



Elemental Scientific

# prepFAST

The Next Step in Automation

- Autodilution
- Autocalibration
- Intelligent QC Dilution



# prepFAST Inline Syringe Dilution

## prepFAST Automation

prepFAST is an autodilution system that automatically performs precise and accurate inline dilutions for samples and standards. Capable of up to 400x dilution, the prepFAST is the fastest, simplest way to ensure high quality data in every run.

### Syringe Dilution

- Clean
- Chemically Resistant
  - Organics
  - Strong Acids
- Low Maintenance
- Accurate and Precise
- Long-Term Stability

### S400V Syringe Pump



The precise ( $<\pm 0.05\%$ ) and accurate ( $<\pm 0.2\%$ ) S400V syringe pump provides smooth and balanced delivery of solutions over a wide range of flow rates (1 to 40,000  $\mu\text{L}/\text{min}$ ) to ensure rapid reliable inline dilutions.

### Four Syringes:

1. Rinse
2. Carrier
3. Diluent
4. Internal Standard

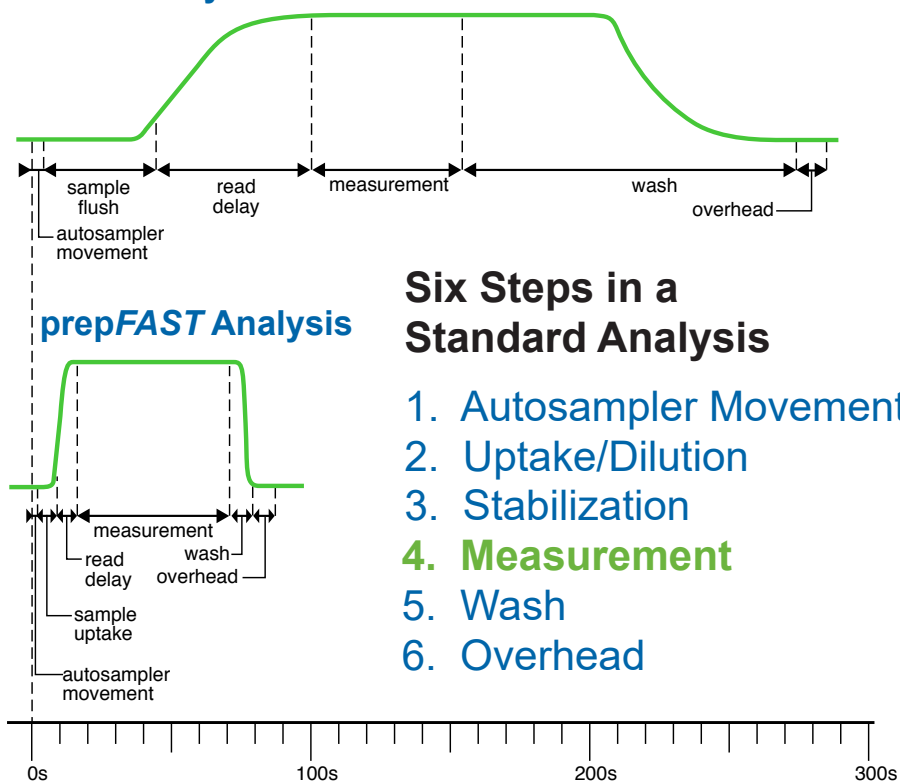
## Valve Injection

- FAST Stabilization
- FAST Washout
- Low Carryover

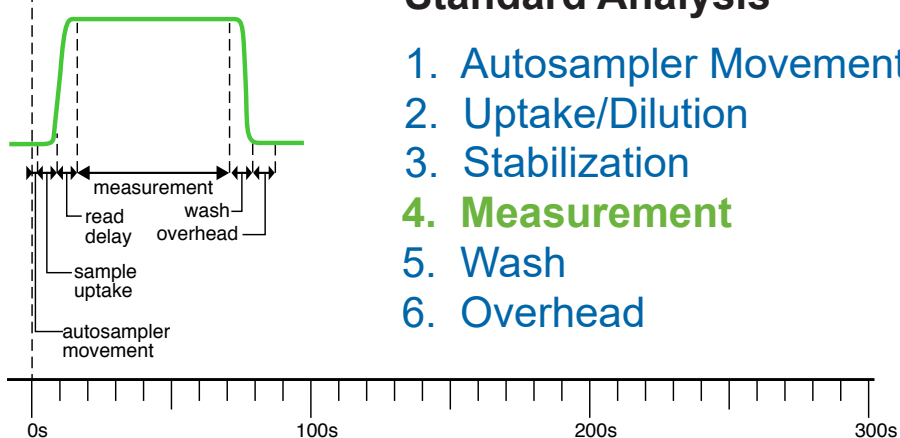


**P7+ Valve**

## Normal Analysis



## prepFAST Analysis



## Six Steps in a Standard Analysis

1. Autosampler Movement
2. Uptake/Dilution
3. Stabilization
4. **Measurement**
5. Wash
6. Overhead

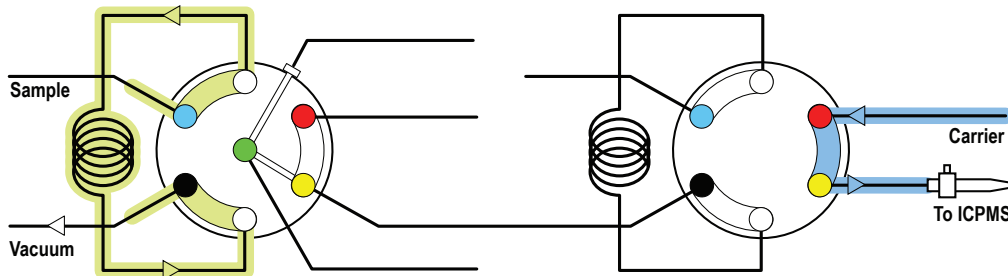
## Benefits

- Fully Automated
  - Autocalibrate
  - Autodilute
  - QC Autodilute
- Rapid uptake, stabilization and washout
- Inline dilution
- Integrated with ICP/ICPMS Software

