, 52 Labradors and 53 German Shepherds. The results revealed that the Greyhound breed showed very little polymorphism compared to the other two breeds.

A group of scientists conducted a study with Chinese researchers to examine mtDNA sequence variance using 564 East Asian dog breeds. The observed results showed that 95% of the dogs were grouped into three main phylogenetic groups. This result also showed that dogs came from a common gene pool. He also points out that East Asian Dogs show more genetic variance than dogs from other regions and that these dogs have their origins dating back 15,000 years [Savolainen et al. 2002].

A research group conducted a study to examine 10 microsatellite markers in 28 different races. Race-specific allele frequencies have been used to elucidate genetic distance and phylogenetic relationships between races. Although autosomal microsatellites explain the genetic variation between races, genetic relatedness between races has been found to be low. It is recommended to use the Single-Nucleotide Polymorphisms Method to explain the kinship relationship between races [Iriun et al. 2003].

Koban et al. [2003] researched the Turkish Kangal Shepherd Dog and revealed that this dog came from North Asian dog breeds.

Parker et al. [2004] used molecular markers to search for genetic relatedness in 85 different dog breeds. The genetic variance between races was found to be 30%. The microsatellite genotype was calculated with 99% accuracy. Phylogenetic analyzes revealed that some breeds are descended from European breeds. The research team also identified four genetic clusters with similar geographic origin, morphology and role in human activities.

A study was conducted to investigate the time of arrival and origin of the Dingo Dog in Australia. In the study, 211 Dingo Dogs obtained from different regions of Australia, 582 bp mtDNA from 767 dogs and 38 wolves from other continents, and 263 bp from 19 dog skeletons obtained from Polynesia were analyzed. The research team also looked at the genetic relatedness of the A29 mtDNA sequence, revealing that Dingo Dogs originated 5,000 years ago. These results indicate that the Dingo came to this continent from East Asia via the Southeast Asian Islands as a result of the expansion of Austronesian society [Savolainen et al. 2004].

Van Asch et al. [2005] analyzed mtDNA using 143 dogs from four different Portuguese native dog breeds. As a result of the analysis, 15 haplo groups were identified, five of which were new in four main haplo groups. They

also developed four interpretations for mtDNA haplo groups for all dogs in the world. The first is that different races carry different haplo groups. Second, Haplogroup A is present in all breeds, including breeds that carry rare haplogroups in the world. Third, the haplogroup carried by dogs of different breeds in one region is less than the haplogroup carried in different regions. There is no correct relationship between genetic differences between races and geographical differences.

Ryabinina published two studies in 2006. As a result of the study, it was revealed that genetic relatedness is low in Central Asian Shepherd (CAC) Dog and North Caucasian Volkadov (KKV) Dog, but high in Caucasian Shepherd (KÇ) Dog. A, B, C and E/W haplo groups were detected in the OAC Dog, and the A and B haplo groups in the KÇ Dog. The obtained data also revealed a gene flow from Scandinavian races to North Caucasian races. As a result, KÇ, KKV, OAC, Turkish Akbaş Shepherd and Turkish Kangal Shepherd Dog settled in a single group and very few genetic differences were found between them [Ryabinina 2006a]. Ryabinina conducted another study comparing Asian and European Dogs. In the study, a very close genetic relationship was determined in Asian Shepherd Dogs. In addition, a close genetic relationship was found between Asian Shepherd Dogs and German Shepherd and Laika Dogs. The relationship between the Serra da Estrella Mountain Dog of Portugal and the Asian Shepherd Dogs was also found to be extremely close. A high level of genetic variation was detected between OAC, KKV and Laika Dogs, whereas no genetic difference was found in KC Dogs [Ryabinina 2006b].

125 dogs of 43 breeds, including the Anatolian Shepherd Dog, one coyote and two wolves were genetically analyzed and the variation in the mtDNA control region was investigated. As a result of the analysis, 45 haplo groups were identified, 29 of which were for the first time [Gundry et al. 2007].

