

SUMY STATE UNIVERSITY  
MEDICAL INSTITUTE



«**BIOMEDICAL  
PERSPECTIVES**»

**ABSTRACT BOOK**

International Scientific and Practical Conference  
of Students, Postgraduates and Young Scientists

(Sumy, October 16-18, 2019)

Sumy  
Sumy State University  
2019

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE  
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## IMPACT TOUGHNESS AS A CRITERION OF RESISTANCE TO DEFORMATION OF CANCELLOUS BONE UNDER CONDITIONS OF GENERAL DEHYDRATION

*Zhukova K.*

*Research advisor: assistant Gordienko E.*

*Department of morphology, Medical Institute, Sumy State University*

**Introduction.** Bone destruction occurs in cases when the amount of absorbed energy exceeds limits of physiological strength of a given bone site. The amount of energy that bone can absorb without fracture depends on its strength and stiffness. The stiffer bone is, the less energy can be absorbed by it without fracture. The architectonics of cancellous bone is an individual integral response of bone to stress and deformation, which it undergoes at various loads. According to its mechanical properties cancellous bone tissue is heterogeneous, nonlinear and anisotropic. Besides, these properties can significantly change depending on age, sex, structural-functional condition of bone tissue, the existence of local and systemic pathological processes

**Aim.** The aim of this research is to adapt a method of determination of impact toughness as a criterion of resistance to deformation of cancellous bone under condition of general dehydration.

**Materials and methods.** 12 samples of a calcaneal bone of young rats with a perforated defect on the 24th day of reparative regeneration in normal and under condition of severe dehydration were fixed in aluminum frames of a cylindrical shape with epoxy glue. Bone was fixed at the border of the aluminum frame and the regeneration area. In experiment pendulum impact tester weighing 5kg. was used. To measure the area of bone fracture, formed under the action of impact tester, was used a microscope MPB-2. Impact toughness was determined by the formula:  $a_n = A_n / F$ ,  $a_n$  - impact toughness,  $A_n$  - the work required for breaking the specimen,  $F$  - cross-section area of the specimen.

**Results.** The main purpose of determination of impact toughness during bending is assessment of working capacity of material in difficult loading conditions and its tendency to brittle fracture. Fixing the frames with bone allows to determine the amount of destruction. The impact toughness values are characterized by the values of the fracture toughness of the cancellous bone, which varied in range of 4,10-6,25 kgf·m/cm<sup>2</sup> in normal and from 0,76-0,98 kgf·m/cm<sup>2</sup> under severe degree of dehydration.

**Conclusion.** Findings of impact toughness under conditions of general dehydration can be used in further researches during examining other pathological conditions.

E-mail for correspondence: o.gordienko@med.sumdu.edu.ua