

# Flow Rate Variability for 2 mL Eichrom Cartridges

Dominic Silvestri

Eichrom Technologies, LLC

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*Portland, Maine USA*

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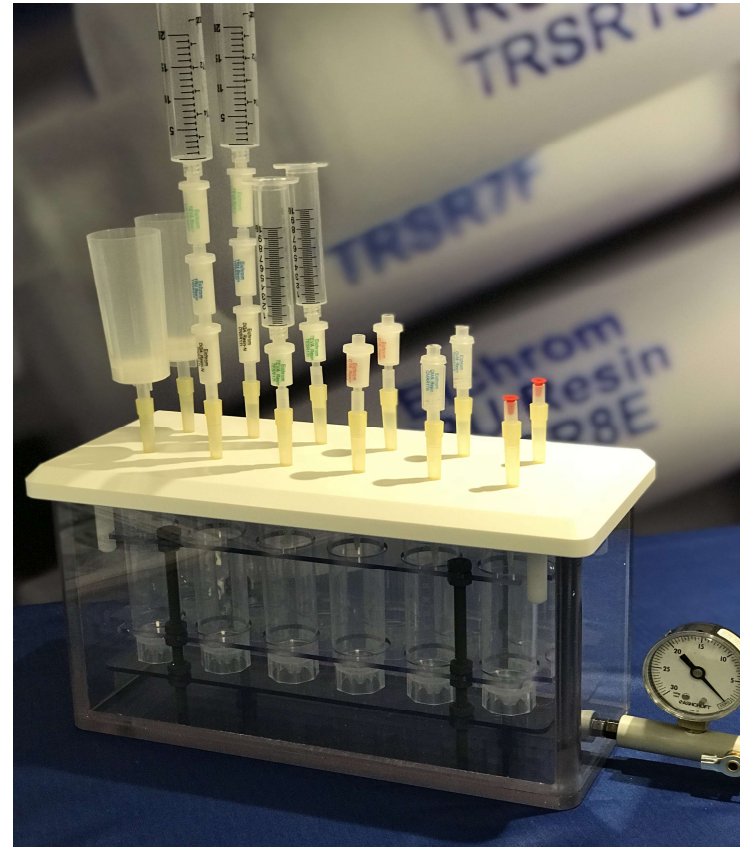
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# Objectives

- Background
- Columns vs Cartridges
- Customer Concerns/Comments
  - Cartridge Variability
  - Sample Variability
- Variables
  - Resin Type
  - Acid Concentration
  - Production Year
  - Inner Tip Type

