

HF AS A COMPETITOR IN THE SYNTHESIS OF ¹⁷⁷Lu-DOTATATE

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Objective: This study was performed to show the interference of Hf, decay product of ¹⁷⁷Lu, in the synthesis of ¹⁷⁷Lu-DOTATATE.

Methods: The experiments were performed following the decay of ¹⁷⁷Lu: 1.64 T_{1/2}, 2.68 T_{1/2} and 4.03 T_{1/2}. The molar ratio Lu:DOTATATE used in the synthesis of the radiopharmaceutical ¹⁷⁷Lu-DOTATATE was calculated for each decay, in two situations: 1) not considering the influence of Hf as a competitor.; 2) considering the influence of Hf as a competitor. Considering these two situations, the synthesis of ¹⁷⁷Lu-DOTATATE (n=3) was carried out in ammonium acetate buffer 0.5 M, pH 7.0, temperature 95°C, 350 rpm for 30 minutes. The radiochemical purity (%) of the radiopharmaceutical was measured by chromatography technique, was used ITLC-SG in sodium citrate buffer 0.1M, pH 5.0.

Results :

Table 1 - Comparison between calculated molar ratio Lu:DOTATATE and ¹⁷⁷Lu-DOTATATE radiochemical purity (%) in two situations: 1) not considering the influence of Hf; 2) considering the influence of Hf.

| Decay (T _{1/2}) | 1 | | 2 | |
|------------------------------|--|-----------------------------|---------------------------------|-----------------------------|
| | not considering the influence of Hf | | considering the influence of Hf | |
| | molar ratio Lu:DOTATATE | radiochemical purity (%) | molar ratio Lu:DOTATATE | radiochemical purity (%) |
| 1.64 | 1:4.4 | 5.2±1.5 | 1:6.7 | 88±9 |
| 2.68 | 1:8.1 | 38.1±0.9 | 1:13.5 | 98.2±0.7 |
| 4.03 | 1:19 | 14.4±2.2 | 1:34.3 | 69.0±2.1 |

Conclusion: The data in the Table 1 show that increment in DOTATATE used is due to: 1) the relative increase in the amount of Lu isotopes; 2) the increase of Hf formed by Lu decay. It suggests that Hf is an important competitor for DOTATATE binding site. These data are relevant in the synthesis of ¹⁷⁷Lu-DOTATATE with high specific activity.