

# Fast, Reliable Pesticides in Food Extractions



**PLE®**  
**Pressurized Liquid Extraction**



# Agenda

- PLE® Overview
  - Pressurized Liquid Extraction
- Extraction and Cleanup for Pesticide Testing
- Questions



# Testing in Food

- Food Safety
  - Pesticides cause Harm to Humans/Pets
  - Identify potential risks to your Supply Chain and Product line
- Analytical
  - Pesticide Analysis
  - Fast
  - Reproducible Results



# Pressurized Liquid Extraction

- An Extraction technique used in the Food Market
- The Technique Incorporates:
  - Solvent
  - Pressure
  - Heat
  - Time



# Why is the PLE so effective?

- Performed near the solvent's supercritical region
- Under Programmable Pressure
- Creates a high degree of analyte solubility releasing them from the solid matrix



# Extraction

- A solid or semi-solid sample is placed in the Pressurized Extraction Cell 5ml to 200ml
- The Extraction cell is capped and placed into the extraction device which can be pressurized to up 2500psi



# Extraction

- The Extraction cell is placed under pressure at ambient temperature (nominally 25 °C)
  - For Pesticides
- No Heat
- The Extract is flushed with solvent then Nitrogen





# The PLE®

## Pressurized Liquid Extraction

### PLE – Pressurized Liquid Extraction

- High Speed
- Modular and expandable from 1 to 8
- Process 1 to 8 samples in 10 to 15 min
- Extraction cell size 5 to 200 ml
- Real time plot of temperature and pressure
- Reduced Solvent Consumption
- Lower Energy Consumption
- In Cell Sample Cleanup