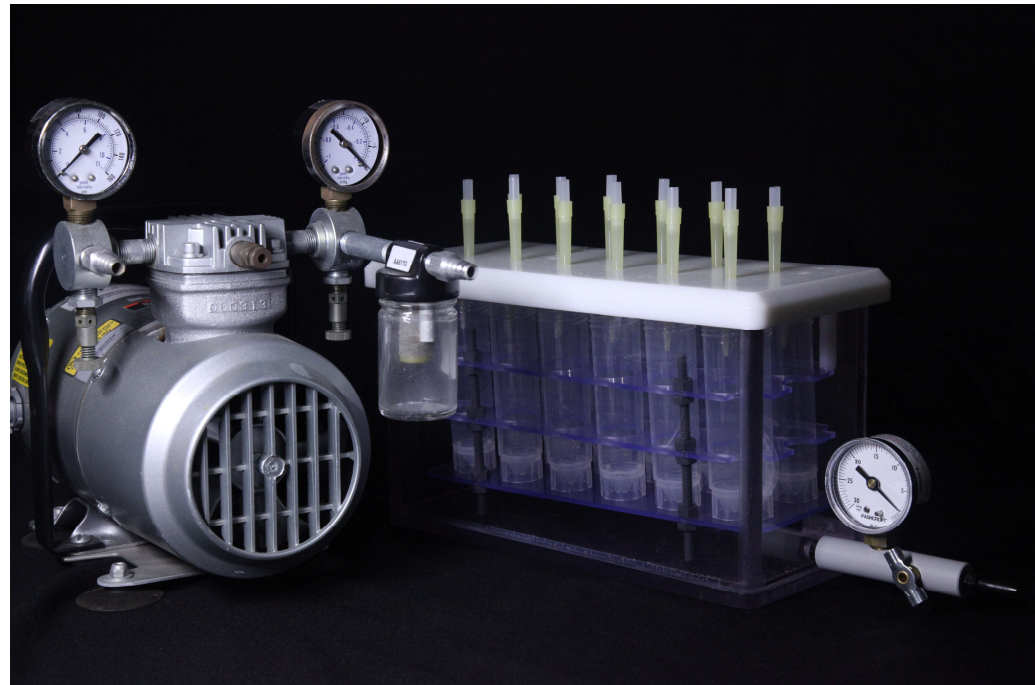


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## Background (Why study flow rate variation?)

- Comment from first customer visits
- Orientation project
- Increased cartridge use over gravity flow columns.

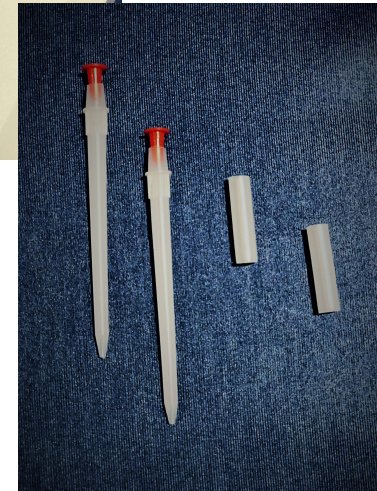
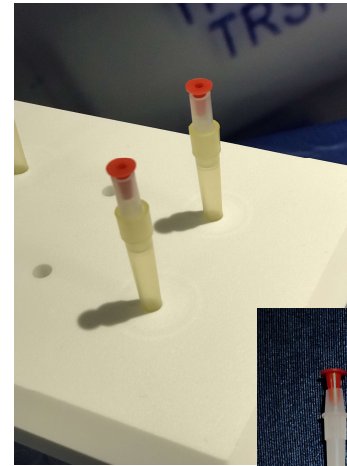


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## Variability

- Old Inner Tips Vs New Inner Tubes
- Lot Year
- Resin Type
- Cartridge position on Vacuum Box
- Acid Type and Concentration



