

Summary

A least studied factor in the pathophysiology of various diseases is the influence of non-destructive mechanical deformation on the function of the neural cells, namely the formation and propagation of the action potential. After having analyzed existing models, in order to study the coupling of the mechanical and electrical properties of the neural cell, models based on the equations of Fitzhugh and Nagumo and the consideration of the axon both as a set of electrical elements and as a material are suggested. In specific, flexoelectricity and the effect of the deformation of the cellular membrane on the kinetics of potassium channels is studied, namely their activation and inactivation pace, as well as the appearance of time delay. Furthermore, changes in the propagation velocity of the neural impulse due to the deformation of the axon are analyzed. The suggested models are supported by experimental results, although the study of such phenomena is particularly arduous. The electromechanical consideration of the propagation of the neural impulse is a field with very important clinical implications and wide perspectives for further research.