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INFLUENCE OF ASCARIASIS ON IMMUNE STATE AND ACUTE RESPIRATORY INFECTIONS IN SPORTSMEN

Kerimov F.A[1]., Davis N.A.[2], Syrov V.N.[3], Islamova J.I.[3], Turdyeva N.D., Osipova S.O.[2]
Research Center of Sport [1], Research Institute of epidemiology, microbiology and infectious diseases [2], Institute of Chemistry of Plant Substances of Academy of Sciences of the Republic of Uzbekistan[3],
fikrat_kerimov@mail.ru

The process of the achievement of peak form of condition is frequently complicated by disorders in physiological state, including secondary immunodeficiency of various degrees, depending on intensity and duration of muscle loading. There is not a great deal known about immune system condition in athletes underwent to significant exercise load. Imbalance of indices of humoral and cellular immunity is observed: decrease of the level of normal antibacterial and antitoxic anamnestic antibodies, increase of counts of leucocytes, neutrophils and monocytes and reduction of lymphocytes count in peripheral blood, these changes often go together with acute respiratory infections (ARI) morbidity, complicated work-out session and athletic performance during competition to a great extent. Neutralization of these disorders can be of great importance. Immunological changes are specified by muscle loading and decrease of its intensity is impossible, but thorough examination of athletes for concomitant diseases which could enhance undesirable changes and increase susceptibility to ARI should exert a favorable effect.

Objective of the study: to detect the prevalence of intestinal parasites in junior wrestlers with an evaluation of their influence on serum levels of IFN- γ and IL-4, morbidity with ARI and the possibility of pharmacocorrection of identified changes.

Materials and methods. 210 junior wrestlers from colleges of Olympic reserve at the age of 15-18 years were examined Control group included 200 individuals from the population of Tashkent and Tashkent region at the same age range. Diagnosis of intestinal parasites included triple coproscopy. Stool samples were collected in Turdyev preservative and were taken with 2-3 days interval, formalin-ether technique was used additionally. Blastocystosis was taken into consideration only in the cases of high intensity infection (5-6 and more parasites in a microscope field (oc.x 10, ob.x40), because Blactocystis hominis are found only in 18% of healthy individuals and only as infection of low intensity, mainly 1-2 parasites in a microscope field. Level of serum IFN-γ and IL-4 was detected by ELISA, test kits of LLC Vector Best production, Novosibirsk, Russia. Ascariasis was treated with a single dose of albendazole (400 mg), following by the 10 day course of ecdysten or ecsumid (daily dose 20-25 mg). Ecdysten is a preparation from the class of phyioecdysteroids, containing ecdysteron, isolated from endemic plant of Uzbekistan Ajuga turkestanica. Ecdysten possesses a diverse biological activity: adaptogenic, hepatoprotective, actoprotective, immunomodulating and other properties, it is produced by the Institute of Chemistry of Plant Substances of the Academy of Sciences. The choice of ecdysten was due to practical absence of side effects, ability to stimulate work capacity and quick recovery after exhausting physical exercises as well as reverse manifestations of fatigue. Ecdysten doesn't belong to doping. Ecsumid is a dry extract of the herb Ajuga turkestanica, containing ecdysteron, flavonoids, iridoids, and polyphenols, exerts tonic action, stimulates working capacity, and prevents negative influence of various stress factors. Ecsumid intensifies protein biosynthesis, especially in muscular tissue, stimulates erythropoiesis and immunogenesis. Ecsumid is lacking in hormone-like properties. Ecsumid induces favorable shifts in carbohydrate, lipid and electrolyte metabolism, corrects a disturbed metabolism in organs and tissues, improves mood, psychic and physical conditions, and increases functionality capabilities. Ecsumid is not a doping agent and can be used in sport medicine without restriction from viewpoint of anti-doping control. The mean values were compared using Student t-test. A $p<0.05$ was considered to be statistically significant

Results and discussion. First of all we are interested in intestinal parasitic diseases, because Uzbekistan belongs to regions endemic on these diseases. Table 1 shows results of parasitological examination of wrestlers and group of comparison. The table demonstrates significant differences in prevalence of two parasitic diseases: ascariasis and blastocytosis. Ascaris lumbricoides were diagnosed in athletes 5 times as high as in population. It should be emphasized the absence of significant differences in prevalence of contact parasitic diseases: enterobiasis, giardiasis and hymenolepiasis with more efficient infectivity potential than soil-transmitted helminth A. lumbricoides.

