
COMPARABLE KARYOLOGIC ANALYSIS OF THE KARAKACHAN DOG WITHIN *CANIS FAMILIARIS*

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ABSTRACT

The Karakachan Dog is one of Europe's oldest dog breeds. A typical Mollos, created for guarding its owner's flock and property, it does not hesitate to fight wolves and bears or to defend its owner and his family in case of danger. Its ancestors started forming as early as the third millennium BC. The Karakachan Dog is a descendant of the dogs of the Thracians - the oldest inhabitants of the Balkan peninsula, renowned as stock-breeders, whom Herodotus describes as the most numerous people after the Indians. The Proto-Bulgarians also played an essential part in the formation of the Karakachan Dog as they brought their dogs with them at the time of their migration from Pamir and Hindukush. The dog is named after the Karakachans - nomadic shepherds of Thracian origin. Due to their conservative stock-breeding traditions, they managed to preserve some of the oldest breeds of domestic animals in Europe - the Karakachan sheep, the Karakachan horse, and, of course, the Karakachan Dog.

The data collected from 8 dogs (5 male and 3 female), possessing exterior and behavior characteristics typical for the breed was used in the study. The Karakachan Dog data was compared with the results from various authors on the topics of Canidae family cytogenetics, the karyotype of the dog, intersexuality in the dog and numerical and structural chromosome abnormalities in the dog. Among numerical chromosome abnormalities diagnosed in the dog, the most common are sex chromosome aneuploides. There were other forms of numerical chromosome abnormalities found in the Karakachan dog - the polyploidy and specific structural chromosome abnormalities.

Keywords: chromosome aberrations, dog karyotype, karakachan dog, karyology

Introduction

The roots of the close friendship between human beings and domestic dogs can be found in ancient times. The tribes living on the Balkan Peninsula have had a cult of dogs and horses and the Proto-Bulgarians have offered sacrifices to dogs. Injuring and bad treatment of dogs has been considered a serious crime and has been severely punished. Such attitude towards animals has enabled the appearance of different types of shepherd dogs ever since the dawn of the Nomadic stock-breeding. This has exerted influence upon the ancestors of the Karakachan dog of local and foreign origin, allowing the formation of convergent forms. The appearance of some of these forms on Bulgarian lands is in close connection with war campaigns and movement of studs and flocks from different European and Asian regions and the movement of

dogs with the flocks. For the first time the name "Karakachan dog" is officially mentioned in Western Europe by Peters (7) in an article dedicated to this breed and published in German cynological issue. Nowadays comparatively typical representatives of this breed can be found in the alpine regions of Bulgaria. Unfortunately there is a greater variety of types and important characteristics as height of the withers, length and colour of the hair, length and width of the head vary in great limits. Except the anomalies of the exterior, typical feature for most representatives is the lack of their outspoken temperament with which the Karakachan dog excels its closest relatives. Characteristic features of this breed are calmness, moderate aggressiveness, unique braveness and self-respect. During recent years, cytogenetic studies of dog chromosomes have focused on establishing the standard karyotype and physical localization of the marker loci (3). But still there have been no studies of the specific karyological characteristics of the different breeds of

dogs and most authors make their studies within the borders of the species. The small number of cytogenetic reports on the dog has been caused in part by difficulty in recognizing autosomes by the use of banding techniques (8).

Materials and methods

The data collected from 8 dogs (5 male and 3 female), possessing exterior (**Fig. 1**; **Fig. 2**) and behavior characteristics typical for the breed was used in the study. The results from the Topashka-Ancheva et al. (9) study was compared with the results from various authors on the topics of Canidae family cytogenetics, the karyotype of the dog, intersexuality in the dog and numerical and structural chromosome abnormalities in the dog. Karyological similarities were sought for the potential relation of the Karakachan dog with its morphologically and geographically close breeds - Sharplanina (Yllyrian Shepherd Dog) from Serbia/Macedonia, Tornjak (Bosnian and Herzegovinian - Croatian Shepherd Dog), Carpatin (Romanian Carpathian Shepherd Dog) classified in first and second group according to the systematics of the Fédération Cynologique Internationale - FCI (2).



