

Identification of an intervertebral disc properties by using a free oscillation method in *in vitro* condition

This dissertation thesis introduces the original measuring method and its results aimed at identifying the character of viscoelastic forces in the respective motion components of an intervertebral disc and their mutual interactions. The method is based on the identification of the motion of a freely oscillating object placed in a center comprising the intervertebral disc when using the step mechanical excitation in the specific direction. The research was carried out on ovine and porcine (*ovis domestica*, *sus scrofa*) intervertebral discs. The measurements were performed safely within the physiological range of motions and using as fresh a sample as possible, free of preservatives. Result is a new methodology, a measurement device, a mathematically precise and original description of the non-linearity of stiffness, verification of linearity of the viscous component, and a promising description of interaction properties with the individual degrees of freedom. This method could provide more accurate values for development of intervertebral discs replacements.

**Key words:** intervertebral disc, spinal disc, free oscillations, viscoelasticity, stiffness, intervertebral disc replacements.