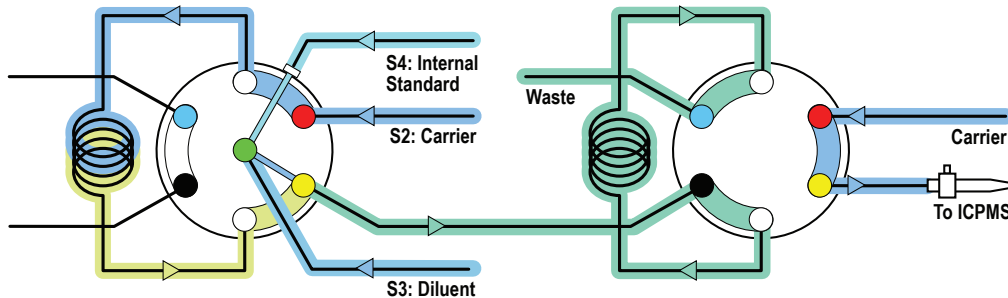
# Automated Inline Autodilution

## Inline Dilutions

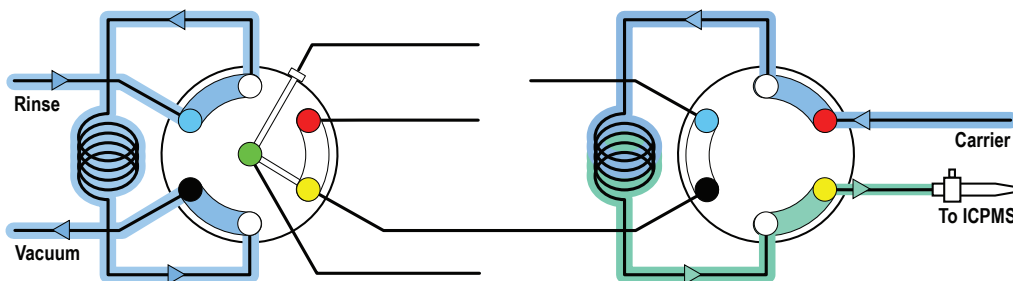
### 1. Vacuum load sample into loop



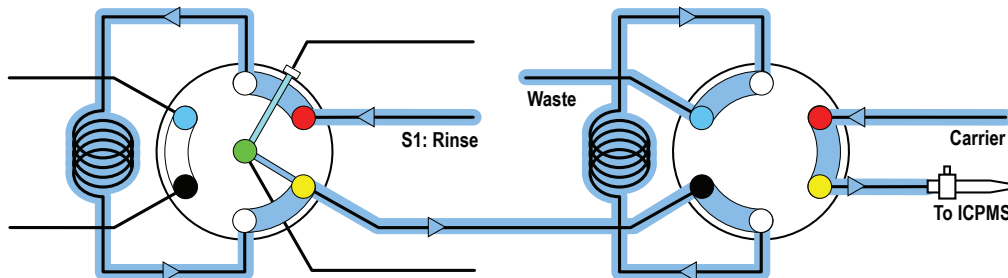
### 2. Syringes add internal standard and dilute sample into second loop



### 3. Diluted sample is injected and sample loop is cleaned



### 4. Sample and dilution loops are cleaned



\*Patent Pending



## FAST, Stable and Accurate

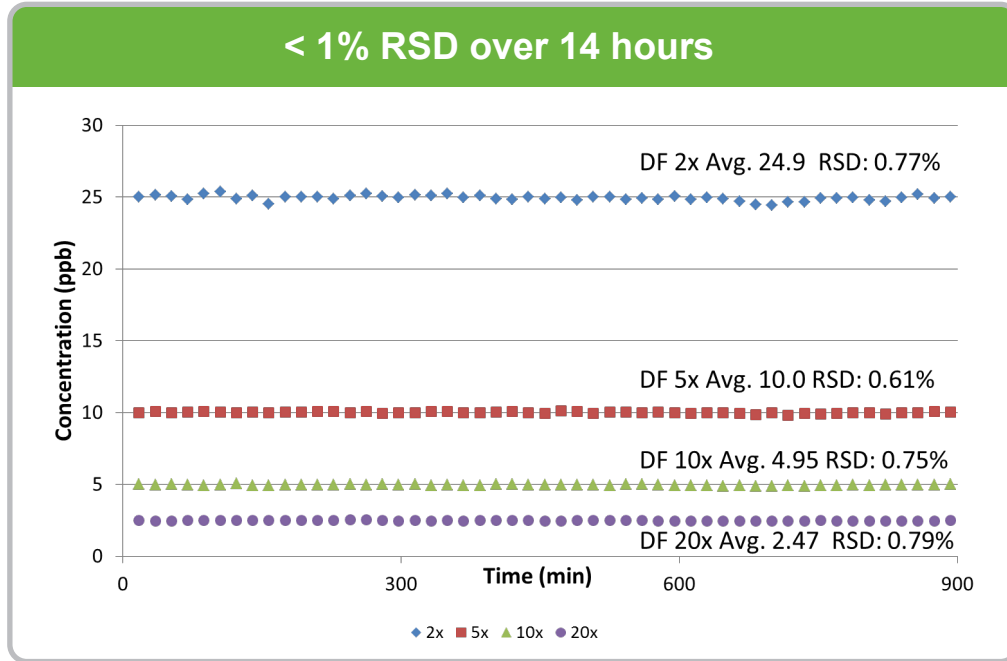


Figure 1. prepFAST autodilution stability throughout a run for a wide range of dilution factors.

