

# Assessment of the effectiveness of biological and pharmacological support for training at the preparatory stage for handball players

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*Based on the analysis of the biological and pharmacological support of athletes, a dietary supplement was chosen to study the effectiveness of the application at the preparatory stage. The presented experimental data indicate that there are positive significant differences between the control and experimental groups of athletes who took dietary supplements of NSP Defense Maintenance. The conducted studies confirm the need for planning the biological and pharmacological support of sports activities in order to increase sports results and prevent and restore athletic health and athletic disabilities.*

**Purpose:** to study the effectiveness of the use of dietary supplements with antioxidant effects and with an immunostimulant effect to optimize the functional state of athletes at the preparatory phase.

**Material & Methods:** the studies were organized on the basis of the laboratory of "Biochemistry and Pharmacology of Sports" of Zaporizhzhya National University with the participation of 28 athletes aged 17 to 23 years. In the process of the experiment, the following methods were used: analysis of scientific and methodological literature, generalization of practical experience, pedagogical observations, methods for assessing functional readiness using computer technologies, methods of mathematical statistics.

**Results:** the use of dietary supplements of the NSP Defense Maintenance company positively affected the growth of overall physical performance in athletes in the preparatory period.

**Conclusion:** it is shown that the biological and pharmacological support of training at the preparatory stage is one of the important factors in increasing the efficiency of the training process.

**Keywords:** biological and pharmacological support, functional preparedness, preparatory period, dietary supplement, antioxidants, immunostimulants.

## Introduction

Very high physical and mental stress, bordering on the capabilities of the human body of highly qualified athletes, also require high technologies of medical and biological support, which allows to increase athletic performance [1; 2; 10].

According to scientists [4; 5; 8; 13], the incorrect organization of the training process, its insufficient individualization, the combination of sports training with intensive work or study in the presence of even compensated defects in a state of health can lead to the appearance of various pathological conditions.

At present, quite a lot of factual material has been accumulated on the etiology, pathogenesis and clinic of disorders that occur under the influence of physical activity of varying intensity. According to modern concepts [4; 6] about the pathogenesis of various disorders that occur in individual organs and tissues of the body under the influence of intense physical activity, the most important pathogenetic link is a violation of energy metabolism.

R. D. Seifulem [9] believes that pharmacological, especially immunopharmacological, correction is one of the main modern directions in the prevention and recovery of health disorders and athletic form of athletes.

Pharmacological preparations that can improve the endurance of training and competitive loads due to a decrease in the formation of toxic metabolites during intense muscle activity include antioxidants – substances of various chemical nature that can inhibit or eliminate non-enzymatic free radical oxidation of organic substances by oxygen [11–13]. In the body, antioxidants protect lipids from oxidation, including membrane cell formation. But the main advantage of antioxidants is the ability to withstand the destruction of lipid cells by free radicals during oxidation. Free radicals occur during stress, which is physical activity. Antioxidants, interacting with them, block free oxidation [5].

There is positive practical experience [12] of the use of individual antioxidants to increase physical performance. So, for athletes specializing in rowing, as well as middle-distance runners, lipoic acid contributes to less inhibition of speed and speed endurance after a great physical load of an aerobic nature, justifies the possibility of its use as a means of increasing physical performance.

The synergistic effect of the use of a combination of phyto-collection of medicinal herbs (root and rhizome of licorice and calamus swamp, rosehips, peppermint leaves and bird highlander) and the drug "Selenium-active"; the drug "Selenium-active", ascorbic acid and sorbitol [5]. The combination gives the greatest antioxidant effect and more stimulates the immune system than the use of these drugs separately.

Modern multivitamin complexes include important additives-electrolytes and trace elements, the concentration of which in the process of intense physical work can be significantly reduced. Therefore, the advantage can be given precisely to vitamin complexes balanced for these important ingredients. As practice shows, complex vitamin preparations are best used in combination with adaptogens of animal and plant origin, nootropics, antioxidants, and plastic energy-stimulating drugs. So, Supradin (12 vitamins and 8 microelements) in combination with Elton or Leveton, which expand the spectrum of its action in the body as an antioxidant, immunomodulator, turned out to be effective in the recovery period. Recommended 1 capsule 2 times a day after meals for three weeks with Elton 2 tablets 3 times a day or leveton. The result – increased adaptation of the body of athletes to physical exertion (speed-strength types, endurance, mental stability) [10].

Despite various positive facts about the effectiveness of the use of pharmacological agents in sports, issues related to the biological and pharmacological support of athletes at various stages of training and various physical activities in aerobic-anaerobic zones of power and restoration of athletic performance are far from fully studied and require research that has both theoretical and practical value for many sports.

