

Update: Determination of Radium
Isotopes in Water Samples using MnO₂
and DGA Resins

Terry O'Brien
2007 RRMC
Jackson Hole, WY

Today's Headlines

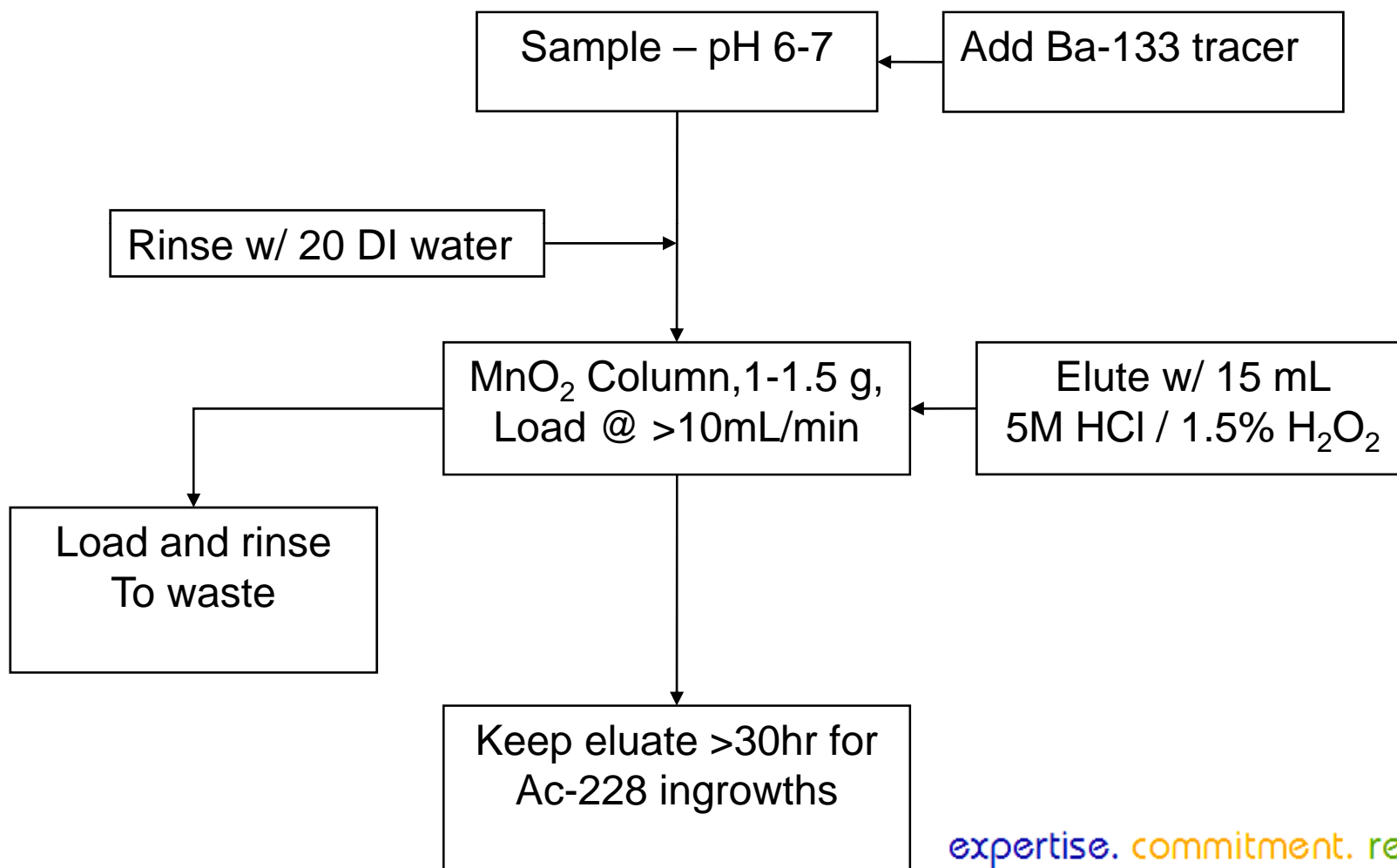
- \$31.5 Million Radium removal project set to begin- Fond Du Lac Reporter Sep 30, 2007
- Lawrenceville, GA to reopen old wells due to drought. Three are known to have Radium- The Atlanta Journal-Constitution October 16, 2007
- Sycamore, IL to add third radium removal system to water supply system. Prior to treatment, radium concentrations averaging 8.25 pCi/L- PRNewswire October 22, 2007

