

STUDY OF COMPLEXING ABILITY OF HEDP WITH ^{188}Re

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The development of labelled by different radionuclides (^{186}Re , ^{188}Re , ^{153}Sm) preparations is now one of a nuclear medicine field intensively developing in such directions as radiotherapy of oncologic and non-oncologic diseases.

The data of the literature testify that the complexes on the basis of diphosphonic acids labelled by radionuclides are perspective preparations for treatment of a bone metastasises.

One of the best specimens of this class of compounds is hydroxyethylidenediphosphonic acid (HEDP), generating complexes with different metals.

In the present report give an account results of study of complex generation of ^{188}Re with HEDP depending on acidity and concentration complexing agent in a reaction mixture.

For study complexing ability HEDP the lyophilicly dried panels of reagents kit were obtained, in composition which one included HEDP - complexing agent, SnCl_2 - reducer, ascorbic acid – antioxidant.

It is shown, that introduction in a reaction mixture 0.5 – 1.0 ml of eluate (the concentration HEDP compose 48 and 24 mg/ml, accordingly) binding of ^{188}Re with HEDP occur practically immediately to efficacy 98 - 99 %. The further increase of ^{188}Re eluate volume results in decrease of binding rate of ^{188}Re with HEDP. So, at introduction 1.5 ml of eluate 98 % of ^{188}Re is bound in 10 minutes, 2.0 and 3.0 ml - 97 % ^{188}Re is bound in 40 and 240 minutes, accordingly. Increase of eluate volume up to 5 - 7 ml essentially are decreased reaction rate and the efficacy of binding ^{188}Re with HEDP reaches 80 - 90 % in 300 - 360 minutes.

The rising pH of reactionary medium up to 3.60 reduce reaction rate more. At introduction in a reaction mixture 0.5 – 1.0 ml of eluate (the concentration HEDP is 48 and 24 mg/ml, accordingly) maximal binding (99 % and 97 %, accordingly) ^{188}Re with complexing in 20 and 60 minutes is reached. The subsequent decrease of complexing agent concentration in a reaction mixture (at pH 3.60) results in considerable slowing down of reaction rate binding ^{188}Re . At minimum concentration of complexing agent (3.4 mg/ml) maximal binding (45 %) in 360 minutes is reached.

The study of binding reaction ^{188}Re with HEDP at pH of a reaction mixture 6.70 has shown that the efficacy of a labeling reaches 89 % in 300 minutes at addition of 0.5 ml eluate.

In remaining cases the efficacy of binding of ^{188}Re with HEDP is much lower. At minimum concentration of complexing agent in a reaction mixture (3.4 mg/ml) the binding ^{188}Re with HEDP hardly reaches of 3,8 % in 300 minutes.

In order to confirm influencing of complexing agent concentration on reaction rate and efficacy of binding ^{188}Re with HEDP the examinations of reaction with concentration HEDP in 10 times less (4.6 mg/ml) and with minimum dilution of a reaction mixture in acid medium (pH 2.70) were carried out. Under the same conditions but with concentration of complexing agent equal 48 mg/ml, the reaction passes immediately and with high yield equal of 99 %. At introduction of 0.5 ml eluate ^{188}Re in a reaction mixture with complexing agent concentration of 4.6 mg/ml efficacy of ^{188}Re binding with HEDP in 50 minutes reaches maximal quantity (56 %). With the subsequent decrease of complexing agent concentration in a reaction mixture with 2.3 up to 0.77 mg/ml, that there correspond to introduction of ^{188}Re eluate in volume of 1.0 – 3.0 ml, results in decrease of efficacy of binding of rhenium with HEDP.

Thus, the results of examinations of regularity of binding ^{188}Re with HEDP in dependence on acidity of medium in an interval pH 2.7 – 6.7 have shown, that at pH 2.7 formation of a complex of ^{188}Re -HEDP occur practically immediately to a yield almost 100 % at introduction of ^{188}Re eluate in volume of 0.5 – 1.0 ml, that there correspond of complexing agent concentrations in a reaction mixture of 24 - 48 mg/ml. Further increase of volume of eluate ^{188}Re and, accordingly, the decrease of complexing agent concentration in a reaction mixture result in to decrease of reaction rate of binding of ^{188}Re with HEDP and the efficacy of formation of a complex ^{188}Re -HEDP even if reaches high quantities is significant in more later times after began of reaction. The similar regularity are observed both in case of performance of reaction and with pH of a reaction mixture, equal 3.6, but at that the high effectiveness of binding ^{188}Re with HEDP is reached in more later times. The rising pH of a reaction mixture up to 6.70 considerably decrease reaction rate and essentially decrease a yield of formation of a complex of ^{188}Re -HEDP. Considerable influencing on reaction rate and yield of formation of a complex renders the concentration of complexing agent in a reaction mixture. The decrease of concentration complexing agent results in decrease of reaction rate and yield of formation of a complex ^{188}Re -HEDP.

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