

APPLICATION OF COMBINED RADIATION TECHNOLOGIES FOR STERILIZATION OF CULTURAL HERITAGE ARTIFACTS

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A set of studies was carried out to establish patterns of changes in the surface characteristics of bone materials as a result of combined sterilizing effects. The results confirmed the possibility of using a combined technique of radiation sterilization of biological tissues for processing tissue samples of fossil biological objects such as mammoths and other ancient animals. Consecutive treatment of bone fragments at the first stage with an ozone-oxygen mixture of low concentration and ionizing radiation with a relatively low absorbed dose at the second stage makes it possible to achieve the required degree of sterility while maintaining the original morpho-mechanical characteristics of the treated objects.

Exposure to ozone at the first stage of the combined sterilization process does not lead to morphological changes in the surface, mechanical properties, or characteristics of bone collagen. The oxygen content increases significantly, which in turn helps to increase the efficiency of radiation exposure at the second stage of sterilization, and, consequently, to further reduce the dose load. Thus, the synergistic effect of exposure occurs due to the effective weakening of the pathogen population and a decrease in their radioresistance under ozone exposure, which enhances the subsequent effect of radiation.

Combined (ozone + radiation) exposure at an absorbed dose of 12 kGy does not lead to significant changes in the collagen content in bone tissue. Noticeable changes in collagen content were recorded at high (20 kGy) values of the absorbed dose during radiation exposure.

The results obtained open up the possibility of using a new promising method for processing biological samples of ancient animals, ensuring the minimum possible changes in their structure, properties and characteristics, and establishing optimal parameters for the sample sterilization process. This technique can be used in the future to work with various samples of fossil biological objects.

Section

Applications of nuclear methods in science, technology, medicine and radioecology

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