**Purpose of the study:** to test the hypothesis that the use permitted antioxidants together with immune stimulants leads to optimization of the functional state and improves the quality of functional preparedness of athletes in speed-strength sports.

## Material and Methods of the research

The study involved 28 volunteer athletes aged 17–23 years of secondary qualification specializing in handball and had a sports rank of 1 category and Candidate in masters of sport. The study was conducted in September – November 2018. All athletes were acquainted with the purpose of the study, medical monitoring of their condition was constantly carried out. No pathological reactions were detected. The obtained numerical results were processed by the method of variation statistics using Student's criterion. The data were taken as reliable when  $P < 0,05$ .

We formed two groups – a control and a research group of 14 volunteer athletes at each age of 17–23 years old, of secondary qualification, specializing in handball and had a sports rank of 1 category and Candidate in masters of sport.

It was logical to assume that the use of antioxidants together with immunostimulants may be one of the ways to correct physical performance and, in particular, in conditions of intense training activity. The Defense Supplement NSP (Defense Maintenance NSP) supplement was selected. NSP Defense Maintenance dietary supplement contains a specially selected spectrum of vitamins - antioxidants (A, C and E), minerals (zinc, selenium) and medicinal plants that restore and strengthen the immune system. The research team at the preparatory stage took the biologically active additive "Protective formula NSP" according to the scheme: the use of dietary supplements – 3 weeks; break 1 week; the use of dietary supplements for 3 weeks. Dose – 1 capsule per day with meals.

To assess the level of functional preparedness and its components in the study, a computer program was used to expressly assess the level of general functional preparedness

of athletes. The examination algorithm within the framework of this program included the performance of the standard submaximal bicycle ergometric test PWC170, as well as measurements of the length (cm) and weight (kg) of the body of athletes. The program automatically calculated the values of general physical performance (rPWC170), aerobic capacity (VO<sub>2</sub>max), values of alactate and lactate power and capacity, threshold of anaerobic metabolism (TANM), heart rate at the threshold level of anaerobic metabolism (HR<sub>TANM</sub>), total metabolic capacity (TMC), reserve capacity (RC), efficiency of the muscular energy supply system (EES), and general level of functional preparedness (LFP) of the body of athletes. All quantitative values that were used in the program were calculated and distributed on functional levels: "low", "below average", "medium", "above average", "high" [7].

## Results of the research

At the first stage of the study, we evaluated the parameters of the functional preparedness of handball players at the beginning of the preparatory period (Table). It was found that the values of almost all indicators of functional fitness corresponded to the average value for athletes of this age and did not have a significant difference between the control and the experimental group ( $p > 0,05$ ).

This conclusion was made on the basis of appropriate scales developed by the authors of the Sports School of high sportsmanship program and taking into account literature data [7].

So, the value rPWC170 and rMOC, reflecting the level of development of the general physical performance and endurance of the body, corresponded to the average values of these parameters for athletes of this age. At the level of the "average" indicator were indicators characterizing the speed endurance of athletes (ALAKp and ALAKc). At the "average" level, the value of the total metabolic capacity of the body of athletes (TMC) was also recorded.

The general level of functional preparedness (LFP) of the subjects in the control group was  $71,33 \pm 1,94$  points and  $73,27 \pm 1,54$  points in the experimental group, which corresponds to the "average" level.

A second examination of a group of handball players was carried out in the middle of the preparatory period (after 4 weeks).

At this stage of the study, the examined handball players of both groups determined the positive dynamics of almost all functional parameters used in the study. It is noteworthy that for most indicators almost the same growth rates were recorded, which indirectly may indicate the harmony of the training sessions of handball players in the process of their preparation for the season. Significant differences between the indicators of the control and experimental groups have not been established.

The final stage of the study was an assessment of the effectiveness of the use of dietary supplements from NSP Defense Maintenance.