Table 1. Prevalence of intestinal parasites in wrestlers

Cohort	Subjects (n)	Individuals with parasites (n/ %)				
		A. lumbricoides	E. vermincularis	H. nana	G. lamblia	B. hominis [1]
Athletes	210	22/10.4±2.1*	16/7.6±1.8	5/2.3±1.0	36/17.1±2.5	27/12.8±2.3
Population	200	4/2.0±0.9	9/4.5±1.4	3/1.5±0.8	32/16.0±2.9	

* significant difference between athletes and population [1] 5 or more parasites in microscope field

Thus a high level of A. lumbricoides prevalence in wrestlers is likely connected with elevated susceptibility to parasites due to immunological changes. To a certain extent it is consistent with a high intensity of B. hominis infection in 12.8±2.3% of athletes, and according to data of N.A, Davis et al (2010) a high intensity of B. hominis infection is diagnosed in 12.5±2.6% of patients with pulmonary tuberculosis and 37.4 ±3.3% of HIV-infected individuals, i.e. in individuals with expressed immunodeficiency. Table 2 shows relative content of blood lymphocytes subpopulations in cohorts under study. We didn't observe significant changes in athletes free of intestinal parasites, but in athletes with ascariasis relative values of CD3+-, CD4+-, CD8+- and CD20+-lymphocytes were significantly lower than in healthy individuals, and a significant difference was observed between athletes with ascariasis and athletes free of intestinal parasites.

Table 2. Lymphocyte subpopulations in wrestlers with ascariasis and free of parasites (Mean ± SD)

Cohort under study	$CD3^+$, %	$CD4^+$, %	$CD8^+$, %	$CD20^+$, %
Healthy individuals (n=15)	59.1±0.7	38.4±1.6	23.5±0.9	23.3±0.9
Sportsmen without ascariasis (n=15)	56.8±2.4	35.4±2.3	22.1±1.6	24.0±1.4
Sportsmen with ascariasis (n=10)	46.8±1.7* and **	26.7±1.3***	18.1±0.8*	28.2±1.4*

*- significant difference with healthy individuals ** - significant difference with athletes free of parasites

Little is known about the susceptibility to A. lumbricoides and these aspects remain unclear. Although protective immunity in ascariasis and other helminthiases is determined by Th2-response, according to Pearce et al., during the incubation period it depends on IFN- γ [11]. It was established by determination of serum cytokines level in athletes without parasites and with ascariasis, that level of IFN- γ was significantly decreased and levels of IL-4 tends to increase in athletes without parasites. Significant decrease of the IFN-γ level in comparison with healthy individuals as well with athletes without intestinal parasites and increase of IL-4 (in comparison with healthy individuals) were observed in athletes with ascariasis (table 3).

Table 3. Level of serum cytokines in wrestlers without intestinal parasites and with concomitant ascariasis

Cohort under study	IFN-γ (pg/ml)	IL-4 (pg /ml)
Healthy individuals (n=15)	128.5±7.0	2.7±0.9
Athletes free of parasites (n=15)	108.1±5.2*	3.5±1.1
Athletes with ascariasis (n=14)	89.5±7.3* and **	6.2±0.8*

* - significant differences with indices in the group of healthy subjects ** - significant differences with indices in athletes free of parasites

Our data show a 5 fivefold increase of morbidity with ascariasis, and also indicate a possible role of decrease in the IFN-γ level in susceptibility to A. lumbricoides. Detection of ARI frequency in wrestlers with A. lumbricoides and free of parasites is of interest, although the groups were not large, respectively 20 and 60 athletes. Surveillance duration was 4 months (September- December). ARI were diagnosed in 3 patients from every group, respectively in 5.0±2.8% and 15.0±7.9% of athletes. Differences were insignificant, likely due to the paucity of the group of athletes with ascariasis, but taking into consideration, that protective mechanisms in respiratory viral infections are connected with elevation of IFN-γ level, and severity of clinical manifestations correlates with an increase in IL-4 level [10], obtained data indicate to possible role of ascariasis in susceptibility to ARI due to decrease of IFN-γ and increase of IL-4 level. Treatment of ascariasis with albendazole and subsequent courses of ecdysten or ecsumid resulted in elimination of A. lumbricoides and rapid recovery of fitness, improvement of immunological parameters, including increase of IFN-γ level.

Conclusion. Prevalence of ascariasis in athletes in the region, endemic on intestinal parasites, is 5 times as high as in normal population. Ascariasis induces a significant decrease of parameters of cellular immunity and level of serum IFN-γ. There is a clear tendency to an elevation of ARI morbidity in athletes infected with A. lumbricoides. Elimination of parasites as a result of treatment with albendazole and courses of ecdysten and ecsumide lead to recovery of physical fitness with improvement of immunological parameters.