

## 2. ABSTRACT

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Title of Rigorous Thesis: Rheological properties of gels

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Rigorous work deals with the evaluation of viscoelastic properties of gels for the formulation of brain phantoms. The theoretical part of the work characterizes brain models for training ultrasound-guided operations. Materials suitable for phantoms are presented. Furthermore, the principle of evaluation of oscillation tests performed in the experimental part is described. Agar and gelatin gels with added glutaraldehyde and glycerol were evaluated. The following parameters were used to characterize and compare the formulated gels: complex modulus  $G^*$  (Pa), phase angle  $\delta$  ( $^\circ$ ), stress  $\sigma'$  (Pa). The gel structure was proven for all gels tested. For gelatin gels, the gel point is indicated at a stress approximately 100 times higher than for agar gels. It can be stated that the structure of gelatin gels is significantly stronger than the structure of agar gels. A stress 10 times lower than that of gelatin gels is sufficient to destroy the structure of the agar gels and induce flow. The thermal stability of the structure of agar and gelatin gels in the temperature range 20  $^\circ$  C to 40  $^\circ$  C at a constant frequency of 1 Hz was tested. Agar gels showed higher temperature stability than gelatin gels. As the agar concentration increased from 0.5% to 0.75%, the stiffness of the gels increased. A decrease in the stiffness of 0.75% agar gels with temperature can be observed. Based on the presented results of oscillation tests and the results of other currently performed experiments, gels of optimal composition and properties for the formulation of the phantom of the brain will be selected.

Keywords: phantoms, gels, agar, gelatin, viscoelasticity, oscillation tests