

# Study of the adaptive capabilities of the functional state of the basketball players' organism to physical loads during the microcycle of the preparatory training period

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**Purpose:** to determine the adaptive capabilities of the functional state of the organism of young basketball players to physical loads during the training microcycle of the preparatory period.

**Material & Methods:** in the study involved 10 basketball players of 14–15 years of training and training group of children's and youth sports school in Kharkov. The survey was conducted during the microcycle of the preparatory period and 12 months later in the preparatory period at the stage of special training. To assess the adaptive capabilities of the functional state of basketball players, a cyto-biophysical method for determining the bioelectrical properties of the nuclei of buccal epithelial cells.

**Results:** the research of the functional state of the basketball players organism on the index of electronegativity (EN%) of the buccal epithelial cell nuclei after exposure to physical loads of various directions showed that the proposed physical loads during the training process proved to be quite effective for the development of athletes preparedness, as evidenced by the improvement in the adaptive capabilities of the basketball players' organism during the considered period of sports training.

**Conclusions:** electronegativity index (EN%) of the buccal epithelial cell nuclei in basketball players after the action of physical loads at the end of the microcycle does not change reliably, but has only a tendency to decrease, which indicates a favorable course of the athlete's organism adaptation processes to physical loads and the rational construction of the microcycle training program.

**Keywords:** functional state of the basketball players' organism, the bioelectrical properties of the nuclei of buccal epithelium cells, the index of electronegativity.

## Introduction

Development of modern basketball is characterized by a significant increase in the volume and intensity of training loads.

Training of high-qualified basketball players is becoming more and more intensive year by year, and growing training and competitive loads impose high demands on their bodies [3; 8].

The existing situation significantly increases the requirements for objective management of the training process, the quality of training sessions, and, especially, the effectiveness of their impact on the basketball players' body [9; 10]. At the same time, the medical-biological assessment of the effect of physical exertion on the athletes' organism acquires a special urgency, it provides information for the optimal dosage of loads, control over the course of recovery processes and forecasting of sports results [4; 5; 7; 8].

To control the training process, it is necessary to evaluate changes in the functional condition of athletes - those that are the result of a long period of training, and those that develop under the influence of loads of individual exercises, exercises, microcycles. This allows you to plan more fully the training process, based on the correspondence between the real adaptive resources and the capabilities of the athlete at the moment and in the prospective perspective [1; 3; 4; 6; 8].

**Purpose of the study:** to determine the adaptive capabilities of the functional state of the organism of young basketball players to physical loads during the training microcycle of the preparatory period for bioelectric properties of nuclei of buccal epithelium cells.

## Material and Methods of the research

In the study, 10 basketball players of 14–15 years of the training and training group of the children's and youth sports school took part. Kharkov. The survey was conducted during the microcycle of the preparatory period and 12 months in the preparatory period at the stage of special training.

The study used the following research methods:

- theoretical analysis and generalization of scientific and methodological literature;
- generalization and analysis of sports training: conversations and analysis of training plans;
- biomedical research methods;
- methods of mathematical statistics.

To assess the adaptive capabilities of the functional state of

basketball players, a cyto-biophysical method for determining the bioelectrical properties of the nuclei of buccal epithelial cells.

Assessment of the functional state of the organism of young basketball players with the cyto-biophysical method (V. G. Shakhbazov) on the bioelectrical (electrokinetic) properties of the nuclei of buccal epithelium cells reflects the degree of adaptation of the human body to physical stresses [2].

The method does not require expensive equipment, it is relatively simple and affordable. Duration of the analysis of one sample is 5–10 minutes. Therefore, it can be attributed to express methods. The advantages of the method should also include full painlessness and non-traumatism for the examinee. The study is based on an analysis of 100 cells. The bioelectrical properties of the nuclei of buccal epithelial cells were estimated from the index of electronegativity (EN %).

To determine the effect of physical loads during the training microcycle on the functional state of the basketball players' organism, a study was also made of the relationship between the bioelectric properties of the nuclei of buccal epithelial cells of the examined basketball players and the cardiovascular system, in particular, the heart rate. It is known that the heart rate is quite informative in assessing the general state of human health [2].

Indicators of electronegativity of the cell nuclei and heart rate were measured before and after exercise at the end of the training session.

## Results of the research and their discussion

At the first stage of the study, the influence of physical loads on the functional state of the basketball players' organism at the beginning of the microcycle was studied in a training session of a developing character that took place after a day of rest. The exercises included physical workout exercises, which were aimed at the development of speed-strength qualities. For this purpose, various accelerations, relay races, exercises with stuffed balls were used. The main part of the training session was devoted to technical training. In the final part, we used relaxation exercises.

Results of this series of studies, which are presented in the table, show that the initial indicator of electronegativity of the

buccal epithelial cell nuclei of the examined basketball players was within the norm and corresponded to 67.2%, which indicates the restoration of the functional state of the athletes organism after a rest day [2]. The heart rate indicators also corresponded to the norm – 73,6 beats min<sup>-1</sup>

After a low intensity training load, the indicator fell by 20,2%, which may indicate insufficient adaptation of the athletes to the training load after the rest period and low fatigue [2]. HR values were consistent 116 beats min<sup>-1</sup>.

