Ultimate Clean Digestion Cups and Clean Lab Testing

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ENVIRONMENTAL EXPRESS®
a Cole-Parmer company

How Low Can You Go?!?!

Regulatory Entities

Competitive Markets

Lower and Lower Detection Levels

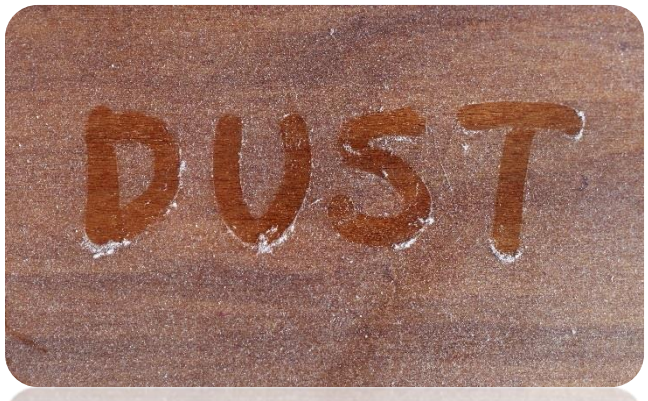
Low Detection Capabilities

- Laboratories recognize importance and difficulties
    - Clean laboratory
    - Clean testing supplies
- New Ultimate Clean Digestion Cup + Clean Lab
- How we navigated through the obstacles

Contamination Elimination

Deep Clean

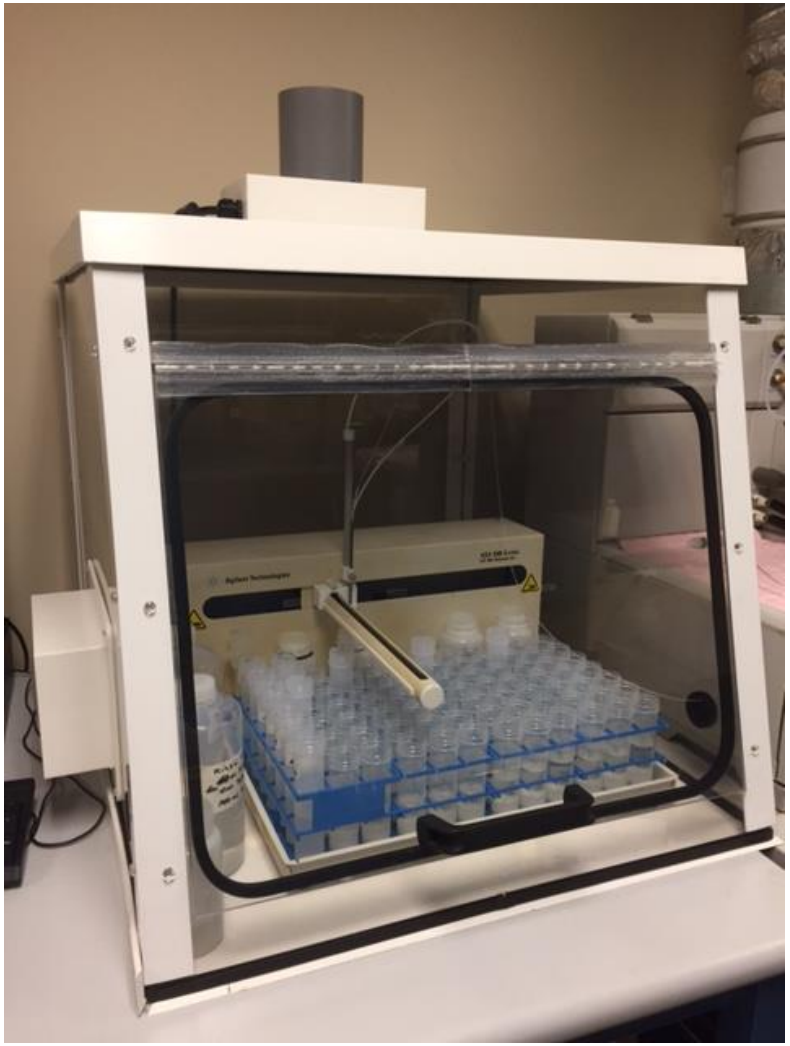
- Organization
  - Removed unnecessary items
  - Reorganized
- Dust elimination
  - Total lab wipe down
  - Vacuum
  - Mop
- Regular Cleaning Schedule