Two Resin Radium Method w/ Yield Monitors

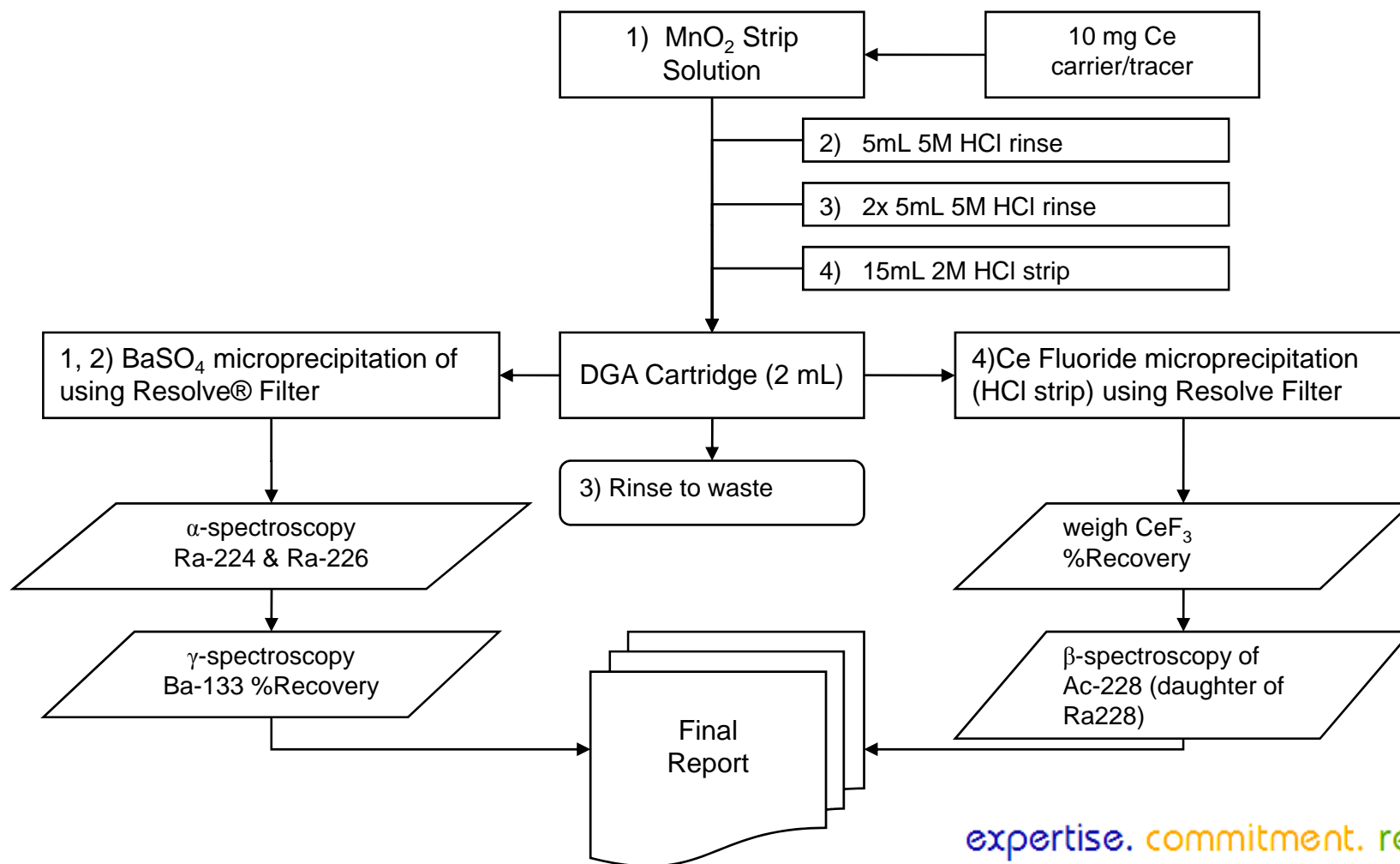
- MnO₂ Resin for pre-concentration
- DGA Resin for separation of Ac / Ra
- Benefits
 - Rapid pre-concentration using vacuum box
 - 10 mL/min flow rates or greater
 - Cerium added as actinium yield monitor
 - Ba-133 added as radium tracer
 - No precipitation required until source prep