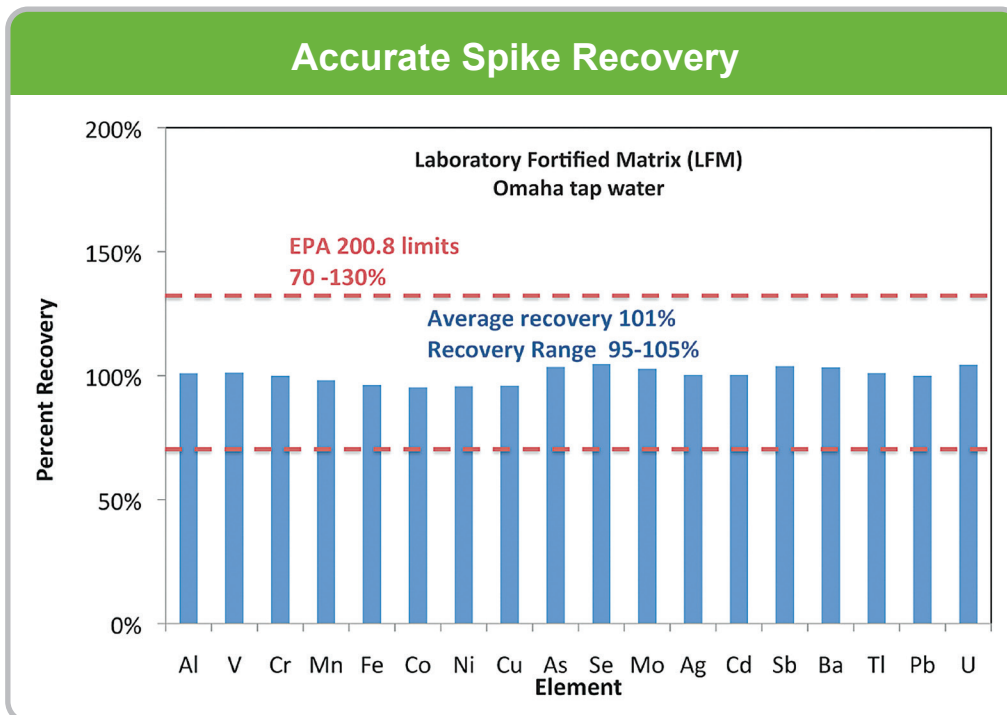
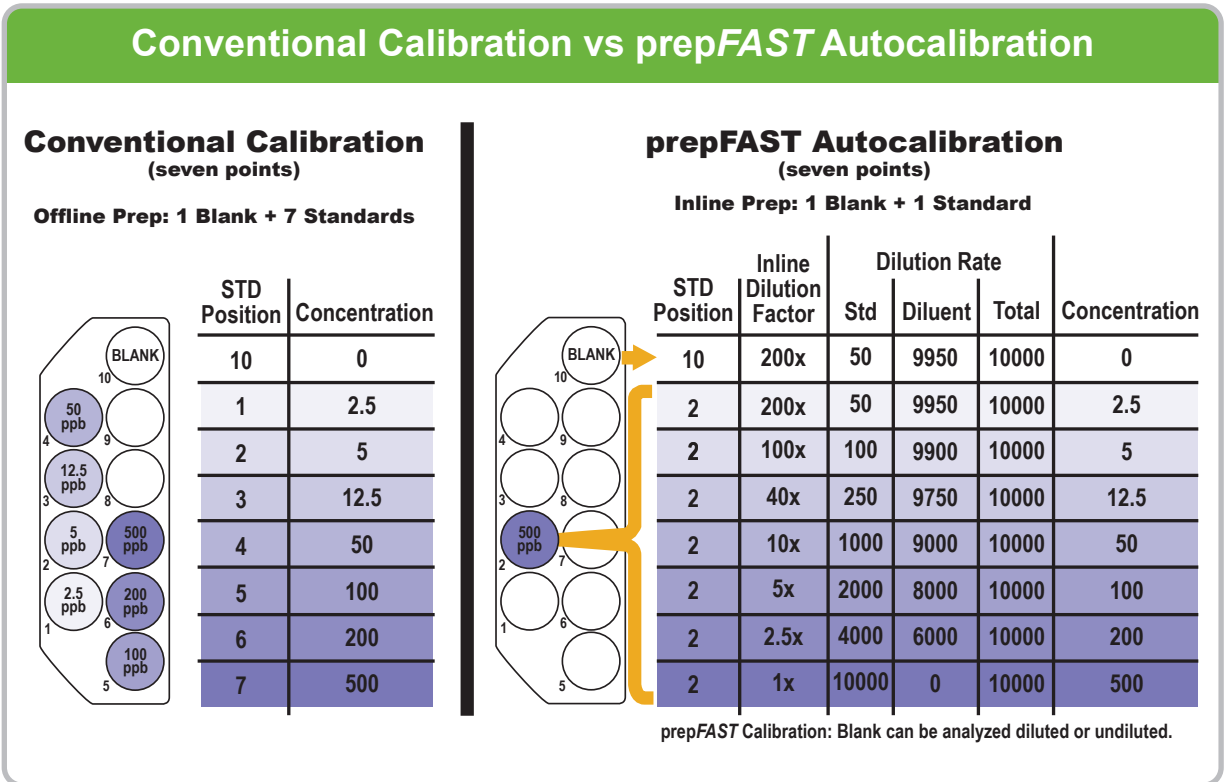
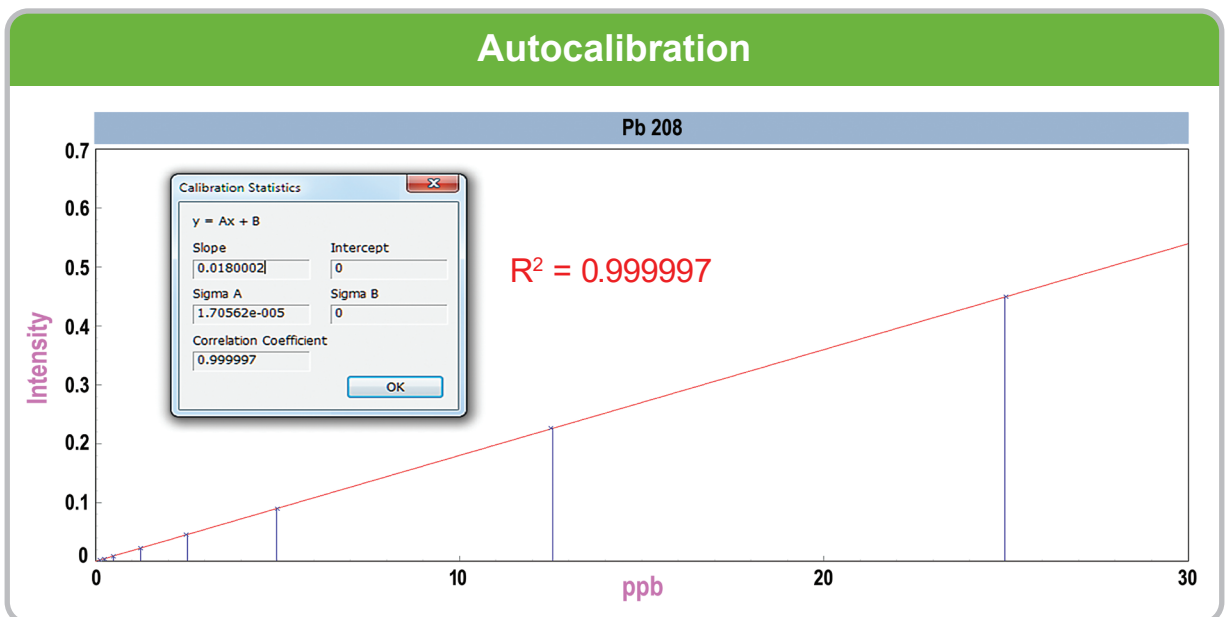


