

## **ADAPTOGENS AND ATHLETES (ADAPTOGENS IN SPORTS)**

One of the most important results of the biological properties of adaptogens is the effective application for people exposed to high physical and nervous loading, i.e., for athletes.

It is well known, that muscular activity and nervous loading causes the reaction of stress or stress—reaction that is prevented by usage of adaptogens and, in particular, eleutherococcus.

In order to understand the mechanics of stress-reaction decreasing under the influence of adaptogens, it is necessary to understand the process of activation of the adrenal cortex during stress. General adaptation reaction (GAR) begins with excitation of the peripheral terminal of the nervous system, which through the hypothalamus gland activates a secretory function of the frontal lobe of hypophysis. A synthesis and "release" of adrenocorticotropic hormone (ACTH) follows, which in turn stimulates secretion of corticosteroids (including cortisol) by the adrenal cortex. An increased state of stress is supported not only by former stress factors, but also by the internal bodily conditions, which have changed as a result of stress, such as the surplus of Corticosteroids that has already become a toxic factor.

Adaptogens thus adjust the metabolic Processes in tissue in such a way, that intervention of adaptive hormones becomes less necessary. By the principle of a feedback, the level of activity of the hypophysis — adrenal system is reduced, which results in keeping an optimum level of stability within an organism.

It has been proven that the level of energy expended necessary for an organism to survive when going from a condition of full rest up to intensive muscular loading can vary ten times. We can present to you that, within this wide range of muscular loading, all physiological functions will be provided without inclusion of stress reactions taking place. This is due to the balanced power inputs. Such condition is referred to as physiological adaptation (in sports the equivalent of a training degree) when the body is adapted (is trained) to adequate conditions of environment and to adequate muscular loadings. Depending on the person's degree of training, one person walking fast can be provided with energy, without activation of the adrenal cortex, whereas sitting will cause stress in another.

In conditions of the loading exceeding a level of physiological adaptation, i.e. in conditions of offensive stress, additional protective reactions of general adaptable syndrome (GAS) are executed, which can increase the stability of the body many times over. Increase in stability by initialization of GAR is provided due to mobilization of internal resources and cannot proceed for a long time. Further, the resources of an organism spent during stress, are restored. Thus, there is not simply restoration up to a former level but super—restoration

Sports training schedules are based on this phenomenon. The optimum mode provides that the beginning of the next training coincides with the peak of super—restoration, and only then it is possible to expect fast escalation of sports results, i.e. increase in the level of physiological adaptation. If sports training occurs too often, while the body has not yet compensated for former expenditures, there is a decrease in the level of physiological (the phenomenon of overtraining). With infrequent trainings, the level of physiological adaptation is not increased, and remains the same.

Similar processes occur to all organisms, which exist in nature. Daily small, and average stressful influences cause time prevalence of catabolic processes, replacing at rest by anabolic ones, thus the habitual homeostasis is restored and there is an increase of a level of physiological adaptation takes place. Action of adaptogens besides regulating influence on metabolic processes is connected to creation in an organism a condition equivalent to alternation of the periods of easy stress that results in acceleration of process of adaptation and increase in its physiological level, i.e. training. The synergetic action of adaptogens and the training process results in an accelerated increase of reserve opportunities for the organism. Increasing the level of physiological adaptation provides such stability to an organism against external indignations and loadings at his greater energetic efficiency.

Therefore application of adaptogens in general and in sports in particular, is connected mainly to the fast increase in the level of physiological adaptation (level of training) due to acceleration of the slowest enzymatic reactions in the anabolic (regenerative) processes and thus an increase in energy and plastic maintenance of specific protective systems. Therefore, improvement of functional maintenance activity of tissue with the help of adaptogens results in an increase in the level of physiological adaptation and makes unnecessary the stress—reaction — it is switched off by the principle of feedback.

Nonspecific resistance is energetically provided in two opposite ways: first, due to increase in the level of physiological adaptation (increase in capacity of key enzymes systems, providing glycolysis and aerobic oxidizing reactions); second, due to a glycogenolysis (use of the glycogen being the form of storage of carbohydrates in an organism) and a glyconeogenesis (formation of glucose not from carbohydrate precursors), mobilized by stress. Application of adaptogens for athletes, on the one hand promotes faster increase in the level of training, due to the more effective utilization of energy resources of an organism and to their faster restoration after trainings. On the other hand, adaptogens diminish the force of stressful influence in the case of muscle loadings that exceed a level of physiological adaptation, due to activation of processes of a glyconeogenesis and a glycogenesis (formation of a glycogen).