Radium Separation Flow Chart

Sample pre-concentration with MnO₂ Resin



Radium / Actinium Separation with DGA resin



Updates to initial method

- Use of vacuum box for pre-concentration step
- Addition of Cerium carrier/tracer for actinium step
- Evaluation of Ce oxalate vs. Ce fluoride precipitation
- Confirmation of 10 mg cerium fluoride micro-precipitation

eichrom

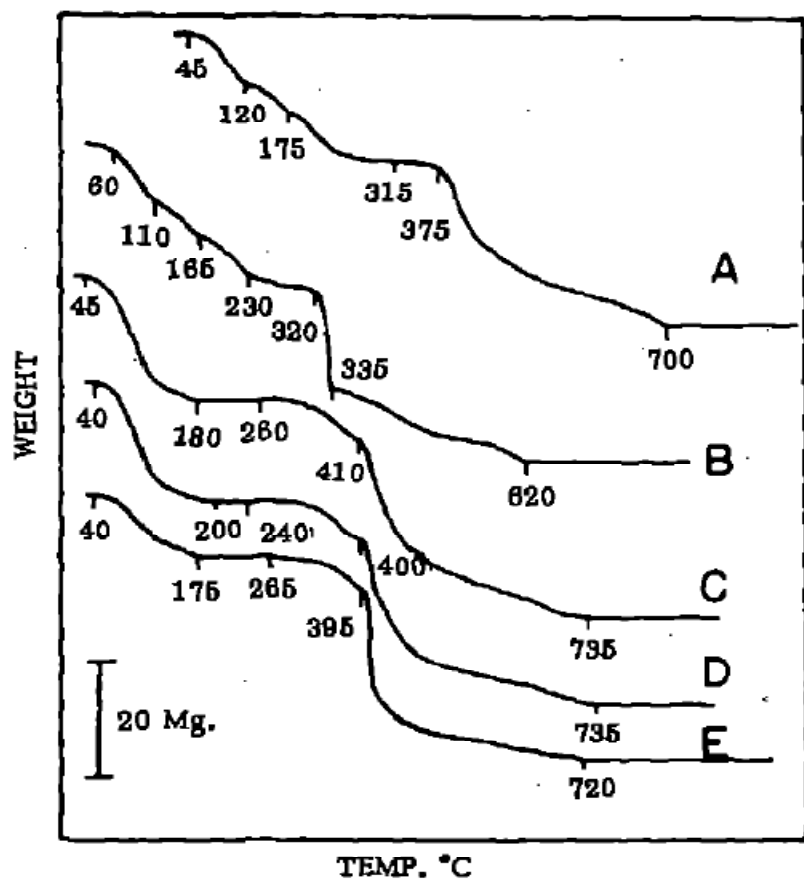
Column Loading-Savannah River Site



expertise. commitment. results.