Contamination Elimination

Sampling Area

- AirLite™
  - Improved data quality
  - Decreased occurrence of random spikes



Contamination Elimination

Sample Prep Area

- Custom enclosure
  - HEPA filter
  - Small fan
- Major impact toward achieving consistent lower detection levels

Sample Prep

Borosilicate glass

- Potential to Leach:
  - Silicon, Boron, Sodium
- Potential to Absorb:
  - Lead and Chromium
- Tends to exhibit “memory” effects from previous solutions

Sample Prep

Standards

- Have not expired
- Certified – carry a robust Certificate of Analysis with information on background contaminants

Acids

- High Purity (sub-boiled distilled)

Deionized water system

- Foundation of the lab
- Well-maintained
- Large-scale system and bench top system

ICP-MS

Peristaltic Pump Tubing

- Low-metals, pre-rinsed pump tubing
- Change intake tubing every day/other day

ICP-MS Parts Cleaning

- When recommended by preventative maintenance schedule
- See contamination levels start to increase on our blanks

ICP-MS Calibration

Calibration Curve

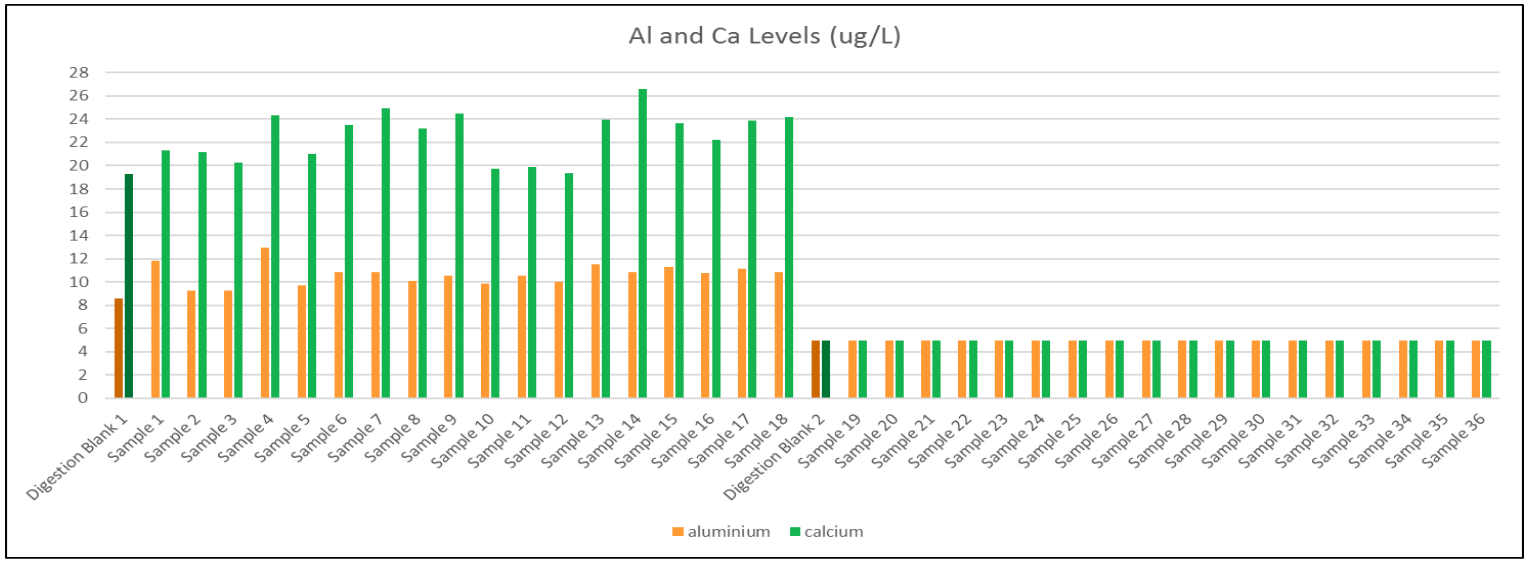
- Less it is handled the more consistency can be achieved
- We use dilutions and a balance
- Our curve is made up of:
  - 4 points within 0-40 ppb for minerals
  - 6 points within 0-1 ppb for all other elements
- Made daily/every other day to ensure optimal instrument calibration