Geyer et al. [2007] investigated the nt230 (del4) MDR1 mutation in the Swiss White Shepherd Dog and revealed that it was in the 16.6 Mb region. This result was different from the result found by Neff et al. [1999]. One of the analyzed dogs was homozygous for the MDR1(-) mutant allele, three were heterozygous, and three wild-type alleles were MDR1(+).

Parra et al. [2008] investigated the genetic inbreeding relationship in terms of mitochondrial, autosomal and Y-chromosome of dogs of English Setter, English Pointer, Epagneul Breton, German Drahthaar and German Shorthaired Pointer breeds. As a result of the research, 18 mitochondrial, 236 allele autosomal and four Y-chromosome haplotypes were determined. It has been concluded that the English Setter breed comes from the Old Spanish Pointer breed. In addition, when autosomal markers were used, it was determined that the British Pointer and German Shorthaired Pointer breeds came

from the common main line. It has been concluded that the Epagneul Breton breed is an isolated breed, and the German Drahthaar breed is the result of crossing the German Shorthaired Pointer breed with other breeds.

A team of Chinese researchers conducted a study with animals consisting of 12 different breeds of dogs, gray wolf and coyote to perform the origin and phylogenetic analysis of the Tibetan Mastiff breed. While Tibetan Mastiff, 12 different dog breeds and gray wolf were collected in the same cluster, coyote wolf was collected in a different cluster. In the study, they claimed that the genetic differentiation of the Tibetan Mastiff and the gray wolf occurred about 58,000 years ago, while the genetic differentiation of the gray wolf with other dog breeds occurred about 42,000 years ago. With this result, they concluded that the Tibetan Mastiff originated before other dog breeds [Li et al. 2008].

Kangal and Akbaş Shepherd Dogs were compared by including previous studies. As a result of the research, it was concluded that the Kangal and Akbaş breeds settled in different branches of the phylogenetic tree [Koban et al. 2009].

582 bp control region in 1576 dogs and 40 wolves obtained from different parts of the world; They investigated the control region of 16,195 bp in 169 dogs and 8 wolves. As a result of the research, they claimed that the dog originated in Southern China 16,300 years ago [Pang et al. 2009].

Klütsch and Caprona [2010] investigated dog – wolf hybridization in Scandinavia and analyzed the 582 bp control region in 514 dogs and identified the D1 haplotype associated with spitz breeds. They claimed that the D1 haplo type occurred in Scandinavia sometime between 480–3,000 years ago.

A study was conducted to identify the origin of the Tibetan Mastiff breed and investigated the mitochondrial cytochrome c oxidase subunit I (COI) gene and the COI marker. According to the results of the research, they identified groups A, B, C, D, which are formed from the main line in dogs. Tibetan Mastiff is in group A of these groups. This result strengthened the theory that the dogs originated in East Asia. According to the cluster analysis, the Tibetan Mastiff and the Old English Shepherd, Newfoundland, Rottweiler and Saint Bernard Dog breeds were found to be the closest breeds. Accordingly, it can be said that the origin of some recognized large breeds, such as the Old English Shepherd Dog, is based on the Tibetan Mastiff [Li et al. 2011].

Ardalan et al. [2011] analyzed mtDNA among dogs of some Southwest Asian breeds, consisting of 1,556 dogs, and compared the results of a previous study on dog-wolf crossbreeding with 582 dogs. According to the results of my research, it has been revealed that both groups have the same gene pool at the rate of 97.4%. However, only five of the 10 haplotypes present

in Southeast Asian breeds were included in this common pool.

Caprona and Savolainen [2013] found extreme phenotypic differences in South Chinese Dogs. They claimed that this situation in South Chinese Dogs, which are quite different from European Dog breeds, can be called “blocking”.

Pertoldi et al. [2013] investigated some Danish Dog breeds consisting of the Danish Spitz, the Danish-Swedish Farm Dog, the Broholmer, the Old Danish Pointer Dog and the Greenland Dog. The results of the study revealed that the Greenland Dog has the least genetic variation in the breed, although it has a population size of 10 times more than the others. Accordingly, he pointed out that population number is a weak indicator for genetic variation.