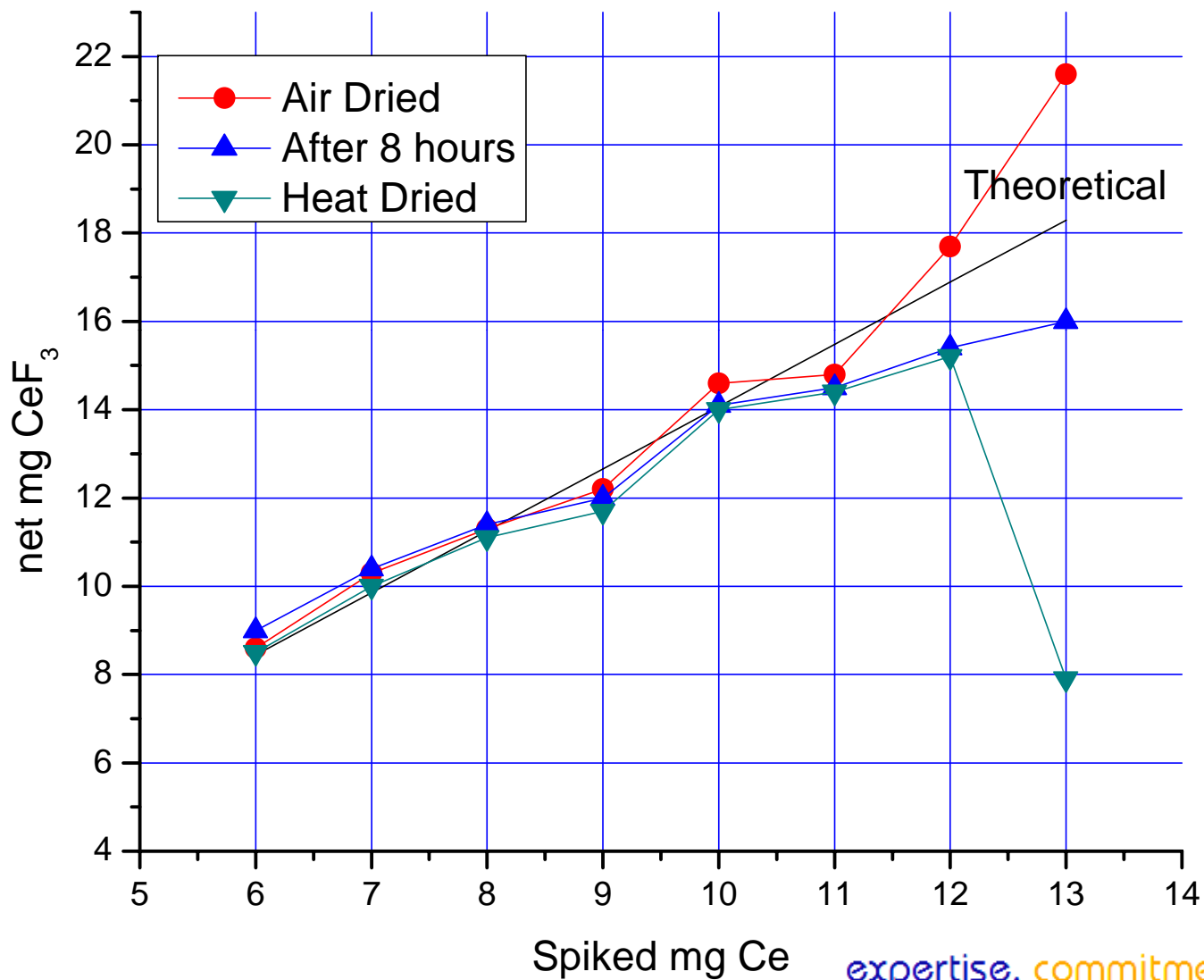
Yttrium and REEs Waters of Hydration

Thermal Gravimetric Analysis



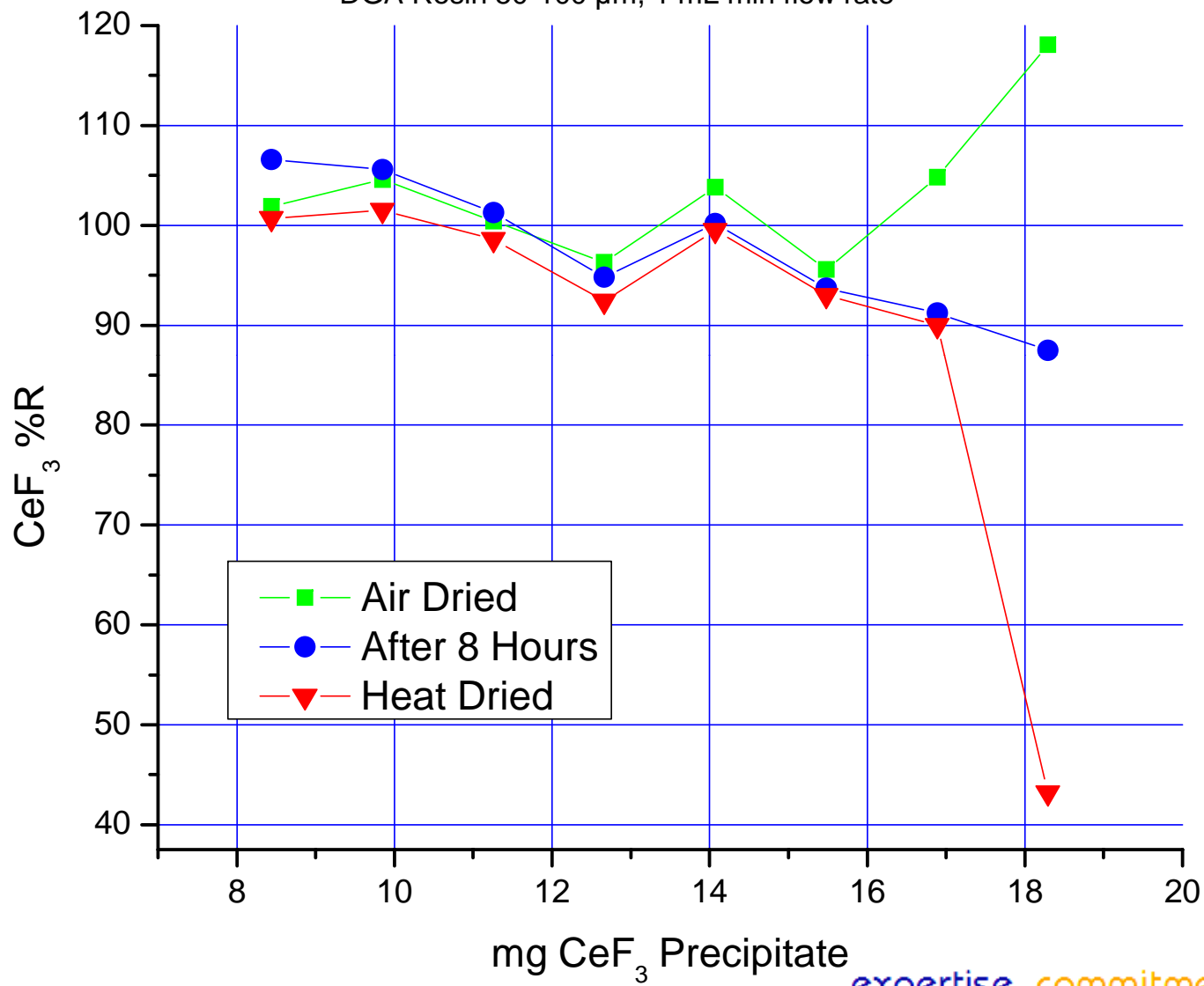
- metal oxalates.
 - A. Gadolinium oxalate 10H₂O
 - B. Europium oxalate 10H₂O
 - C. Yttrium oxalate 9H₂O
 - D. Holmium oxalate 10H₂O
 - E. Erbium oxalate 6H₂O

Ce precipitate after DGA Resin, Normal
50-100 μm resin, 1 mL/min flow rate



Recovery of Ce as CeF₃ Precipitate

DGA Resin 50-100 μm, 1 mL min flow rate



Summary

- Improved 'two resin' radium method is rapid and reliable
- Recovery tracing of both Radium and Actinium procedures
- Reduced time for sample preparation and analysis

Future Work

- Modification to barium micro-precipitation
- Optimizing MnO₂ Resin amount vs. sample size and TDS

eichrom



expertise. commitment. results.

Acknowledgements

- Lawrence E. Jassin
- Anil H. Thakkar
- Dr. E. Philip Horwitz
- Sherrod L. Maxwell
- Dr. William Burnett
- Robert T. Shannon
- Steffen A. Happel

Questions