Figure 2. Omaha tap water is used as the EPA 200.8 defined, Laboratory Fortified Matrix (LFM) and Quality Control Standard (QCS). Recovery of 95-105% greatly exceeds EPA requirements of 70-130%.

# Autocalibration

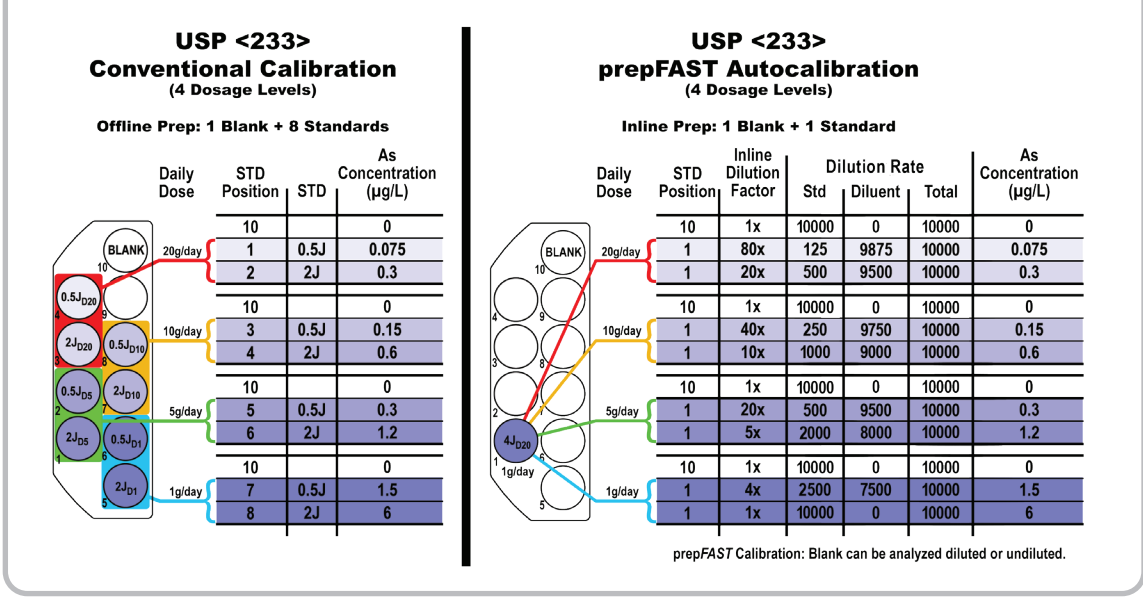


**Figure 3.** Illustration of conventional calibration vs. prepFAST autocalibration function using a single multi-element standard. The full calibration curve is created from vial 2 in the standards rack. Dilution occurs rapidly using small volumes at high flow rates. Sample is then injected at the user's desired flow rate.

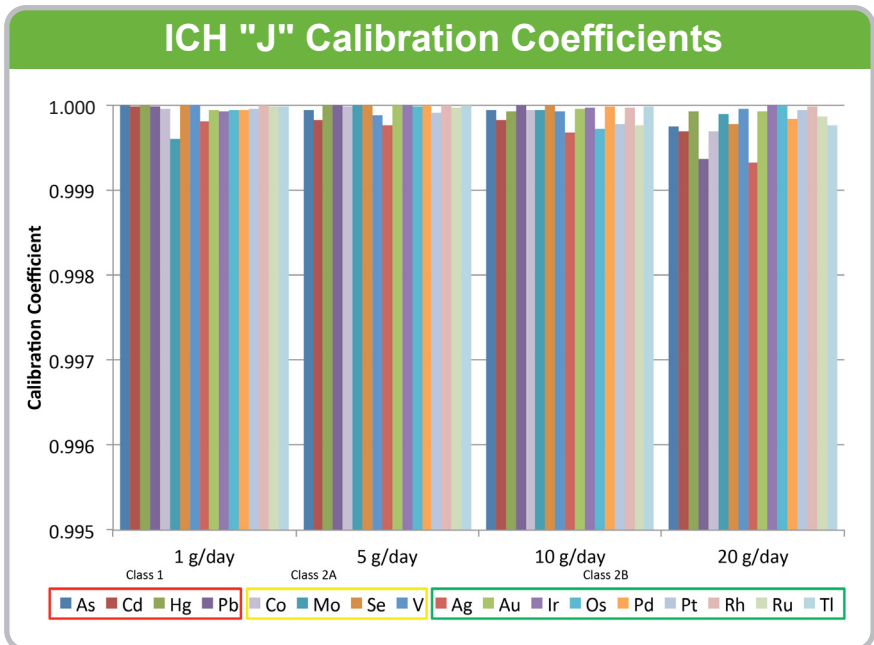


**Figure 4.** Predefined dilution factors for a single multi-element standard are used to build calibration curves. Accuracy of dilution results in high linearity ( $R^2 = 0.999997$ ).