## A RESEARCH

The phenotypic similarity between white-skinned shepherd dogs appears to be quite high, but this needs to be supported by genetic research. A Polish scientist named Magdalena Karolina Wieczorek has a research called “Genetic comparison on white livestock guardian breeds” in Poland. This researcher carried out a genetic research using 215 dogs from Akbaş Shepherd, Tatra, Chuvach, Great Pyrenean, Maremma and Kuvasz breeds. According to the results of this research, Akbaş Shepherd-Tatra and Chuvach-Great Pyrenean dogs were found to be closely related to each other. The Maremma dog was less related to this dual group, and the Kuvasz dog was determined to be the most different dog breed from the other 5 breeds. However, the result of this research was found suspicious by me. Because Tatra, Chuvach and Kuvasz dogs are located in a basin area that borders each other. It was expected that these three races were more related to each other than other races. Afterwards, as a result of the interview with the researcher, it was determined that the researcher did not personally collect blood/hair samples from dogs, he asked help from people related to dogs in some countries and provided these samples by mail. It is also mentioned in the study that the Kuvasz samples were supplied not from Hungary but from the USA. This situation reduces the reliability of the research and misinforms the scientific world about the kinship of these dog breeds. In this respect, this manuscript will provide the opportunity to correct if there is an error in this regard [Wieczorek 1996].

## AN OPINION

According to scientists, the dog was domesticated in Asia and spread to other parts of the world from this continent. Turks are also from Central Asia. They migrated

from Central Asia to different parts of the world such as Europe and Anatolia in different periods of history [Yılmaz and Ertugrul 2011a, b, c]. It is believed that the homeland of the Turkish Akbash Shepherd Dog is Central Asia and was brought with them to Anatolia when the Turks came from Asia. The Turks may have taken these white-skinned shepherd dogs to other parts of Europe as well. It is also believed that the Hungarians came from the Hun Turks, one of the ancient Turkish tribes. When the ancestors of the Hungarians came to this region, they may have brought white-skinned dogs, which are now called the Kuvasz Dog. Hungary, Slovakia and Southern Poland are in the same basin and dogs called Kuvasz, Chuvach and Tatra are bred in the countries of this basin, respectively. Kuvasz, Chuvach and Tatra were brought by the Hun Turks and may be dogs of the same origin [Yılmaz and Ertugrul 2012a, b, c, d].

Hun Emperor Atilla M.S. 451 led an expedition to Roman Gaul (present-day France) and fought the Battle of Catalunum. Dogs cannot travel thousands of kilometers on their own, but they can travel long distances with humans. Some white-skinned shepherd dogs may have been brought to the battlefield by Hun soldiers. When the owner of the dog dies in battle, the dog stays there. These dogs may have been the ancestors of the Great Pyrenean Dog because the area where the Battle of Catalunum took place is in what is now France [Anonim 2014]. Today, the Maremma Dog is bred in Italy in the Maremma Valley, north of Rome. Atilla M.S. He organized an expedition to Rome in 452 and stayed for a while in this region where the Maremma Dog lived. The ancestors of the Maremma Dog may have been brought by the soldiers of Atilla. The Etruscans lived in an area north of Rome that included the Maremma Valley. There are some opinions that the Etruscans are of Turkish origin. The Maremma Dog may have been brought to the Maremma Valley by the Etruscans, which may be the second possibility of the Maremma Dog's migration to this region. Some scholars have opinions that the ancestors of the Bulgarians may be Turks, and that the Karakacan nomads in Bulgaria are Slavized Turkic tribes. The Karakacan Dog may also have been brought to this country by the old Bulgarian Turks. The Greek Shepherd Dog is bred in the northern part of Greece. This region is adjacent to the region where the Karakacan Dog is bred in Bulgaria [Atanassov 2006]. It is reported in foreign sources that this dog originated in Turkey and may be related to Akbash [Yılmaz 2018]. Azerbaijan and Georgia are countries on the border with Turkey and on the migration route of Turks. Azerbaijanis are Turks. Caucasian and Georgian Shepherd Dogs may be the dogs brought by Turks during their migration from Central Asia to Europe and Anatolia [Anonim 2014]. The hypothesis of this project is "All white-skinned shepherd dogs are descended from the Central Asian Shepherd Dog, which was taken by the Turks from Central Asia

