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ASSESSMENT OF Q-HETEROCHROMATIN IN PATIENTS WITH ACUTE MOUNTAIN SICKNESS[1].

A.I.Ibraimov, M.D., Ph.D.* N.N.Brimkulov, M.D., Ph.D.** M.M.Mirrakhimov, M.D., Ph.D..**

* Laboratory of Human Genetics and **Department of Pulmonology
& High-Altitude Climatotherapy,
Kyrgyz Institute of Cardiology,
Bishkek, 720040, Kyrgyzstan.

SUMMARY. To determine genetic markers of the possible development of acute mountain sickness (AMS), we assessed the number and distribution of specific chromosomal regions, namely, Q-Heterochromatin regions (Q-HR) in 34 subjects who developed AMS after the ascent to 3600 m above sea level (Eastern Pamir). Controls were 36 subjects without signs of AMS. Q-HR analysis was performed using propil quinacrine mustard staining of the chromosomal preparations obtained from short-term lymphocyte culture. Unlike the controls, subjects with AMS were found to have certain differences in distribution of quantitative characteristics of chromosomal Q-HR variability; the total number of Q-HR in AMS subjects were 2.15 $\pm$ 0.19 in comparison to 1.06 $\pm$ 0.14 in the control group ($P<0,001$). Thus, these data suggested the role of the hereditary predisposition in the development of acute mountain sickness.

Key words: acute mountain sickness, Q-heterochromatin regions.

RESUMEN. El presente estudio se ha diseñado para determinar marcadores genéticos del posible desarrollo del mal de montaña agudo (MMA), para lo cual se ha evaluado el número y distribución de las regiones cromosomiales específicas, nominalmente, las regiones de heterocromatina-Q (Q-HR) en 34 sujetos que desarrollaron MMA después de ascender a 3600 metros sobre el nivel del mar (Eastern Pamir). Los controles fueron 36 sujetos sin signos de MMA. El análisis de Q-HR se realizó utilizando la tinción de mostaza de propil quinacrina de las preparaciones cromosomales obtenidas de los cultivos de linfocitos. A diferencia de los controles, los sujetos con MMA mostraron ciertas diferencias en la distribución de características cuantitativas de la variabilidad cromosomal Q-HR; el número total de Q-HR en sujetos con MMA fue de 2.15 $\pm$ 0.19 en tanto que en los controles fue de 1.06 $\pm$ 0.14 ($P<0,001$). Estos datos sugieren el rol de la predisposición hereditaria en el desarrollo del mal de montaña agudo.

Palabras claves: Mal de Montaña Agudo, Regiones de Heterocromatina-Q.

INTRODUCTION

Some biological and physiological characteristics of the high-altitude natives are known (Mirrakhimov, 1978). Our previous studies on aborigines in Eurasia and Africa have shown their significant heterogeneity in chromosomal Q polymorphism (Ibraimov and Mirrakhimov, 1982a,b,c; Ibraimov and Mirrakhimov, 1983). It was felt that the main reason for the observed interpopulation cytogenetic differentiation was the influence of climatic environmental factors rather than the racial, national or ethnic features of the population under study.

It was of interest the large decreases in chromosomal Q heterochromatin material in the gene stock of aborigines of high altitude and northern latitudes as compared to residents of moderate latitudes of Eurasia or subequatorial Africa (Ibraimov et al. 1986a,b). The same was found in mountaineers, who are well adapted to high altitude (Ibraimov et al., 1990).

We postulate that number of Q heterochromatin may play an important role in the development of acute mountain sickness (AMS) in subjects that living at sea level ascend to high altitude places.

The aim of the present investigation was

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Address for correspondence: Nurlan N. Brimkulov, M.D., Ph.D
Department of Pulmonology & High-Altitude Climatotherapy,
Kyrgyz Institute of Cardiology,
Togolok Moldo Str. 3,
Bishkek, 720040, Kyrgyzstan.

the assessment of this hypotheses.

MATERIAL AND METHODS

During ascent from Gulcha (1650 m above sea level) to Murgab (Eastern Pamir, 3600 m above sea level) 70 volunteer men aged 18-20 years were studied. In 34 of these subjects signs of AMS were observed (headache, nausea, respiratory distress, exertional dyspnea, insomnia and loss of appetite, etc). In the other 36 subjects no signs or symptoms of AMS were observed.

In all subjects the number and distribution of Q-heterochromatin regions (Q-HR) were assessed. Q-HR analysis was performed using propil quinacrine mustard staining of the chromosomal preparations obtained from short-term cultures of peripheral blood lymphocytes (Ibraimov, 1983) . The calculation and registration of chromosomal Q-HR variants were performed using the criteria and methods described in detail elsewhere (Ibraimov and Mirrakhimov, 1985).

The differences between mean number of Q-HRS observed in subjects with and without AMS were analyzed by using Student's t-test .

RESULTS AND DISCUSSION

Unlike the controls, subjects with AMS were found to have certain differences in distribution of quantitative characteristics of chromosomal Q-HR variability (Table 1); the total number of Q-HR in AMS subjects were higher (2.15 ± 0.19) than in the control group (1.06 ± 0.14; $P<0.001$).

On the whole, the results obtained are in agreement with those of previous studies on chromosomal Q polymorphism in human population. According to the clinical results, the subjects with AMS were believed to be the less adapted to the high altitude climate as compared with the control group and these data suggest that measurement of chromosomal Q-heterochromatin material could be an important marker of selective adaptation of men to high-altitude climate (Ibraimov et al; 1990).

Table 1. Distribution of Q variants in AMS subjects and controls.

Number of Q variants	Subjects with AMS (N = 34)	Controls (N = 36)
0	0.09*(3)	0.31 (11)
1	0.32 (11)	0.33 (12)
2	0.15 (5)	0.36 (13)
3	0.29 (10)	-
4	0.09 (3)	-
5	0.06 (2)	-
Mean number of Q Variants	2.15±0.19**	1.06±0.14

* frequencies.
Between parentheses are the number of subjects
**P<0.01 with respect to controls (Student t test).

Thus, these data suggested the role of the hereditary predisposition in the development of the acute mountain sickness.

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