^{188}RE-MICROSPHERES OF ALBUMINE – THE POTENTIAL PREPERATION FOR RADIOTHERAPY

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An important direction in radiopharmacy is the search, the development and estimation of particular properties of radiopharmaceuticals for radiotherapy of tumoral and non-tumoral diseases, where the main thing is the choice of optimal carriers and radionuclides.

The microparticles have a much higher degree of selective accumulation in tissues of patients than soluble preparations. And, this process can be programmed by change of physico-chemical properties of microparticles and variation of methods of injection to patient. In developing preparations for radiotherapy the various microparticles can be used. The colloid particles uptake in organs of the reticuloendothelial system. The microaggregates and macroaggregates are unstable, liposomes are quickly exposed to decomposing. It results in the higher irradiating of organs and tissues that do not need to be treated.

For preparation of microspheres, various materials can be used: glass, ceramics, synthetic polymers, inorganic salts, starch, casein, gelatin, albumine. The albumine microspheres have of advantage: physiologicality and biodegradability; technologically and simplicity of method of preparing of microspheres; possibility of preparation of microspheres with given sizes.

Among traditionally used radionuclides in radiotherapy in recent years, significant attention has been given to the radionuclide of 188-Re. The development of preparations on the basis of ^{188}Re is a perspective direction of radiopharmacy. ^{188}Re has the optimal nuclear-physical characteristics in its use for radiotherapy.

The energy of particles (E = 0,728 MeV (25 %), E = 0,716 MeV (79 %) MeV) create a good dose for treatment. The presence of a gamma-component with energy 155 KeV - allows observation of behavior of the radionuclide in an organism by use of a gamma - camera.

The short half-life of ^{188}Re (17 hours) allows to keep the patients in special conditions short time.

^{188}Re is a generating radionuclide Therefore kits to the generator of ^{188}Re, similar to kits to the generator of ^{99m}Tc, can be designed.

Being grounded on what is stated above, we undertake an attempt to develop kits to the generator of ^{188}Re on the basis of albumine microspheres for radiotherapy of both oncological and nononcological diseases.

Microspheres, ^{188}Re with sizes 10-20 micron for treatment of rheumatoid arthritis (damage of large and intermediate joints), intraperitoneal administration and intrapleural administration at metastases covering a cavity.

Microspheres, ^{188}Re with sizes 40-60 micron for treatment of disseminated kidney cancer (intraarterial, selectively), intratumoral administration to damaged nodules less than 2-3 cm.

Microspheres, ^{188}Re with sizes 80-100 micron for large neoplasms and metastases of liver (intraarterial, selectively), intratumoral administration to damaged nodules with sizes over 3 cm.

Preparation of albumine microspheres is carried out by thermal denaturation of protein in vegetable oil. Microspheres are obtained with the necessary range of sizes by ultrasonic fractionation. At our laboratory the method of preparation of albumine microspheres with any sizes of particles (from 5 - 10 up to 800 - 1000 microns) has been developed.

Labelling efficiency is increasing with the increase of the amount of microspheres. The experiments have shown, that the direct introduction of ^{188}Re results in binding ^{188}Re with an efficiency of about 70 %. Though in the low efficiency of labelling of albumin microspheres, stability of a labelled preparation is rather high. The study of kinetics of eliminating ^{188}Re from albumine microspheres at room temperature has shown, that ^{188}Re practically is not eliminated from microspheres and remains (stays) in the linked state at a level of 70 % within 24 hours.

To elevate the percent of binding ^{188}Re with microspheres, we have decided to carry out modification of microspheres by incorporating various complexes or function groups with the surface of microspheres. Such complexes can be DTPA, diphosphonic acids derivative, mercapto- derivative and so on.

We have carried out the study of kinetics of binding ^{188}Re with this complex, which is composed of phosphorus-containing groups.

The binding of ^{188}Re with the complex was studied in dependence from pH, concentrations of the carrier in eluate 188Re, time of carrying out of the reaction and storage of a labelled preparation at room temperature.

Optimal conditions for preparation of a ^{188}Re-complex follow:

- The time of labelling the complex is 40 - 50 minutes.
- Volume of eluate ^{188}Re for labelling complex is 1,5 ml.
- The eluate 188-Re should be with the carrier.