to other countries." If this hypothesis can be proven as a result of genetic analysis, the results of this research will not only serve animal science, but also anthropology for humanity. Therefore, this is original and has great importance.

## CONCLUSION

White-skinned Akbash Shepherd (Turkey), Caucasian Shepherd (Azerbaijan), Georgian Mountain (Georgia), Central Asian Shepherd (Kazakhstan), Karakacan (Bulgaria), Greek Shepherd (Greece), Kuvasz (Hungary), Chuvach (Slovakia), Tatra (Poland), Maremma (Italy) and Great Pyrenean (France) Dogs should be investigated using the phylogenetic tree method. For analysis, hair, tissue and/or blood samples should be collected from dogs with white fur in Turkey, Azerbaijan, Georgia, Kazakhstan, Bulgaria, Greece, Hungary, Poland, Slovakia, Italy and France. The genes selected for sequence analysis should be the Cytochrome b protein gene in mitochondrial DNA and the SRY genes in the Y chromosome. If the genetic similarity between these dogs is revealed as a result of the research, information about the distribution of these dogs from Central Asia to these regions and the migration routes of these dogs will be revealed. Thus, the evidence about the migrations of the Turks in history will be provided through dog science and will also contribute to the science of anthropology.

## REFERENCES

- Anonim (2022b). Greek Sheep Dog. [www.dogbreedinfo.com](http://www.dogbreedinfo.com) (access 19.08.2022).
- Anonim (2014). Anadolu ile Orta Asya Arasındaki Bağ Gösteren 3 Bin Yıllık Mezar Bulundu. [www.zaman.com.tr](http://www.zaman.com.tr).
- Ardalan, A., Kluetsch, C.F.C., Zhang, A.B., Erdogan, M., Uhlen, M., Houshmand, M., Tepeli, C., Ashtiani, S.R.M., Savolainen, P. (2011). Comprehensive Study Of Mtdna Among Southwest Asian Dogs Contradicts independent Domestication Of Wolf, But İmplies Dog-Wolf Hybridization. *Ecology and Evolution*. 1, 373–385. DOI: [10.1002/ece3.35](https://doi.org/10.1002/ece3.35).
- Atanassov, N. (2006). Livestock Guardian Dog General – Frequently Asked Questions. [www.bulgarianshepherddog.free-servers.com](http://www.bulgarianshepherddog.free-servers.com).
- Caprona, M.D.C. Savolainen, P. (2013). Extensive Phenotypic Diversity among South Chinese Dogs. *International Scholarly Research Notices*, 2013, ID 621836. DOI: [10.5402/2013/621836](https://doi.org/10.5402/2013/621836).
- Clutton-Brock, J., (1996). Köpekler. Sabah Kitapları. Mondadori Basımevi. Verona, İtalya.
- Geyer, J., Klintzsch, S., Meerkamp, K., Wöhlke, A., Distl, O., Moritz, A., Petzinger, E. (2007). Detection of the nt230(del4) MDR1 mutation in White Swiss Shepherd dogs: case reports of doramectin toxicosis, breed predisposition, and microsatellite analysis. *J. et. Pharmacol. Therap.*, 30, 482–485. DOI: [10.1111/j.1365-2885.2007.00885.x](https://doi.org/10.1111/j.1365-2885.2007.00885.x).



