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PHYSIOLOGICAL AND BIOCHEMICAL ASPECTS OF HARD TRAINING

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The problem concerning hard training is one of the most important issues of sports theory and practice, high athletic performances, in particular.

The founder of physiology of sports in our country - Dragomir Mateev - left us a slender theory on the functional leading during athletic training. This theory makes it easier for us to consider the physiological, biochemical and scientific foundations of high training stresses. Nowadays, the processes of functional and structural perfection of athletes show an ever increasing improvement. Presumably, from mainly descriptive sciences, at present, physiology and biochemistry have turned into operative, "productive" sciences. After having described the changes taking place in human organism, they become ever more helpful for specialists in the control of processes, in finding and using the most effective training means, leading to a quicker and more lasting accomplishment of the final goals of athletic training, i.e. improved performance.

The descriptive physiology and biochemistry of sports revealed us the basic mechanisms through which the processes of functional and structural perfection of organism take place. The well-known phase of decrease in the functional potential of organism during stress is followed by a phase of restoration and over restoration of this potential. At rest, a steady equilibrium between functional and plastic processes is characteristic. Upon physical exertion the functional metabolism prevails while the plastic metabolism is supressed. In the restoration phase, the plastic

metabolism is supressed. In the restoration phase, the plastic metabolism is intensified by increasing the production of ATP. It has been proved that biochemical changes resulting from physical stress are not harmful. They are the main factors contributing to functional activity organisation in the organism. Hence, reaching definite optimal deviations in the biochemical status of organism is a prerequisite of functional improvement.

On this basis a model of rational training regimen has been created. Here is a brief outline of the general principles of this regimen:

1. The intensity and duration of each workout should be in a position to cause changes in homeostasis and fatigue to the extent that they stimulate an effective restoration and overrestoration. Slighter stresses lead to an insignificant or no effect at all while exeessive ones disturb normal restoration processes, and no phase of overrestoration is attained.

2. Exposure to the following stress should be made after a complete restoration on the organism - in the phase of overrestoration. If this principle is not adhered to overfatigue, exhaustion and overtraining can be observed. The same figure - curve II. The secret of rational training in 1950-1955 seemed to be to define the moment of overrestoration in order to carry out the next training. This is the time when top-pist athletes used to train 3-4 times a week. However, further physiological and biochemical investigations, as well as the experience of leading coaches and athletes all over the world, led to the following conclusions:

a/ Diagram II for the schedule of successive workouts is mainly for novices. In highly trained athletes where an increase of the bulk and intensity of the stress factor is required, such a regimen cannot be practically applied. Much time will be neces-

sary for a complete restoration before the next workout, sometimes 2 - 3 days.

b/ Research studies and worldwide practice prove that to reach the desired degree of functional and structural (energy) exhaustion, and a considerably higher effect of overrestoration as well, is much better if the following training stress is applied before complete restoration has taken place. The repeated consecutive workouts according to the diagram shown in fig. 3 lead to a considerably higher training effect in outstanding athletes if immediately after that the necessary rest and complex restoration procedures are secured. The model scheme of a training stress, shown in fig. 3, gives a principally new physiological substantion of hard training.

Here, I would like to refer to the remarkable study of Dragomir Mateev. Developing the principles of Vvedenski about parabiosis, and transferring them to the physiology of athletic training, Mateev drew attention to the fact that in conditions of a certain degree of fatigue middle, and even weak stimuli elicit the same functional and biochemical response, as strong stimuli do in conditions of complete restoration. The data of Mateev enabled us to understand better the physiological nature and higher efficiency of the cited above scheme of stress exposure in athetic training.

It is neither possible, nor rational to constantly increase the intensity and bulk of training stresses. When the intensity of the training loads augments, the strength of proprioceptive muscle impulses becomes a natural physiological barrier to any further increases in intensity. The intensity and duration of training stresses reached so far, especially using submaximum loads in world ranking athletes, can hardly be perceptibly exceed-