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PHYSICAL AND BIOLOGICAL EXAMINATION OF GEL Y2O3 MICROSPHERES FOR RADIOEMBOLIZATION THERAPY

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Introduction
Radioembolization is a specific type of internal radiotherapy used to treat primary or metastatic hepatic tumors. The basis of this therapy is the intra-arterial insertion of microspheres containing beta radioactive yttrium in the vicinity of the tumor tissue. The aim of the work was carried out physical and biological experiments performed to determine radiometric parameters and to define the possible medical usefulness of the newly developed gel 90Y2O3 microspheres.
Materials and Methods: Manufacturing based on the sol-gel method allowed to obtain spherical, yttrium trioxide grains of fully polycrystalline structure with diameters between 20 μm and 100 μm (62.1% of the total batch). NAA analysis confirmed a high concentration of radioactive 90Y in the sample (>99.99%). The developed procedure for determining the specific activity of a single microsphere showed that at the time of administration, the activity can be specified at the level of 2600 –3200 Bq per microsphere. The reduction in colorectal cancer cell proliferation in vitro confirms the significant influence of beta radiation from yttrium-90 trioxide microspheres. Histopathological examination of the distribution of microspheres in the animal model confirmed the proper location of yttrium trioxide microspheres inside blood vessels in a porcine model.
Results: Gel Y2O3 microspheres manufactured using the sol-gel method showed relevant properties, indicating the possible use of microspheres for further biological and preclinical studies.
Conclusions. Physical investigations, cancer cell proliferation, histopathological studies, and their results created a basis for future activities toward to clinical experiments.
Keywords: radioembolization, sol-gel method, spherical yttrium trioxide grains, 90Y microspheres, dosimetry, cell line study, histopathology.
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