- Gundry, R.L., Allard, M.W., Moretti, T.R., Honeycutt, R.L., Wilson, M.R., Monson, K.L., Foran, D.R. (2007). Mitochondrial DNA Analysis Of The Domestic Dog: Control Region Variation Within And Among Breeds. *J Forensic Sci.*, 52(3), 562–572. DOI: [10.1111/j.1556-4029.2007.00425.x](https://doi.org/10.1111/j.1556-4029.2007.00425.x).
- Irion, D.N., Schaffer, A.L., Famula, T.R., Eggleston, M.L., Hughs, S.S., Pedersen, N.C. (2003). Analysis of Genetic Variation In 28 Dog Breed Populations With 100 Microsatellite Markers. *J Hered.* 94, 81–87. DOI: [10.1093/jhered/esp004](https://doi.org/10.1093/jhered/esp004).
- Klütsch, C.F.C., Caprona, M.D.C. (2010). The IGF1 Small Dog Haplotype Is Derived From Middle Eastern Grey Wolves: A Closer Look At Statistics, Sampling, And The Alleged Middle Eastern Origin Of Small Dogs. *BMC Biology*, 8:119. DOI: [10.1186/1741-7007-8-119](https://doi.org/10.1186/1741-7007-8-119).
- Koban, E., Altunok, V., Nizamioğlu, M. and Togan, İ. (2003). Employment of Some Molecular Techniques to Answer Some Questions and Problems Related with Kangal Dog. 1. Uluslar Arası Kangal Köpeği Sempozyumu Bildirisi. Sivas, Turkey.
- Koban, E., Saraç, Ç. G., Açına, S. C., Savolainen, P., Togan, İ. (2009). Genetic Relationship Between Kangal, Akbash And Other Dog Populations. *Discrete Applied Mathematics*, 157, 2335–2340. DOI: [10.1016/j.dam.2008.06.040](https://doi.org/10.1016/j.dam.2008.06.040).
- Li, Q., Liu, Z., Li, Y., Zhao, X., Dong, L., Pan, Z., Sun, Y., Li, N., Xu, Y., Xie, Z. (2008). Origin and phylogenetic analysis of Tibetan Mastiff based on the mitochondrial DNA sequence. *J Genet Genomics.*,35(6), 335–40. DOI: [10.1016/S1673-8527\(08\)60049-1](https://doi.org/10.1016/S1673-8527(08)60049-1).
- Li, Y., Zhao, X., Pan, Z., Xie, Z., Liu, H., Xu, Y., Li, Q. (2011). The origin of the Tibetan Mastiff and species identification of Canis based on mitochondrial cytochrome c oxidase subunit I (COI) gene and COI barcoding. *Animal*, 5, 1868–1873. DOI: [10.1017/S1751731111001042](https://doi.org/10.1017/S1751731111001042).
- Neff, M.W., Broman, K.W., Mellersh, C.S., Ray, K., Acland, G.M. Aguirre, G.D., Ziegler, J.S., Ostrander, E.A. ve Rine, J. (1999). A Second-Generation Genetic Linkage Map of the Domestic Dog, *Canis familiaris*. *Genetics*, 151, 803–820. DOI: [10.1093/genetics/151.2.803](https://doi.org/10.1093/genetics/151.2.803).
- Pang, J-F., Klütsch, C., Zou, X-J., Zhang, A-B., Luo, L-Y., Angleby, H., Ardalán, A., Ekström, C., Sköllermo, A., Lundeberg, J., Matsumura, J.S., Leitner T., Zhang, Y-P., Savolainen, P. (2009). mtDNA Data Indicate a Single Origin for Dogs South of Yangtze River, Less Than 16.300 Years Ago, from Numerous Wolves. *Molecular Biology Evolution* 26(12), 2849–2864. DOI: [10.1093/molbev/msp195](https://doi.org/10.1093/molbev/msp195).
- Parker, H.G., Kim, L.V., Sutter, N.S., Carlson, S., Lorentzen, T.D., Malek, T.B., Johnson, G.S., DeFrance, H.B., Ostrander, E.A., Kruglyak, L. (2004). Genetic Structure of the Purebred Domestic Dog. *Science*, 304 (5674), 1160–1164. DOI: [10.1126/science.1097406](https://doi.org/10.1126/science.1097406).
- Parra, D., Méndez, S., Cañón, J., Dunner, S. (2008). Genetic Differentiation in Pointing Dog Breeds Inferred from Microsatellites and Mitochondrial DNA Sequence. *Anim Genet*, 39(1), 1–7. DOI: [10.1111/j.1365-2052.2007.01658.x](https://doi.org/10.1111/j.1365-2052.2007.01658.x).