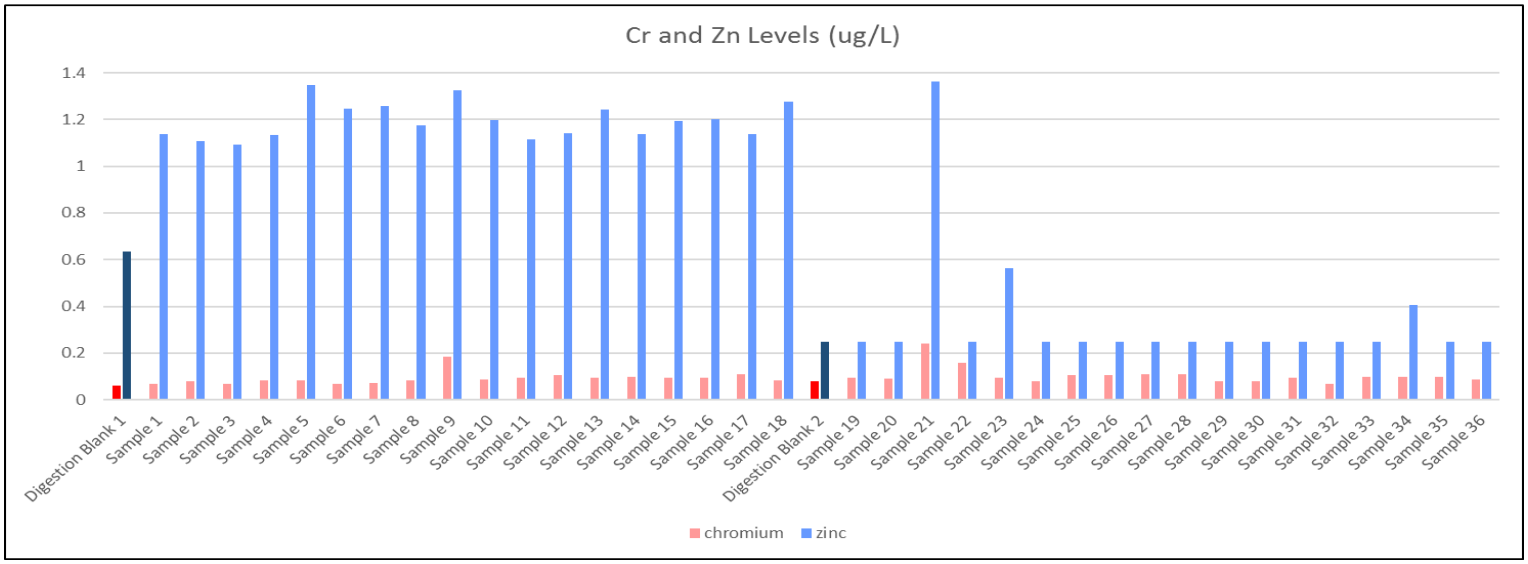
Sample Prep

Sample Preparation

- Introduces many opportunities for contamination to occur
- Must be attentive
- We make smaller batches of digestion solution
  - Sample size # means making multiple batches
  - Originally only 1 digestion solution blank was analyzed
  - Noticed elevated metals hits on groups of samples

