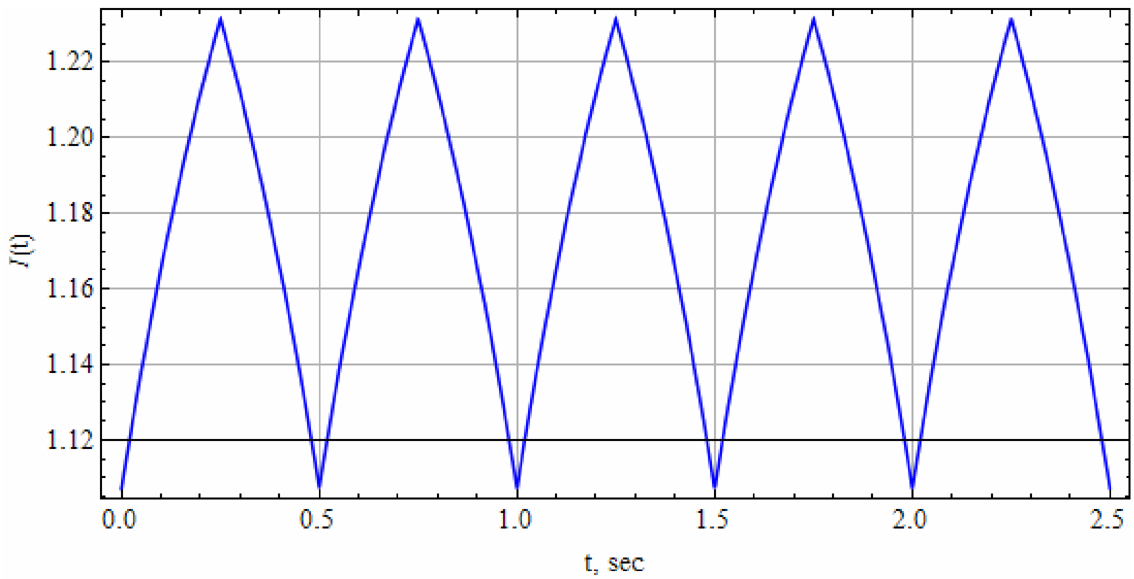

It can be seen, that graph of $i(t)$ is well approximated by "serrated" signal, however differs from last by some convex component.

Developed set up of scanning electron beam of MT-22C accelerator consists of digital to analog converter (DAC), which generates signal corresponding to $i(t)$ function, gain circuit and rotary magnet. The system allows one to scan with energy of electrons 13 MeV to aperture ±15 cm. Heterogeneity of electron flux density in the scan range is no more than 2%.

PROCESS OF THE PREPARATION RADIOPHARMACEUTICAL "NANOCOLLOID 99mTc-Al_2O_3" FOR LYMPHOSCINTIGRAPHY

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Nanocolloid preparations labeled with a short-lived radionuclide technetium-99m (^{99m}Tc) are widely used for diagnostic tests in medicine. The use of radioactive nanocolloids in oncology is based on the possibility of the rapid and effective identification of "sentinel" lymph nodes (SLN), which are the first lymph nodes where the lymph from a malignant tumor flows. The optimal effective method of identifying areas of localization of SLN is scintigraphy or radiometry with using technetium-99m-labeled nanocolloids.

As a rule, nanocolloid preparations are made on the basis of compounds forming stable hydrosols. The decisive factor for the success is not so much their chemical composition as the size of the nanoparticles. It is known that the optimum particle size for lymphoscintigraphy is 20-100 nm. Such particles are derived from tissues at a rate which does not allow them to penetrate into the bloodstream. On the other hand, particles with sizes less than 20 nm can easily pass into the bloodstream, which prevents the imaging of lymph nodes [1].

We have carried out preliminary studies which showed that stable colloidal compounds could be obtained in simpler way - by means of adsorption of the reduced ^{99m}Tc on the alumina gamma [2]. The original premise for the use of alumina as a "carrier" label of ^{99m}Tc is its relatively low toxicity, combined with good adsorption properties, availability and low cost. However, the research on obtaining ^{99m}Tc labeled nanocolloids on the basis of gamma-Al_2O_3 oxide has been conducted by anybody to date. This has determined the purpose of our work.

As the object of these studies the nanopowder with low-temperature (cubic) modification of the gamma-oxide Al_2O_3 was used. The specific surface area was 320 m^2/g. According to electron microscopy, the particles were irregular in shape and had a non-smooth surface. Their average length was in the range of 8-10 nm with the diameter of 2 nm. For the experiments, the original suspension of aluminum oxide was prepared by diluting the sample of gamma-Al_2O_3 oxide nanopowder with the 7-10 nm particles diameter in the water followed by filtration under certain conditions. To prevent the partial loss of oxide in the sediment a further processing of the suspension in an ultrasonic bath was carried out, after which the activation of the surface of the gamma - oxide 0.05 M HCl was brought up to pH = 2. The adsorption process was carried out under static conditions by mixing suspension with eluate followed by injecting additives.

In order to obtain stable ^{99m}Tc compounds with oxide Al_2O_3, it has been previously investigated the effect of oxides acid activation on the value of their adsorption capacity ^{99m}Tc having different degrees of oxidation in static conditions of adsorption. The recovery process has been investigated in the presence of a reducing agent ^{99m}Tc - tin chloride (II) ($SnCl_2$ $2H_2O$). For the first time the adsorption process of the reconstructed ^{99m}Ts on nanoscale powder of gamma-aluminum oxide has been studied, and the method of obtaining nanocolloids ^{99m}Tc (IV)-Al_2O_3 has been developed. The yield of ^{99m}Tc (IV)-Al_2O_3 nanocolloids with a given size depending on the labeling reaction conditions in the presence of ascorbic acid, sodium pyrophosphate, gelatin at different temperatures has been determined.

The studies found that in the absence of chemical additives, the yield of labeled nanocolloids of the size less than 100 nm is 62% for the overall radiochemical purity of the product 85%, while the output of ≤ 50 nm colloid - less than 6%. The introduction of ascorbic acid to the reaction mixture has resulted in an increase in the radiochemical purity of the filtrate of 100 nm up to 96%.

Medico-biological tests of labeled ^{99m}Ts on oxide Al_2O_3 have been carried out on rats in order to study their distribution in the organism of the experimental animals and determine the functional suitability for the scintigraphic imaging of lymph nodes. The level of accumulation of the drug in the lymph node is 1.6% of the total introduced activity, which is enough for its safe imaging (Fig. 1).

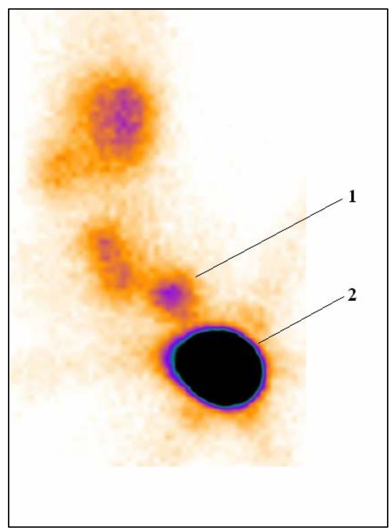

Fig. 1. Scintigram of rats after injection of radiopharmaceutical "Nanocolloid 99mTc-Al_2O_3" (1 - lymph node, and 2 - location of the drug).

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2. V.S. Scuridin, E.S. Stasyuk, A.S. Rogov, V.L. Sadkin et al. Studying of static and dynamic adsorption technetium-99M on aluminum oxide // J.Physics, –2010. – v. 53. – № 10/2 – p. 294–300.