- Pertoldi, C., Kristensen, T.N., Loeschcke, V., Berg, P., Praebel, A., Stronen, A.V., Fredholm, M. (2013). Characterization of the genetic profile of five Danish dog breeds. *Journal of Animal Science*, 91(11), 5122–5127. DOI: [10.2527/jas.2013-6617](https://doi.org/10.2527/jas.2013-6617).
- Ryabinina, O.M. (2006a). Mitochondrial DNA variation in Asian Shepherd Dogs. *Genetika*, 42(7), 917–920. DOI: [10.1134/S1022795406070088](https://doi.org/10.1134/S1022795406070088).
- Ryabinina, O.M. (2006b). Genetic Diversity and Phylogenetic Relationships in Groups of Asian Guardian, Siberian Hunting And European Shepherd Dog Breeds. *Comparative and Evolutionary Genomics And Proteomics, Proceedings of the Fifth International Conference on Bioinformatics of Genome Regulation and Structure*. 3: 225-228.
- Savolainen, P., Zhang, Y-P., Luo, J., Lundeberg, J., Leitner, T. (2002). Genetic Evidence for an East Asian Origin of Domestic Dogs. *Science*, 298(5598), 1610–1613. DOI: [10.1126/science.1073906](https://doi.org/10.1126/science.1073906).
- Savolainen, P., Leitner, T., Wilton, A.N., Matisoo-Smith, E., Lundeberg, J. (2004). A detailed picture of the origin of the Australian dingo, obtained from the study of mitochondrial DNA. *Proc Natl Acad Sci USA*, 101(33), 12387–90. DOI: [10.1073/pnas.0401814101](https://doi.org/10.1073/pnas.0401814101).
- Van Asch, B., Pereira, L., Pereira, F., Santa-Rita, P., Lima, M. ve Amorim, A. (2005). MtDNA Diversity Among Four Portuguese Autochthonous Dog Breeds: A Fine-Scale Characterisation. *Genetics*, 6(37), 1–8. DOI: [10.1186/1471-2156-6-37](https://doi.org/10.1186/1471-2156-6-37).
- Wieczorek, M.K. (1996). Genetic Comparison on White Livestock Guardian Breeds (Unpublished MSc Thesis). University of Warsaw, Department of Animal Science, Warsaw.
- Yılmaz, O. (2012). Some Morphological Traits of the Tarsus Fork-Nose Dog in Turkey. *Bulgarian Journal of Agricultural Science*. 18(1): 111-115.
- Yılmaz, O. (2018). Hunting Dog Breeds of Turkey. *International Journal of Livestock Research*, 8(3), 1–5. DOI: [10.5455/ijlr.20170923124626](https://doi.org/10.5455/ijlr.20170923124626).
- Yılmaz, O., Ertugrul, M. (2012a). Determination of Kars Shepherd Dog Raised in Turkey. *Canadian Journal of Pure and Applied Science*, 6(3), 2127–2130.
- Yılmaz, O., Ertugrul M. (2012b). Determination of the Rize Koyun (Sheep) Dog in Turkey. *Canadian Journal of Applied Sciences*, 2(1), 216–221.
- Yılmaz, O., Ertugrul, M. (2012c). Determination of Akbash Shepherd Dog Raised in Turkey. *J. of Science and Technologies, Animal Studies and Vet. Medicine*, II(5), 51–57.
- Yılmaz, O., Ertugrul, M. (2012d). Determination of Zerdava Dog (Kapi Kopegi) Raised in Northeast of Turkey. *Scientific Papers, Series D. Animal Science*, 55, 258–261.
- Yılmaz, O., Ertugrul, M. (2013). Some Morphological Characteristics of Kangal Dogs Raised in Various Parts of Turkey – I – Body Measurements. *International Journal of Livestock Research*, 3(1), 81–87. DOI: [10.5455/ijlr.20130109095630](https://doi.org/10.5455/ijlr.20130109095630).
- Yılmaz, O., Ertugrul, M. (2015). Turkish Kangal (Karabash) Shepherd Dog Raised in Europe. *Canadian Journal of Pure and Applied Science*, 9(2), 3393–3397.
- Yılmaz, O., Coskun, F., Ertugrul, M. (2015a). Social Aspect of Dog Fighting. *International Journal of Livestock Research*, 5(2), 8–12. DOI: [10.5455/ijlr.20150215083841](https://doi.org/10.5455/ijlr.20150215083841).