Sample Prep





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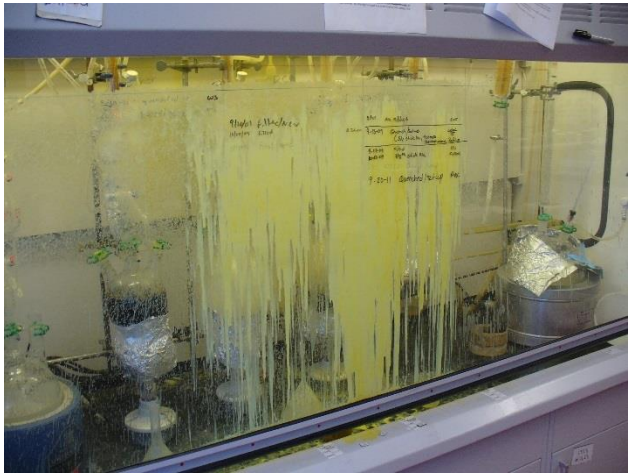
Sample Prep

Fume Hood

- Consider installing a HEPA filter
- Keep clean from dust, spills, other chemicals

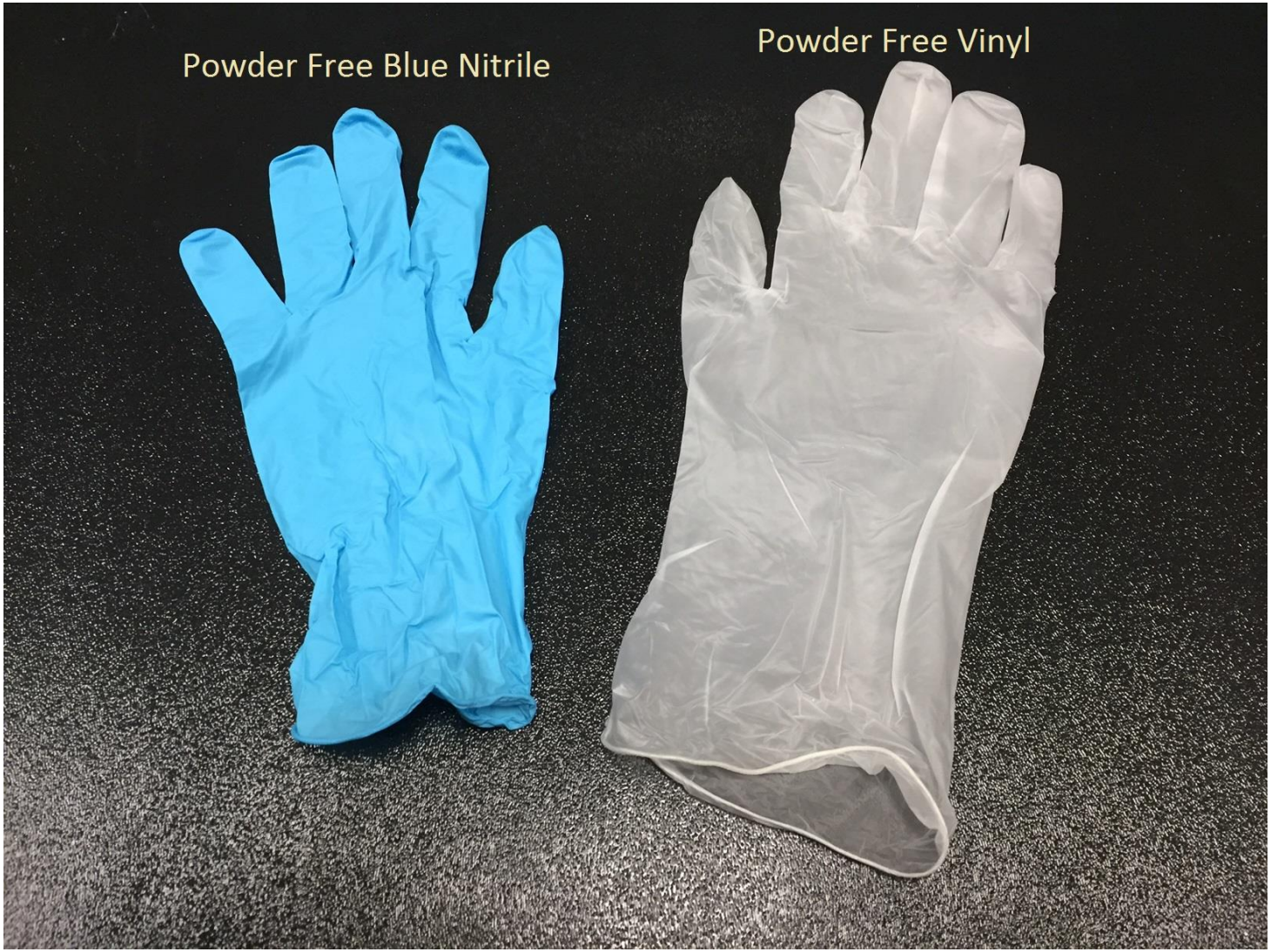


Sample Prep

Personal Protective Equipment (PPE)

- Protects personnel from potential hazards
- Protects lab equipment and samples from personnel
- Metals can be found in everything
  - Deodorant, cosmetics, lotions, lint on clothes, soil on shoes
- Our lab
  - Lab coats, safety glasses, pull free-flowing hair back, remove as much jewelry as possible, vinyl gloves

Sample Prep



Sample Prep

	Powder Free Blue Nitrile Gloves out of box (ug/L)	Powder Free Blue Nitrile Gloves rinsed with Deionized Water (ug/L)	Vinyl Gloves out of packaging (ug/L)	Vinyl Gloves rinsed with Deionized Water (ug/L)
Sodium	83.59	5.252	301.4	<5
Magnesium	21.14	10.43	<5	<5
Aluminium	9.505	<5	<5	<5
Phosphorus	6.007	<5	<5	<5
Potassium	111.6	5.644	<5	<5
Calcium	6264	2627	35.75	15.27
Iron	7.907	<5	<5	<5
Zinc	259.1	135.1	15.85	1.902
Strontium	1.444	0.6905	<0.25	<0.25
Manganese	0.4559	0.192	<0.0625	<0.0625
Zirconium	0.1259	<0.0625	<0.0625	<0.0625
Lanthanum	0.0816	<0.0625	<0.0625	<0.0625
Cerium	0.1172	<0.0625	<0.0625	<0.0625

Sample Prep

Whenever possible:

- Do not run other tests in the same vicinity
  - Contamination from fumes, residue, ash
- Separate standards preparation and sample preparation
  - Contamination from splashes, spills, or mishandling is less likely

Contaminant Free Products

- Need and capability in achieving trace and ultra trace detection levels drives a demand for contaminant free products to run the tests.

- After years of study, in both the manufacturing and laboratory process, Environmental Express developed the Ultimate Clean Cup.

Contaminant Free Products

Ultimate Clean Cup

- 50 mL digestion cup
- Specifically designed for trace metals analysis
- Carries the most robust certification on the market today
- Certified for 68 elements at ppb and ppt levels
- Carefully handled to avoid common means of contamination
- Specially designed packaging

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Closing Thoughts

- Contaminant-free products will not benefit a lab if clean lab procedures and techniques are not followed.
- Ultimately, each individual lab needs to develop:
  - Its own system of best practices
  - Standard operating procedures to fit its clean lab needs
- Necessary to understand what the best practices are and the reasoning and repercussions behind those practices.
- Fundamentals are key and the data produced can only be as good as the preparation.

Questions?

Thank you