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## DRD4 Gene Polymorphism in Children of Nomadic and Urban Indigenous Populations in the North of West Siberia

**Key words:** *DRD4, Siberia, ethnic groups, indigenous population, urban population.*

**Annotation:** *The aim of the work was to assess prevalence of the frequencies of the DRD4 gene alleles in nomadic and urban residents of the north of West Siberia. The results of the study show, there are significant differences of DRD4 gene allele frequency among the schoolchildren of the north of West Siberia belonging to different ethnic groups. The children of the nomadic parents who are reindeer herders and the urban residents of the north of West Siberia are significantly distinguished by the frequency of DRD4\*7R allele.*

Dopaminergic system *DRD4* gene are associated with cognitive human activity (10). Repeat region are found in exon 3 of this gene. The number of repetitions can be from 2 to 11. Particular attention is drawn to a *DRD4\*7R* allele with 7 repeats emerged in humans according to some scientists (7, 12) about 40,000 years ago during the migration of modern man from Africa to Eurasia. A study of Brazilian scientists (11) have demonstrated that this allele is very often present in the genotype of Native American nomadic tribes of "hunter-gatherers" and much less often it is observed in the sedentary Native Americans. Perhaps just such features as "novelty seeking" and "perseverance" which are typical for the "gatherers" with *DRD4\*7R* (8) give them advantage in their nomadic lifestyle. The advantage is likely to disappear when a person moves to a settled way of life and undergoes "selection". However, it was found that the *DRD4\*7R* allele is much less common in the Mongoloid populations than it is observed in European and American populations (6). Our previous study have shown significant differences the frequency of *DRD4\*7R* allele between the students who came to study from the northern regions of West Siberia (2).

The aim of the work was to assess prevalence of the frequencies of the *DRD4* alleles in nomadic and urban residents of Yamal-Nenets Autonomous Area (YaNAA) of Tyumen Region belonging to different ethnic groups.

We examined schoolchildren belonging to different indigenous ethnic groups including Nenets, Selkups, and Khanty whose parents either resided in the local settlements or lead a nomadic way of life rearing their reindeer herds in YaNAA of Tyumen Region. The study was performed in the boarding schools of Purovsky district of YaNAA where were both the children of nomadic people (ChNP) and the children whose parents permanently lived (ChPLP) in a settlement. The samples of buccal epithelial cells for the polymerase chain reaction (PCR) were obtained from 178 of the ChNP and 140 of the ChPLP. Informed consents were received from the children's parents or their guardians to carry out this research. The schoolchildren were also

divided into subgroups based on ethnicity (Nenets, Selkups, and Khanty). The samples of DNA were extracted from the buccal epithelial cells by means of reagents and a technique developed by PrepFiler Automated Forensic DNA Extraction Kit (USA). Amplification of the DNA loci studied was performed by PCR using thermocycler "Tertsik" ("OOO DNA technology", Moscow, Russia).

To determine the *DRD4* alleles used the technique described earlier (5). The differences between the frequencies of prevalence of these gene alleles in the groups was assessed by the criterion  $\chi^2$  using the program «Statistica 6.0». Statistically significant difference between the samples was considered in  $p < 0.05$ .

Except for nomadic Khanty, the most of the schoolchildren had *DRD4\*4R* allele (Table 1). Some investigators believe that all alleles of this cluster are derived from the ancestral variant *DRD4\*4R* allele and therefore this allele is found in the most of the human population more frequently than the others (8). Among the nomadic Khanty, there is a significant increase in the frequencies of prevalence of the *DRD4\*2R* ( $p < 0.04$ ), *DRD4\*5R* ( $p < 0.01$ ), and *DRD4\*7R* ( $p < 0.01$ ) alleles, while the frequency of the individuals with the *DRD4\*4R* allele ( $p < 0.01$ ) is significantly reduced.