Fig.1. Male Karakachan dog Sirak 2 (Photo by A. Sedefchev)



Fig. 2. Male Karakachan dog Harry (Photo by A. Sedefchev)

Results and Discussion

The dog is the domestic animal possessing largest number of chromosomes and therefore is most challenging for cytogenetic analysis (1). All investigated male and female Karakachan dog individuals have chromosome number $2n=78$. At the basic cytogenetic level, the Karakachan dog karyotype consists of 38 pairs of acrocentric autosomes gradually diminishing in size and does not differ from the karyotype of the dog as the species *Canis Familiaris* (4). Sex chromosome pair is represented by two large metacentric X chromosomes in females. The Y chromosome in males has metacentric morphology and is the shortest one in the complement. Deviations concerning the chromosome number in the sex chromosome pair (XXY, XO, OY for example) were not observed. In all analyzed male and female animals a normal configuration of the sex determining chromosome pair was observed – XX for females and XY for males (9). Other breeds in contrast to the Karakachan dog have been described to have hermaphrodite-animals with disturbances in the balance of sex chromosomes (6), presented on **Table 1**.

Among numerical chromosome abnormalities diagnosed in the dog, the most common are sex chromosome aneuploides (3). There were other forms of numerical chromosome abnormalities found in the Karakachan dog - the polyploidy and specific structural chromosome abnormalities (9), presented on **Table 2**.

Conclusions

- It was confirmed that the number and morphology of bone marrow cell chromosomes of the Karakachan dog breed does not differ from the domestic dog (*Canis familiaris*, L. 1758) standard karyotype (9) which was reliably described by Hare

et al. (5).

TABLE 1

The structure of the Sex chromosomes in hermaphrodite dogs.

Breed	Number of dogs	Structure of the sex chromosomes
Poodle	5	XX, XY
Shipperke	1	XX (XX:XY)
Beagle	10	XX:XXY, XX
Dackel	2	XXY, XX:XY
Pug	2	XX:XY, XX
English Cocker Spaniel	6	XX
Mongrel	1	XY
German Shepherd	3	XY, XY:XX
Bull Terrier	1	XY
Yorkshire Terrier	1	XY
Schnauzer	1	XY
Miniature Schnauzer	4	XY, XXY
Pekingese	1	XY
Briard	2	XX

TABLE 2

Chromosome aberrations and polyploidy in 8 specimens of Karakachan dogs. (9)

Name and age	Percentage of Polyploid cells	Percentage of cells with aberrations
		$X \pm \% E\Sigma$
Valia - 3.3 years	6.45%	6.45
Sirak2 -3.9 years	4.76%	7.14
Murtap -11 years	12%	12
Rim - 15 years	1	0
Paijo 2 - 9 years	3.13%	6.25
Fatma - 7 years	9.52%	9.5
Sara - 9 years	5.89%	5.9
Harry - 3.4 years	6.45%	9.67
	6.89 ± 1.12	8.13 ± 0.87

- It was confirmed that in the Karakachan dog karyotype were observed relatively high percentage of cells with structural and numerical chromosome aberrations.

- In contrast to other breeds deviations concerning the chromosome number in the sex chromosome pair, in the

Karakachan dog were not observed.

- Because of the lack of sufficient data for comparison, there cannot be conclusions made at this moment on the presence or lack of karyological similarities between the Karakachan dog and Sharplanina (Yllyrian Shepherd Dog) from Serbia/Macedonia, Tornjak (Bosnian and Herzegovinian - Croatian Shepherd Dog) and Carpatin (Romanian Carpathian Shepherd Dog). Investigations in this field of study could be fairly informative.

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