- Yilmaz, O., Coskun, F., Ertugrul, M. (2015b). Livestock Damage by Carnivores and Use of Livestock Guardian Dogs for its Prevention in Europe. *Journal of Livestock Science*, 6, 23–35.
- Yilmaz, O., Coskun, F., Ertugrul, M. (2015c). Human Factor in Dog Fighting. *Journal of Veterinary Advances*, 5(4), 653–656. DOI: [10.5455/jva.20150421012656](https://doi.org/10.5455/jva.20150421012656).
- Zajc, I., Mellersh, C.S., Sampson, J. (1997). Variability of canine microsatellites within and between different dog breeds. *Mamm Genome*, 8, 182–185. DOI: [10.1007/s003359900386](https://doi.org/10.1007/s003359900386).
- Zajc, I., Sampson, J. (1999). Utility of canine microsatellites in revealing the relationships of pure bred dogs. *Journal of Heredity*, 90(1), 104–107. DOI: [10.1093/jhered/90.1.104](https://doi.org/10.1093/jhered/90.1.104).

## MOŻLIWE PODOBIENSTWO GENETYCZNE U PSÓW PASTERSKICH O BIAŁYM UMASZCZENIU, TAKICH JAK TURECKI OW CZAREK AKBASH, POLSKI OW CZAREK PODHALAŃSKI, KUVASZ, CHUVACH I OW CZAREK ŚRODKOWOAZJATYCKI

### STRESZCZENIE

Według badań naukowych pies został udomowiony w Azji i z tego kontynentu rozprzestrzenił się na inne części świata. Z Azji Środkowej pochodzą również Turcy. Uważa się, że ojczyzną tureckiego owczarka akbash jest Azja Środkowa. Turcy mogli zabrać psy pasterskie o białym umaszczeniu także do innych części Europy. Uważa się również, że Węgrzy pochodzą od Turków–Hunów, jednego ze starożytnych plemion tureckich. Kiedy przodkowie Węgrów przybyli do tego regionu, prawdopodobnie sprowadzili ze sobą psy, które obecnie nazywane są psami kuvasz. Węgry, Słowacja i południowa Polska znajdują się w tym samym dorzeczu i w krajach tej krainy hodowane są psy zwane odpowiednio kuvasz, chuvach i owczarek podhalański. Kuvasz, chuvach i owczarek podhalański zostały przywiezione przez Turków–Hunów i mogą być psami o tym samym pochodzeniu. W artykule postawiono hipotezę, że wszystkie psy pasterskie o białej sierści pochodzą od owczarka środkowoazjatyckiego, który został zabrany przez Turków z Azji Środkowej do innych krajów. Jeśli hipotezę tę uda się udowodnić w wyniku analizy genetycznej, wyniki tych badań posłużą nie tylko nauce o zwierzętach, ale także antropologii ludzkości.

**Słowa kluczowe:** *Canis familiaris*, pies stróżujący, pokrewieństwo genetyczne, owczarek akbash, owczarek podhalański, kuvasz