Next series of studies was conducted on the second day of the microcycle in a training session aimed at developing general physical training (Table).

Results of the study indicate that the initial index of electronegativity of the buccal epithelial cell nuclei was higher than in the previous series of studies, but remained within the norm and amounted to 71,3%, which is 4.1% higher than the previous one, which is explained by sufficient body recovery. HR values were consistent 82,9 beats min<sup>-1</sup>.

After physical loads of high intensity and volume, the index of electronegativity of the buccal epithelial cell nucleus decreased by 14,4%. Thus, this training led to less pronounced changes in the electronegativity index of the buccal epithelial cell nuclei, which indicates a less significant following physical stress on the body of basketball players and more pronounced fitness for them. Heart rate indicators for basketball players after physical exertions of the second day of the microcycle – 124 beats min<sup>-1</sup>.

The next series of studies was conducted with the same training and training group of basketball players in 12 months, in the preparatory period, at the stage of special training.

The samples of buccal epithelial cells from basketball players were taken on the third day of the microcycle. The output index of electronegativity (EN, %) of the buccal epithelial cell nuclei (the results are presented in the table) was within the norm – 69,1%. After the load, the electronegativity index of the buccal epithelial cell nuclei was 60%, that is, the EN after the training load decreased by 9,1%, which indicates an increase in the adaptability to physical activity in athletes.

The heart rate for basketball players on the third day of the microcycle was: to the load – 82,1 beats min<sup>-1</sup>, after the load –

**Influence of physical loads of training exercises on the functional state of the basketball players' organism during microcycles of the preparatory period in terms of electronegativity (EN, %) of buccal epithelial cell nuclei**

Days of microcycles	Indicators of electronegativity of properties cell nuclei of buccal epithelium (EN, %)		
	before training	after training	difference
1st day of a microcycle, after a day of rest	67,2	47,0	20,2
2nd day of a microcycle	71,3	56,9	14,4
3rd day of a microcycle	69,1	60,0	9,1
4th day of the microcycle	61,6	57,3	4,3
5th day of the microcycle	60,3	57,9	2,4

157 beats min<sup>-1</sup>.

The results of the studies obtained on the 4th day of the microcycle during the game training showed that the initial index of electronegativity of the buccal epithelial cell nuclei was 61,6%. After training, which was accompanied by an increased emotional state of basketball players, the electronegativity index of the buccal epithelial cell nucleus was 57,3%, that is, the decrease in the electronegativity index of the buccal epithelial cell nucleus was only 4,3%, which indicates a significant increase in athletes' fitness, increase their adaptability to Physical exercise with sufficient recovery after training the previous day of the microcycle. This is indicated by the heart rate, which amounted to the load 76 beats min<sup>-1</sup>, after the load – 128 beats min<sup>-1</sup>.

The next series of studies was conducted in a training session on general and special physical training (the results are presented in the table). Classes were conducted at the end of a weekly microcycle, the output indicator of electronegativity of the buccal epithelial cell nuclei was 60,3%. After training, the electronegativity index of the buccal epithelial cell nuclei decreased in all athletes by an average of 2,4% and amounted to 57,9%.

The HR indicators after performing the exercises during this training session were – 125 beats min<sup>-1</sup>, and before doing the exercises – 74 beats min<sup>-1</sup>.

Thus, the results of studies of the functional state of the organism of basketball players on the indicator of electronegativity of the buccal epithelial cell nucleus after exposure to physical loads of different directions indicate that the proposed physical loads during the training process of this group of surveyed basketball players proved to be quite effective for the development of athletes' preparedness, as evidenced by the improvement of adaptive capabilities basketball players in the course of the considered period of sports training.

Obtained results allowed us to conclude that the physical loads that are used in the microcycle in the studied period of the training process were adequate to the functional capabilities of the basketball players' organism, and by the end of the microcycle the athletes were already sufficiently adapted to them.

## Conclusions

1. Results of the studies made it possible to reveal that at the initial stage of the microcycle training loads led to a significant decrease in the electronegativity index of the buccal epithelial cell nuclei in basketball players, which indicates that their organism is insufficiently adapted to these loads.

2. According to the results of the research it is established that the bioelectric properties of the nuclei of buccal epithelium cells in basketball players vary under the influence of one training session and depend on the functional status of the athletes.

3. Using the estimation of the electronegativity index of the buccal epithelial cell nuclei and the heart rate, it was found that the degree of decrease of these parameters is directly related to the volume and intensity of the loads.

4. The indicator of electronegativity of the buccal epithelial cell nuclei in basketball players after the action of physical loads at the end of the microcycle does not change reliably, but has only a tendency to decrease, which indicates a favorable course of adaptation processes of the athletes organism to physical loads and rational construction of the microcycle training program.

**Prospects for further research** are related to studies of the effect of physical exertion on the functional state of the basketball players' organism in the conditions of competitions.

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