High efficiency of application of adaptogens during trainings and directly before competition is confirmed in a number of experimental studies.

In studying the influence of extracts of roots and leaves of eleutherococcus on the work capacity of athletes at static and dynamic loadings, it has been shown that wrestlers, weight-lifters and gymnasts receiving eleutherococcus leaves extract one time and receiving a mix of extracts of roots and leaves by gymnasts in the amount of 2 ml caused an increase in work capacity at static loading (keeping of a corner in thrust) on 6—8 %. In dynamic loading of the maximal capacity (30 second workout on a bicycle ergometer) for gymnasts, who took the mixture of extracts of roots and leaves, resulted in an increase in working capacity by 12% (Blokhin 1966)

In the other studies the influence of the extract of eleutherococcus on the functional condition of cardiovascular system and working capacity of skiers (Dalinger 1966) was estimated. It appeared that an extract of an eleutherococcus in a dose of 4 ml 1—1, five hours prior to start not only reduced the timing of 30 km distance passage by 3%, but also reduced the time of restoration of reference values of pulse and arterial blood pressure by twice as much.

In conditions of a multi—day ski campaign (the group was without special preliminary

preparation), all athletes receiving an extract of eleutherococcus, did not show fatigue. Restoration of pulse and arterial pressure occurred twice faster for them in comparison with a control group. All parameters came back to initial parameters by the end of the first day (weight, pulse, arterial pressure). For the control group of skiers, normalization of these parameters in most cases required three days.

Reflection of strong restoration action of the extract eleutherococcus is its influence on muscular tone. After receiving a preparation, the heavy muscular work was carried out easier, and the residual muscular tone has been expressed much more poorly. A day later the muscular tone in the group of skiers receiving eleutherococcus was lowered below initial parameters that reflected more active processes of restoration after the high physical loadings. Under action of an eleutherococcus increase of stability in oxygen insufficiency, and faster restoration of an oxygenation of blood on a dosed out and maximal delay of breath have been marked also. Thus the maximal delay of breath was the longer in duration in skilled group.

Positive influence of a powder of schizandra seeds in the amount of 0.5 g within 20 days resulted in an increase in work capacity of basketball players.

(Levchenko 1971) Reduction in the duration of normalization of the pulse rate was marked during intensive physical loadings.

Very impressive results were obtained during a 36 day training of swimmers with the influence of saponins from aralia mandzhurica (saparal) in a dose of 50 mg day on processes of restoration of functional parameters. (Sokolv, Monogarov et al. 1971) A wide spectrum of parameters were measured with the athletes, including the functioning of the respiratory system, the cellular blood count, and the functioning of the adrenal cortex, etc.

It is revealed, that the saparal causes reduction in the level of tissue hypoxia after physical loading due to an increase in the oxidation reduction processes in tissue, promotes strengthening of protective properties of an organism, raising cytophagous activity of leukocytes. After receiving saparal, a more economical reaction of the body occurs in regard to the cardiovascular system and to other parameters. Smaller decrease in work capacity during the first two—three days after the high physical loadings was also evident.

In more detailed studies of the influence of the extract eleutherococcus on athletes (Badul and Badul 2000), swimmers in an experimental group received 2 ml of the extract eleutherococcus daily for 21 days. The experiment showed that Eleutherococcus improved performance essentially in the 50 and 200 m (by 7.6 % and 3.6% respectively). Thus, even after the termination of the dosage of eleutherococcus the experimental group still had steady tendency to improvement of results for two weeks; whereas, productivity of swimmers in the control group tended to fall down. With swimmers in an experimental rate of restoration of pulse after heats has essentially increased, and its frequency right after a heat was stably lower. For swimmers in a skilled group, the improvement of parameters of a spirometry was noted up to 23 % and carpal dynamometry was noted up to 5.7%.

One of factors (benefits?) of action of adaptogens is their action on the cardiovascular system through modulation of the mechanism of curtailing (slowing or thinning?) blood and the formation of nitrogen oxide. A 20—day course of receiving extracts of eleutherococcus and

leuzea reduced the coagulation potential of blood and activity of factors of curtailing, which grew in conditions of intensive trainings at athletes (Azizov 1997). The extract of a schizandra resulted in an increase in the contents of an nitrogen oxide in the saliva of the athletes and plasma of blood. This is a testament to the ability of adaptogens to promote relaxation of the vascular wall through formation of nitrogen oxide (Panossian, Oganessian et al. 1999)

Thus application of adaptogens by athletes in all cases promotes the accelerated training process or increase in a level of physiological adaptation, and the steady effect of an after—action is marked.

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