1 Apparatus

1.1. Analytical balance- 0.0001 g sensitivity

1.2. Beaker (10 mL, 50 mL)

1.3. Vials

1.4. Pipettes

1.5. Fume hood

1.6. Column holder

1.7. Alternatively a vacuum box system incl. vacuum pump or a positive pressure set-up (e.g. synthesizer or peristaltic pump based) might be used

1.8. Empty columns e.g. AC-142-TK (or empty cartridges e.g. AC-100-R01 in case of use of a vacuum or positive pressure system) incl. appropriate frits

Note: Alternatively, commercially available prepacked cartridges may be used (e.g. reference ZR0.3-R10-S contains 100 mg ZR Resin).

Note: A small amount of extractant may bleed from the ZR Resin during Zr elution, this may be addressed using a guard column (e.g. using Prefilter Resin).

Note: In case Zr-89 would preferably be obtained as chloride or citrate TBP Resin may be used as an alternative [3].

2 Reagents

All references to water should be understood to mean deionized water (18 MΩ).

2.1 Hydrochloric acid (HCl), 37%, p.a.

2.2 *2M HCl* - Add ca. 600 mL of water in to a 1000 mL volumetric flask. Add 167 mL concentrated hydrochloric acid. Complete with water.

2.3 Alternative: 6M HCl - Add ca. 400 mL of water in to a 1000 mL volumetric flask. Add 500 mL concentrated hydrochloric acid. Complete with water.

2.4 *0.05M oxalic acid* – Weigh 450 mg of anhydrous oxalic acid or 630 mg oxalic acid dihydrate into a 100 mL volumetric flask. Add ca. 80 mL of water to dissolve the oxalic acid. Complete with water. This solution should be prepared freshly.

Note: oxalic acid solutions of higher concentrations may be used

2.5 ZR Resin[1] – Bulk s grade resin or prepacked 0.3 mL cartridges

3 Procedure

3.1 Column preparation (alternatively prepacked cartridges may be used):

3.1.1 Per column to be packed weigh 100mg of the resin into a suitable vial (e.g. 2 mL Eppendorf cap)

3.1.2 Add 1-3 mL of water (alternatively 2M HCl may be used) and allow resin to soak for at least 30 min, preferably while shaking

3.1.3 Allow column and frits to soak in water for at least 30 min

3.1.4 Place appropriately sized containers below the column.

3.1.5 Empty soaked columns.

3.1.6 Transfer soaked resin into empty column, allow to settle.

3.1.7 Place frit on top of resin. Do not compact the resin (ideally the frit should remain approx. 1 mm above the resin bed).

3.1.8 Break tip and allow liquid to pass the column.

3.2 Zr separation:

3.2.1 Pass 3 mL of 2M HCl through the column to precondition (in case the dissolved target is loaded from 6M HCl precondition with 3 mL 6M HCl).

3.2.2 Load dissolved target (2M or 6M HCl, the dissolution may e.g. be performed as described in [2]) onto the column

NOTE: The method has been tested or up to 300 mg stable Y

3.2.3 Rinse column with four times 2.5mL 2M HCl

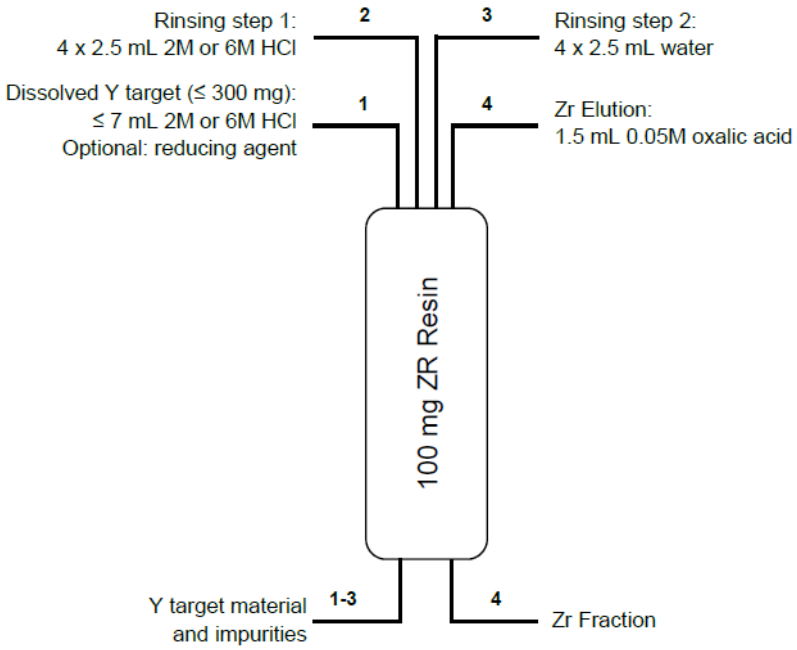
3.2.4 Rinse column with four times 2.5 mL water

3.2.5 Place clean labeled container below column

3.2.6 Elute Zr using 1.5 mL 0.05M oxalic acid

NOTE: Higher concentrations of oxalic acid may be used, this will typically also lead to a slight decrease of the elution volume

3.3 Synopsis of the separation



4 References

(1) Dirks et al.: "On the development and characterisation of an hydroxamate based extraction chromatographic resin". Presented at the 61st RRMC, October 25th - 30th, 2015, Iowa City, IA, USA http://www.triskem-international.com/iso_album/poster_zr_resin_radiopharmacy.pdf

(2) Jason P. Holland, D.Phil, Yiauchung Sheh, Jason S. Lewis, Ph.D: "Standardized methods for the production of high specific-activity zirconium-89", Nucl Med Biol., 36(7), 2009, 729–739; doi:10.1016/j.nucmedbio.2009.05.007

(3) Graves et al.: "Evaluation of a chloride-based 89Zr isolation strategy using a tributyl phosphate (TBP)-functionalized extraction resin". Nucl Med Biol. (2018), 64-65, 1-7; doi: 10.1016/j.nucmedbio.2018.06.003