

## EFFECT OF TRAINING ON FEMUR MINERAL DENSITY OF RATS

Nikolay G. Belyaev<sup>1</sup>, Igor V. Rzhepakovsky<sup>1</sup>, Lyudmila D. Timchenko<sup>1</sup>, David A. Areshidze<sup>2</sup>, Alexander N. Simonov<sup>3</sup>, Andrey A. Nagdalian<sup>1</sup>, Igor A. Rodin<sup>4</sup>, Matvey I. Rodin<sup>4</sup>, Sergey N. Povetkin<sup>1</sup> and Marina E. Kopchekchi<sup>5</sup>

<sup>1</sup>Institute of Life Systems, North Caucasus Federal University, Stavropol, Russia.

<sup>2</sup>Researching Laboratory of Experimental Biology and Biotechnology, Moscow State Regional University, Moscow, Russia.

<sup>3</sup>Department of Epizootology and Microbiology, Stavropol State Agrarian University, Stavropol, Russia.

<sup>4</sup>Department of Anatomy, Veterinary Obstetrics and Surgery, Kuban State Agrarian University, Krasnodar, Russia.

<sup>5</sup>Department of Morphology, Animal Pathology and Biology, Saratov State Agrarian University, Saratov, Russia.

e-mail: geniando@yandex.ru

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**ABSTRACT** : Reducing the mineral density of bone tissue of athletes in carrying out training loads, bordering on the functional capabilities of the body at the first stages, is asymptomatic and difficult to diagnose. A comprehensive study of the possible mechanisms underlying the fall in bone mineral density in athletes is of great practical importance. Therefore, the study was conducted using rats with the 12 weeks of training. The training process was composed of five cycles: 1-4 weeks – preparatory cycle; 5-6 – transitional cycle; 7-8 – main cycle; 9 – active rest cycle, 10-12 – heavy loads cycle. On the 8th and 12th weeks of training the mineral density of this bone part was lower by 22% ( $P<0.001$ ) and 26.6% ( $P<0.001$ ), respectively as compared to control group. It is concluded that the decline in bone mineral density is the main reason for its mechanical strength reduction leading to injuries or stress fracture during the stages of prolonged intensive muscle loads.

**Key words** : Muscular load, parathyroid hormone, calcitonin, bone mineral density.

### INTRODUCTION

The desire to achieve high results often urges an athlete to execute a training load by utilizing maximum functional capacity. A rapid increase in muscle exercise is not an uncommon thing during the initial stage in amateur sports. Such training conditions, especially in combination with other stress factors, might lead to the adaptive mechanism failure. The damage often affects the cardiovascular system, the blood system and the musculoskeletal apparatus, in particular, the bone tissue *i.e.*, the organs and the organ systems that suffer from the biggest load while adapting to the specific sport activity.

The most common form of the bone tissue disorder among the athletes is the mineral density reduction, which in its turn leads to the mechanical strength failure, making them more vulnerable to injuries. The athlete's mineral bone density decrease in the early stages, usually being asymptomatic, hence difficult to diagnose. Therefore, a comprehensive study on the possible reduction of the bone tissue mineral density is of great practical importance.

Given that the main mineral component that provides the bone mechanical strength are the calcium salts, a comprehensive metabolism study of this very inorganic component in the body might prove informative.

### MATERIALS AND METHODS

The experimental animals in our study were four month old "Wistar" line rats. All the animals were handled in accordance with the EU Directive 86/609/EEC and the Russian law regulating experiments on animals. The research was conducted during 12 weeks of training. The training process was composed of five cycles: 1-4 weeks – preparatory cycle; 5-6 – transitional cycle; 7-8 – main cycle; 9 – active rest cycle, 10-12 – heavy loads cycle. The experiment involved 120 animals, 10 rats in the experimental and control groups for each training cycle.

To model the muscle exercises, a treadmill was used. The intensity of the performed exercises in the experiment was regulated by varying speed and angle of the treadmill. In the initial training stages, the belt speed was set to 10 m/min with further speed and angle increase in the transition cycle the animals performed running at the speed