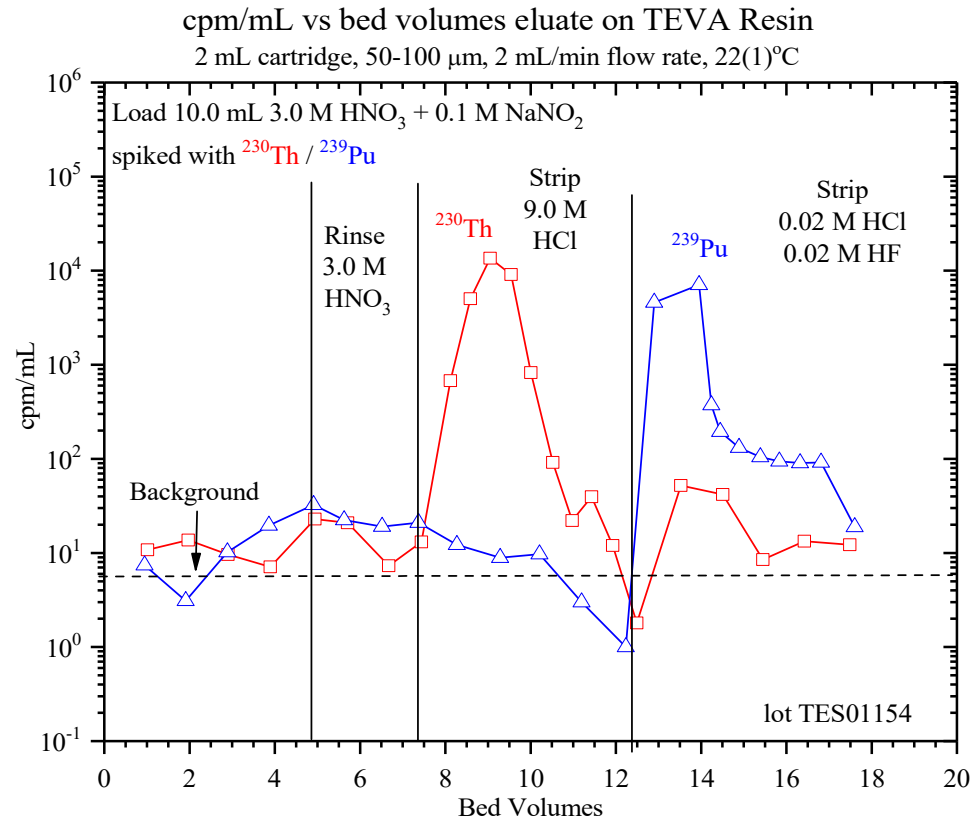
## Types of Cartridges

- UTEVA
- TEVA
- TRU
- Availability of Archive Samples
  - 2006 – 2017



# Types of Acid Rinses

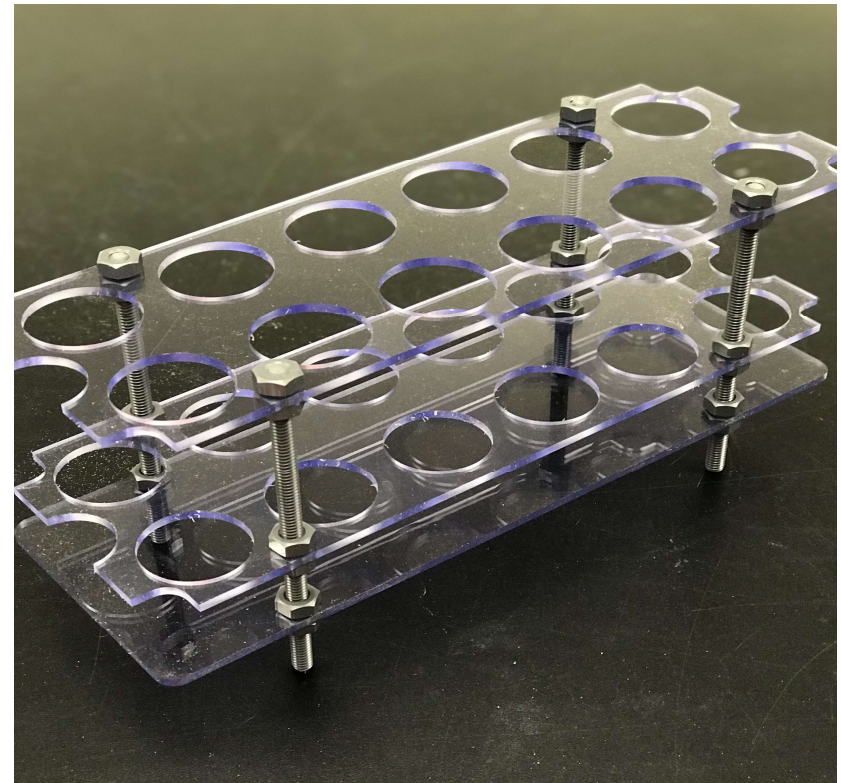
- Mimic Typical Procedure
- 3M Nitric Acid
  - Load/Rinse
- 9M Hydrochloric acid
  - Strip Th
- 0.1M Hydrochloric acid
  - Strip Pu





## Method & Observations

- Constant vacuum (5 inches Hg)
- 20 mL of acid solution
- Flow Rate
- Splatter/splash
- Fit of inner tip/tube to cartridge



## Results

	Minutes for 20 mL @ 5" Hg Vacuum		
Resin	Total Average	New Tips	Old Tips
TEVA	15	17.3	12.7
UTEVA	8.4	8.6	8.1
TRU	7.9	7.5	8.2

	% RSD		
Resin	Total	New Tips	Old Tips
TEVA	41.3	39.3	32.3
UTEVA	42.9	48.8	34.6
TRU	32.9	30.7	35.4