## Multiple Curves from a Single Stock Standard



**Figure 5.** USP protocols define a tight calibration range for each drug. In this example multiple drug specific calibration curves are automatically generated from a single stock standard.



**Figure 6.** Multiple calibration curves for the USP elements have good linearity for drugs with a large range of daily doses. (ICH = International Conference on Harmonisation)

# Inline Autodilution

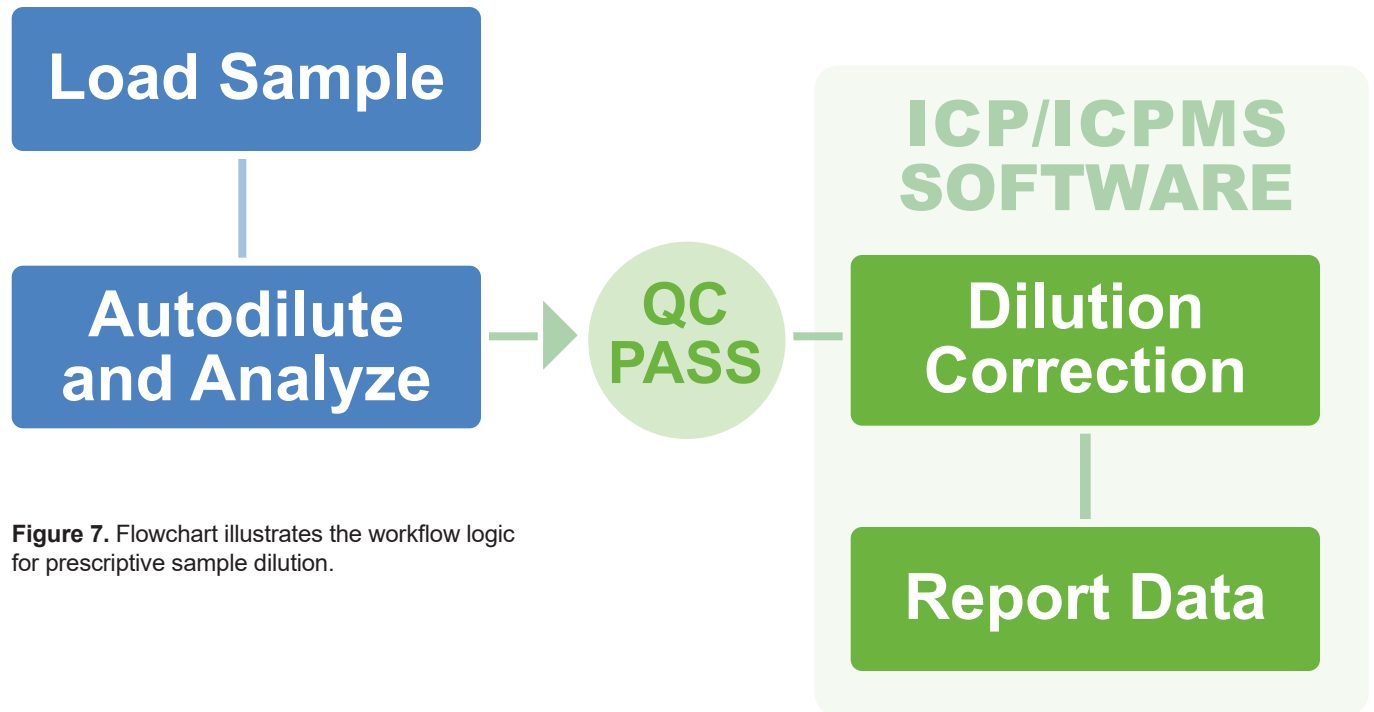


Figure 7. Flowchart illustrates the workflow logic for prescriptive sample dilution.

