

**DTPA EXTRACTION FOR RARE-EARTH ELEMENT ANALYSIS**  
**Updated September 2013**

**I. Reference:**

Karimi et al., 1986. Simultaneous extraction of Yb, Dy, and Co from feces with EDTA, DCTA or DTPA. J. Animal. Sci. 63(Suppl. 1):447.

**II. Personal Protective Equipment:**

- A. Lab coat
- B. Safety glasses/goggles
- C. Latex gloves

**III. Reagents**

- A. 0.1 M Diethylenetriaminepentaacetic acid (DTPA) ( $C_{14}H_{23}N_3O_{10}$ )
  - 1. Add 40.0 g DTPA and 3.81 g KCl to ~ 800 ml of deionized water. To dissolve, adjust pH to 6.5 with 6 N NaOH and q.s. to 1 L
- B. 6 N nitric acid ( $HNO_3$ ):
  - 1. Add 375 ml concentrated  $HNO_3$  (16 M) per liter of solution

**III. Procedure**

- A. Wash all glassware with 6 N nitric acid before using  
**NOTE: Wash glassware in designated fume hood using small amounts (small beaker).**
- B. Weigh  $0.2 \pm 0.0040$  g of feces or RE-labeled feed into a 20 ml screw cap tube (16 X 125 mm). Using a calibrated bottle top dispenser or volumetric pipette, add 15 ml of 0.1 M DTPA to each tube and rotate using the "ferris wheel" rotator for 30 to 40 minutes. Please note, the final concentrations are based on this volume, so it needs to be correct
- C. Remove tubes from the wheel and remove caps
- D. Filter supernatant through fast, qualitative filter paper twice, or centrifuge ( $500 \times g$ ) once for 15 min. and then filter once. Pour into vials for analysis by atomic absorption spectrophotometry
- E. Standards and blanks are prepared using the above procedures, but with feces containing no RE
- F. Pour filtered supernatant from vial to glass tube (16 X 125 mm) for analysis. Dilute with 0.1 DTPA to the desired concentration range. Vortex thoroughly

**IV. Standards:**

- A. The AA has different sensitivities for the different RE. Therefore, this directly affects dosage amount of the RE labeled feedstuff. Below are the standards for Yb and Er
- B. Stock Standard- ~ 1000 ug/ml for both Yb and Er
- C. Yb working standards. (Optimal range: 3 to 12 :g/ml).
  - 1. Dilute stock standard to ~ 100 :g/ml (5 ml stock in 50 ml)
  - 2. Working standards: 4, 6, 8, 10 and 12 :g/ml

<u>g Yb/ml</u>	<u>ml substock/100 ml</u>
4	4
6	6
8	8
10	10
12	12

  - 3. Make all standard dilutions with 0.1 M DTPA
- D. Er working standards. (Optimal range: 30 to 120 :g/ml)

1. Working standards: 40, 60, 80, 100 and 120 :g/ml

g Yb/ml ml substock/100 ml

4	4
6	6
8	8
10	10
12	12

2. Make all standard dilutions with 0.1 M DTPA

E. Add 15 ml of each standard to .2 g feces containing no RE to correct for background