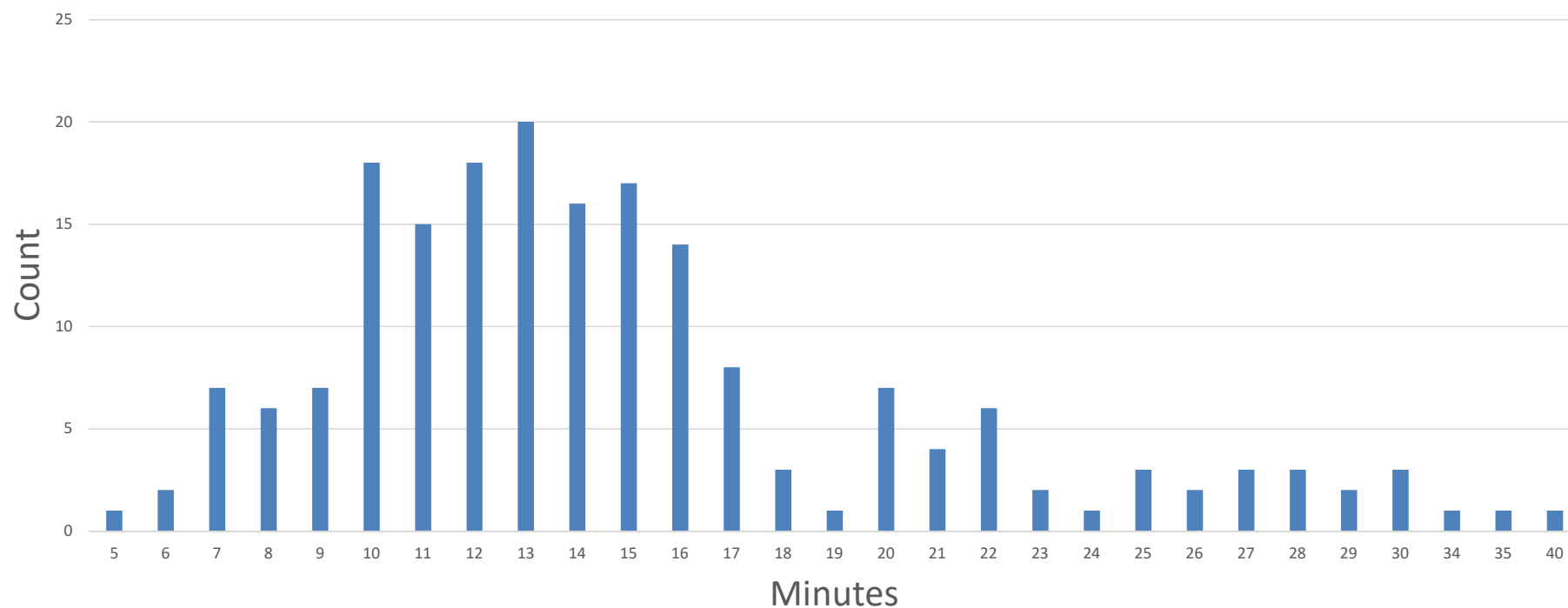


## Comparing Acids

Resin	Average Time 3M HNO3 (Minutes)	
TEVA	Old	New
	9.9	22.4
	Average Time 9M HCl	
	Old	New
	15.0	15.2
	Average Time 0.1M HCl	
	Old	New
	13.3	14.4

## TEVA Chart

### Total Flow Count, TEVA Cartidge (All Acid Solutions)



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## Conclusion

- More data needed (Adjust vacuum to 2 mL/min flow, not constant 5”Hg)
- General Trends
  - TEVA slower than UTEVA/TRU
  - 9M HCl slower than 3M HNO<sub>3</sub>/ 0.1M HCl
  - Little difference between old/new tip
  - Little difference with production year
- Typical RSD 20-40%
  - Larger variations likely due to sample (not cartridge)

## Future Actions

- Collecting more data within our standard QC Method
- Possible Tube Refinement
  - Correlation within tube fit



**Thank You!**