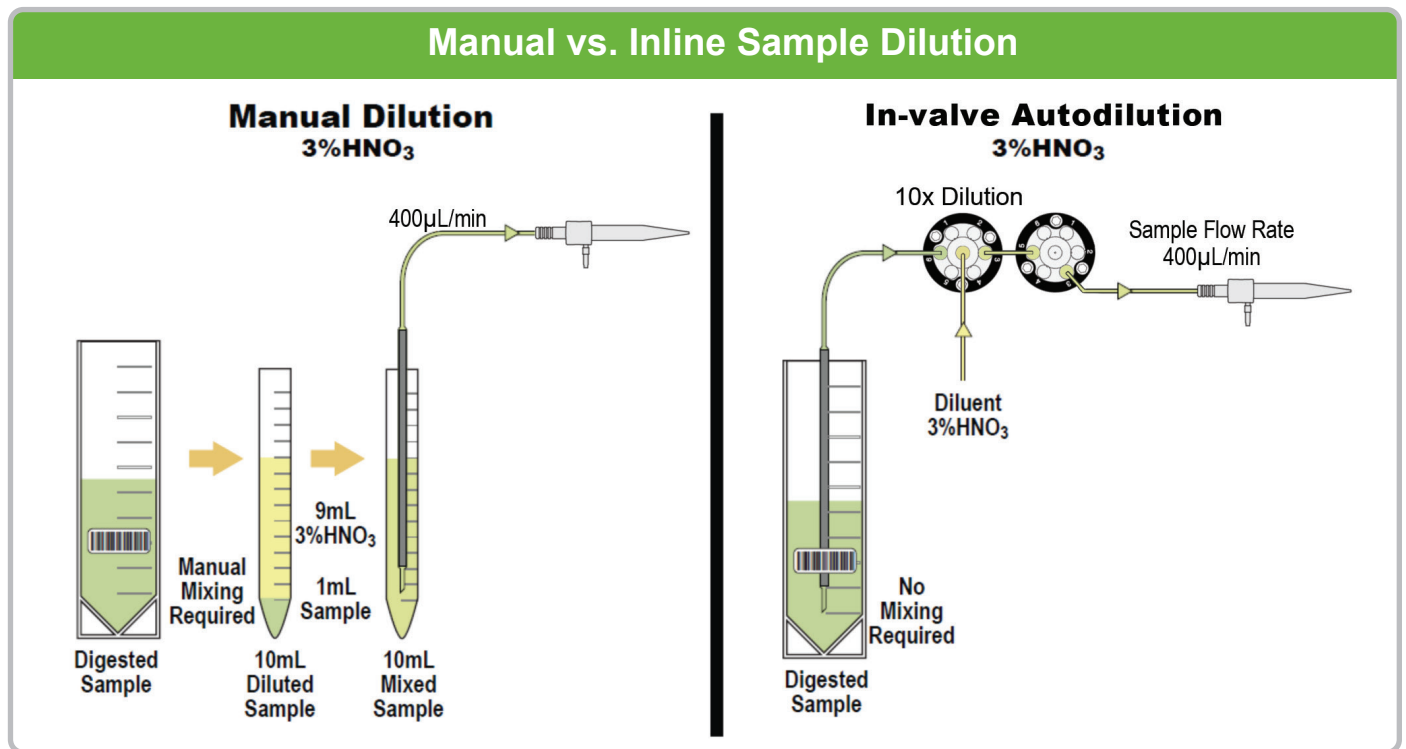
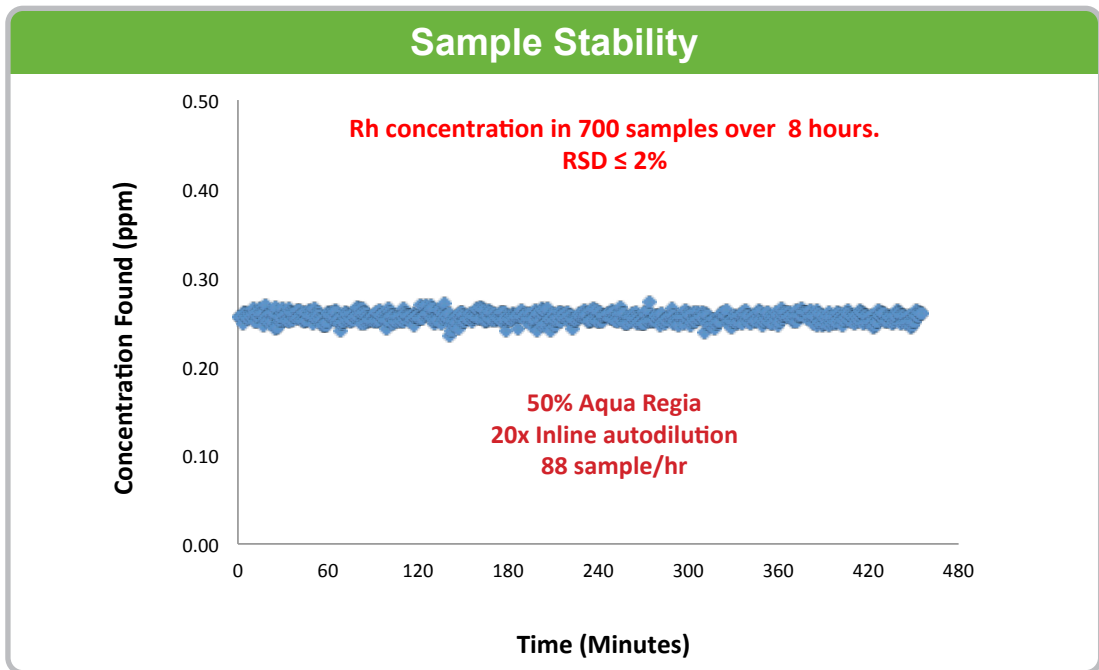
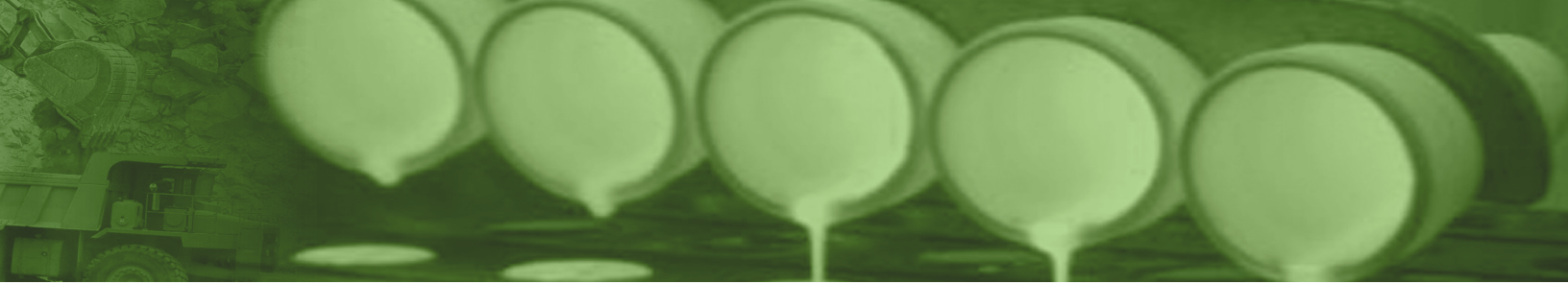
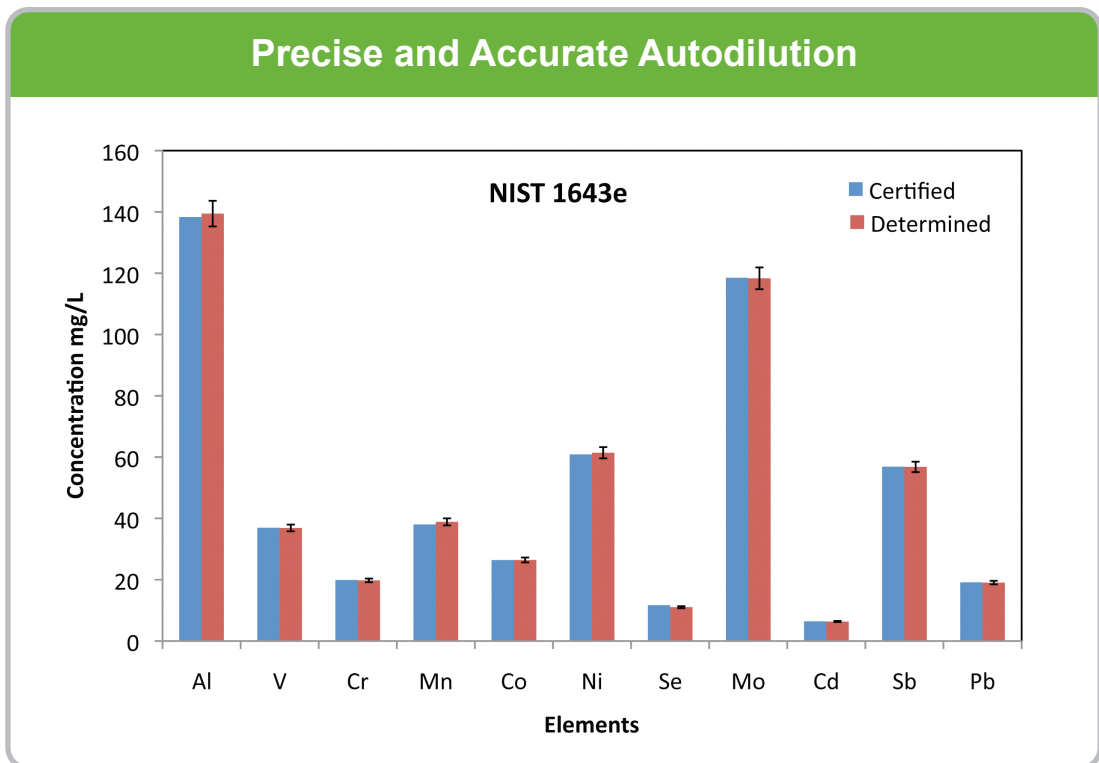