Table 1

Prevalence of the frequencies of *DRD4* alleles in different ethnic groups of schoolchildren in Yamal-Nenets Autonomous Area

<i>DRD4</i> allele	Frequencies of <i>DRD4</i> alleles in different ethnic groups								
	Selkups % (val.)			Nenets % (val.)			Khanty % (val.)		
	Nomadic n=56	Settled n=50	P	Nomadic n=51	Settled n=43	P	Nomadic n=24	Settled n=47	P
*2R	8.9 (5)	6.0 (3)	0.08	13.7 (7)	6.9 (3)	0.02	16.7 (5)	8.5 (4)	0.04
*3R	3.6 (2)	4.0 (2)	0.56	5.9 (3)	9.3 (4)	0.06	0	6.4 (3)	
*4R	48.2 (27)	64.0 (32)	0.04	52.9 (27)	58.1 (25)	0.23	12.5 (3)	70.2 (33)	0.01
*5R	12.5 (7)	12.0 (6)	0.89	7.8 (4)	9.3 (4)	0.36	41.7 (10)	6.4 (3)	0.01
*6R	5.4 (3)	4.0 (2)	0.62	3.9 (2)	6.9 (3)	0.12	4.2 (1)	4.3 (2)	0.56
*7R	19.6 (11)	6.0 (3)	0.02	13.7 (7)	4.7 (2)	0.03	29.2 (7)	4.3 (2)	0.01
*8R	1.8 (1)	4.0 (2)	0.06	2.0 (1)	4.7 (2)	0.09	0	0	

The *DRD4\*7R* allele are found almost in every 4<sup>th</sup> individual of the nomadic Khanty, in every 5<sup>th</sup> of the nomadic Selkups, and in every 7<sup>th</sup> of the nomadic Nenets.

For comparison, among the urbanized ethnic subgroups, the frequency of prevalence of this allele is significantly lower: 24 % of the settled Khanty, 22 % of the settled Nenets, and 17 % of the settled Selkups. Among the nomadic Nenets, there was a significant increase in the frequency of persons with *DRD4\*2R* allele (13.7% in ChNP and 6.9% in ChPLP;  $p < 0.02$ ).

It is known that the sign of "novelty seeking" in some Mongoloid groups is found in the individuals with *DRD4\*2R* allele, which is prevalent among these populations, but is not in the

ones with *DRD4\*7R* allele (12). Among the nomadic Nenets, 13.7% of the 51 schoolchildren have both *DRD4\*2R* and *DRD4\*7R* alleles.

When psychological testing, the majority of Europeans with a higher index of "novelty seeking" have the allele *DRD4\*7R*, while, by contrast, in the Finnish population, this sign is found in the individuals with *DRD4\*2R* and *DRD4\*5R* alleles (9). Perhaps, this association pertains to the nomadic Khanty who, as it is known, are related to the Finno-Ugric peoples.

Among the ethnic groups of the north of West Siberia, the Khanty are the most urbanized group. As a result of the active migration of a significant number of male population to YaNAA from the European part of Russia and the CIS countries, who are mainly occupied in oil and gas production, there is hybridization between the indigenous and migrant populations. This effect is the most clearly manifested in the Khanty (3). The same may be said of Selkups (4).

Other associations in mate choice occurs in the Nenets. They are not prohibited marriages between close relatives. Therefore, in the Forest Nenets, there are more common individuals who are homozygous for a significant number of loci (1). These features of assortative marriage, there appears to have effect on the prevalence of allele frequencies among ethnically different groups of the schoolchildren. It is presumed that the allele *DRD4\*2R* occurred in the Mongoloid race as a result of recombination between the *DRD4\*4R* and *DRD4\*7R* alleles. Therefore, the *DRD4\*2R* allele plays a role of the *DRD4\*7R* allele in Asian populations (12).

Thus, the results suggest that there are significant differences of *DRD4* gene allele frequency among the schoolchildren of YaNAA belonging to different ethnic groups. The children of the nomadic parents who are reindeer herders and the urban residents of YaNAA are significantly distinguished by the frequency of *DRD4\*7R* allele. The Nenets schoolchildren are also characterized by the higher frequency of *DRD4\*2R* allele.

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