The results of the study indicate (Table) that at the end of the preparatory period, athletes noted a further significant im-

Indicators of functional fitness of athletes in the control and experimental groups during the experiment

Indicators	Groups	Beginning of the preparatory period	End of the preparatory period	Increase, %
rPWC170, kgm·min <sup>-1</sup> ·kg <sup>-1</sup>	CG	20,89±0,34	22,72±0,53	8,74
	EG	21,05±0,32	23,97±0,37*#	13,87
VO <sub>2</sub> max, ml·min <sup>-1</sup> ·kg <sup>-1</sup>	CG	62,16±0,98	66,96±1,12	7,72
	EG	62,46±1,58	69,16±1,44*	10,72
Alactate power, W·kg <sup>-1</sup>	CG	6,35±0,26	6,95±0,39	9,41
	EG	6,48±0,21	7,45±0,32*	14,31
Alactate capacity, conventional units	CG	38,33±1,34	41,79±1,34	8,83
	EG	39,13±1,07	44,43±1,29*#	15,4
Lactate power, W·kg <sup>-1</sup>	CG	55,78±0,21	6,07±0,24	8,73
	EG	5,61±0,16	6,35±0,21*	14,15
Lactate capacity, conventional units	CG	30,63±0,95	33,41±1,32	9,07
	EG	31,58±0,72	36,18±1,12*	13,59
TANM, %	CG	62,22±1,65	66,59±1,72	7,03
	EG	61,28±1,53	66,21 ±1,63*	7,67
HR <sub>tanm</sub> , beats·min <sup>-1</sup>	CG	161,12±4,87	173,61±4,51	7,75
	EG	156,36±4,39	172,13±4,32*	10,13
TMC, conventional units	CG	194,39±5,12	210,89±5,99	8,49
	EG	191,89±3,29	213,11±5,39*	10,88
PC, points	CG	74,86±0,44	80,87±2,13	8,03
	EG	73,57±0,37	79,61±1,19*	8,21
EES, points	CG	75,23±0,89	80,33±1,49	6,78
	EG	74,08±0,77	79,69±1,33*	7,57
LFP, points	CG	71,33±1,94	81,73±2,21	14,58
	EG	73,27±1,54	89,43±2,56*#	22,06

**Remark.** \* –  $p < 0,05$  in comparison with the beginning of the preparatory period; # –  $p < 0,05$  in comparison to the control group.

provement in almost all indicators characterizing the general, speed, speed-strength endurance, efficiency of the energy supply system and reserve capacity of the body. This increase in all indicators characterizing the functional preparedness of handball players was also reflected in the scoring of the general level of functional preparedness, which amounted to 81,73±2,21 points in the control group (relative increase – 14,58%) and 89,43±2,56 points in the experimental group (relative increase – 22,06%).

The ALAKp and ALAKc indicators characterizing speed endurance increased from the beginning of the experiment by 9.41% and 8.83% in the control group. In the experimental group, they were significantly higher than in the control, and their growth from the beginning of the experiment was 14.31% and 15.4%, respectively. The largest relative increase in these indicators (speed-power and speed endurance) in both groups indicates that they are one of the main qualities of handball players and therefore a lot of time was devoted to the preparatory period for the development of these qualities.

The smallest relative increase in the results in both groups was recorded in indicators characterizing the efficiency of the energy supply system of muscle activity (EES CG – 6,78%; EG – 7,57%) and the total metabolic capacity of the body of athletes (TMC CG – 8,49%; EG – 10,88%). In our opinion, this is due to the fact that in the preparatory period, athletes perform large volumes of loads, and the body of athletes is not sufficiently adapted to such loads, which does not allow them to work in an economical mode.

At the end of the 8-week experiment, we note significantly higher differences in the experimental group compared to the control group in terms of rPWC170 (indicates the level of general physical performance and endurance of the body), alac-

tate capacity (characterizes speed endurance), LFP (indicator of the general level of functional preparedness).

## Conclusions / Discussion

Thus, it can be assumed that the use of Defense Maintenance NSP according to the recommended dietary supplement plan had a positive effect on the growth of overall physical performance among athletes in the preparatory period.

Our results coincide with the positive effect of using a complex antioxidant complex (selenium – 500 mg/day, lipoic acid – 400 mg/day, vitamin C – 500 mg/day, vitamin E – 400 mg/day) [3]. The authors established a significant increase in special physical performance in middle-distance runners in the preparatory period.

There are a number of groups of pharmacological preparations, a large number of biologically active food additives and products of specialized sports nutrition, which, with a skillful approach, will solve almost all the tasks of biological and pharmacological support. It must be remembered that there can be no pattern, since genetically gifted athletes differ significantly from each other not only in anthropometric parameters, metabolic characteristics, functioning of the nervous and endocrine systems, molecular structure of muscle fibers, but also in pharmacogenetic qualities that determine individual sensitivity to one or another medicine.

**Prospects for further research.** Further research will be aimed at studying the optimization of specialized nutrition for athletes during the organization of a long-term training process for athletes of various training orientations. Research in these areas can provide more precise control of the training process, improve athletic performance and prevent maladaptation processes.

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