Figure 8. Mixing inline eliminates the need to premix/dilute samples in discrete tubes prior to analysis. This cost effective approach improves sample throughput, saves time, and reduces labware and reagent consumption. After in-valve dilution, the sample is injected (400 μL/min) at the user's desired flow rate.





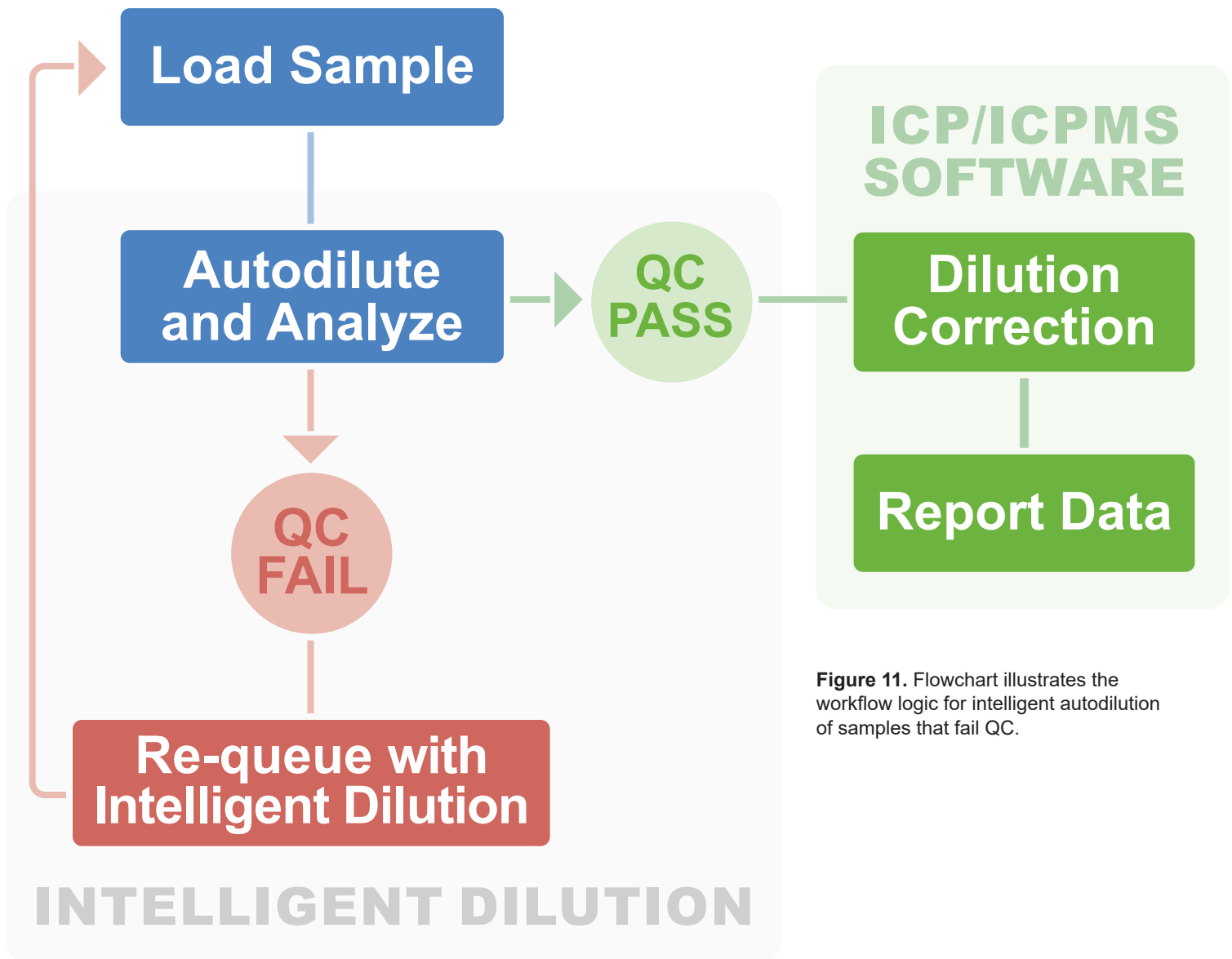
**Figure 9.** Fire assay digests for precious metals in Aqua Regia require dilution before analysis. prepFAST inline 20x autodilution eliminates the manual dilution step.



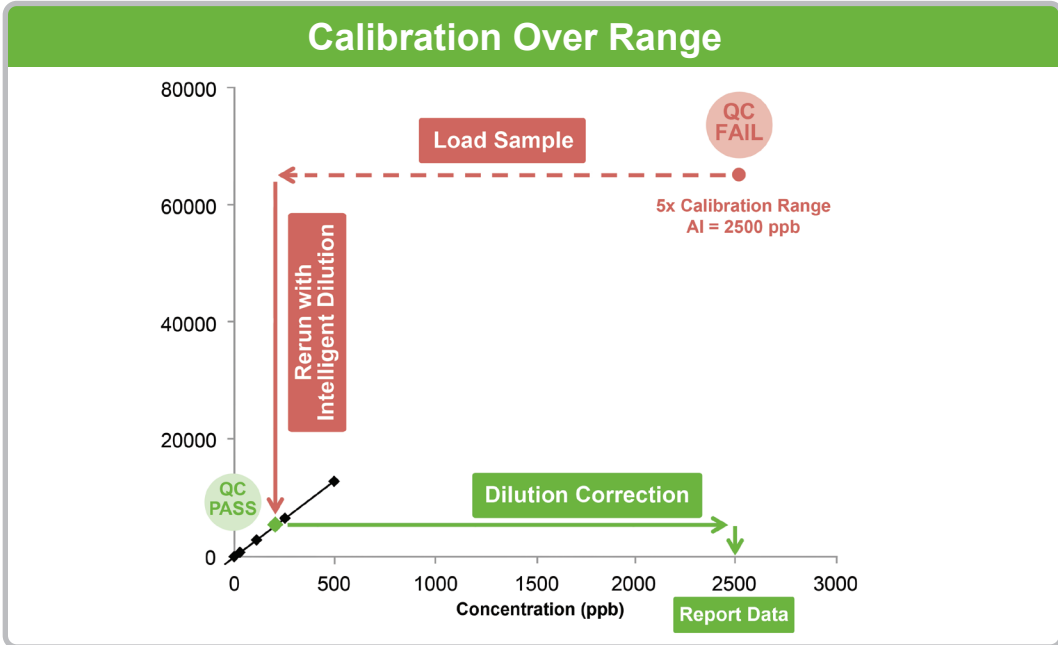
**Figure 10.** Precise and accurate results for concentrations of metals in a Trace Metals in Water Certified Reference Material (CRM, NIST 1643e) are obtained with prepFAST autocalibration and autodilution.

# Intelligent Autodilution

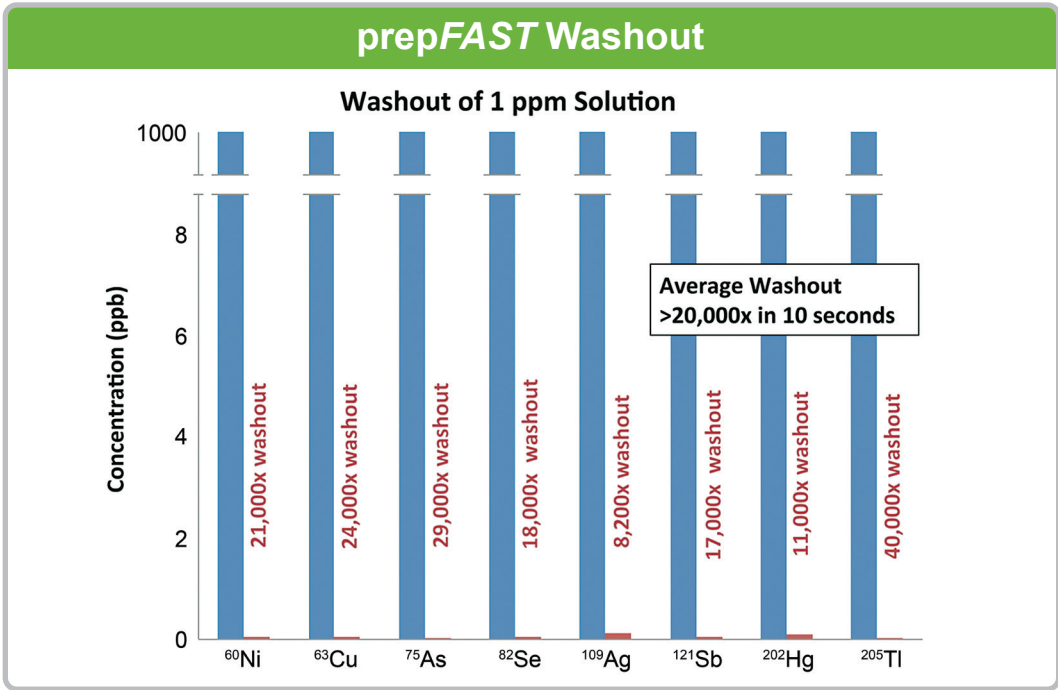
## Automated QC Dilutions



**Figure 11.** Flowchart illustrates the workflow logic for intelligent autodilution of samples that fail QC.



**Figure 12.** prepFAST autodilution in combination with ICPMS QC software can eliminate in-run QC failures. After a QC failure is detected, ICPMS software immediately inserts a new sample line with an intelligent dilution factor. The prepFAST automatically reruns the sample at the new intelligent dilution factor. Advanced prepFAST QC functions are currently available on select instruments.



**Figure 13.** For a selection of elements, using the prepFAST, washout greater than 20,000x is achieved in 10 seconds. This is more than sufficient to eliminate any carry-over from the high concentration QC over range sample onto the intelligently diluted re-run.



## prepFAST Applications

- Environmental
- Pharmaceutical
- Clinical
- Geochemical
- Petrochemical
- Forensic
- Semiconductor

# Elemental Scientific

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Contact us by phone at 402.991.7800 or by e-mail at [prepFAST@icpms.com](mailto:prepFAST@icpms.com). Our scientists and engineers are available to answer your questions related to elemental analysis. We are pleased to provide our customers complimentary analytical advice from our on-staff chemists.

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