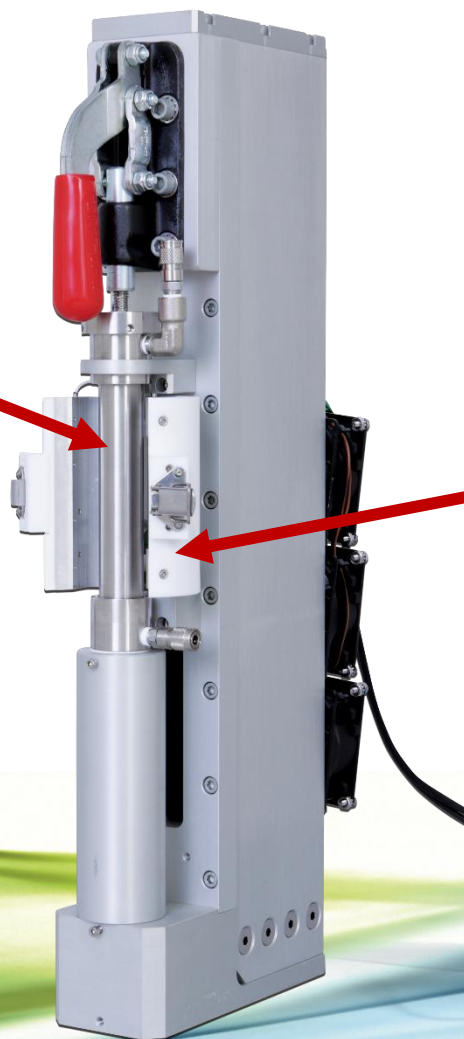






Extraction Cell

Heater



# Economical Extraction Cells



# Easy to Use End Caps





# Modular and Expandable

Expandable from 1 to 8 Modules

Parallel Extraction

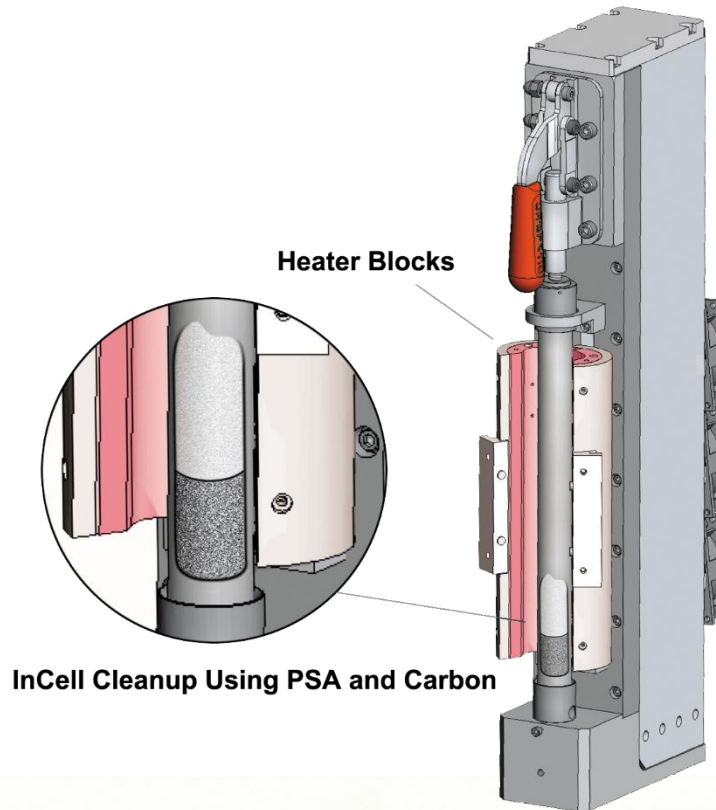


# In Cell Cleanup for Pesticides

Eliminates Manual cleanup

Uses In Cell Cleanup

- Florisil
- PSA
- Carbon
- Silica

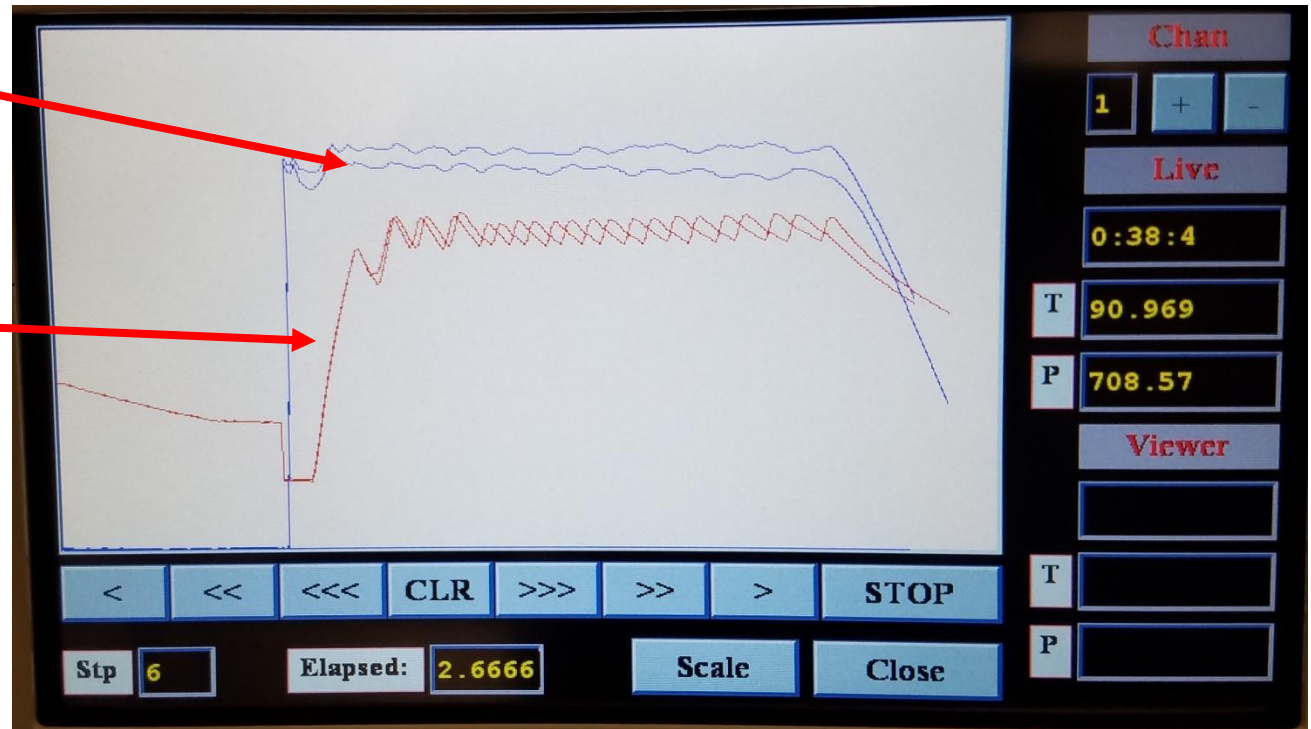




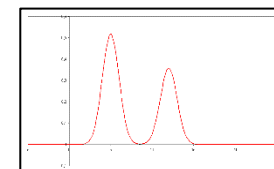
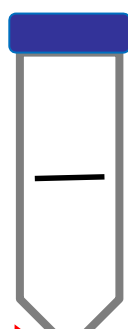
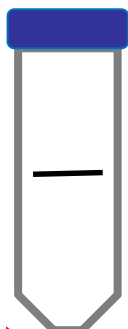
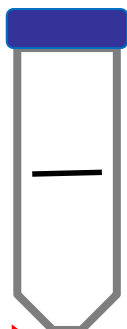
# Method Documentation

Pressure

Temperature



# Standard Quechers Pesticide Workflow



**2 minutes**

Weigh the Sample

**5 minutes**

Load the Sample  
into the Vessel add H<sub>2</sub>O  
and Acidified ACN

**30 minutes**

Shake Vessel

**10 minutes**

Add Quechers salt,  
shake and centrifuge

**10 minutes**

Extract  
Filtration

**=**

**52 minutes**

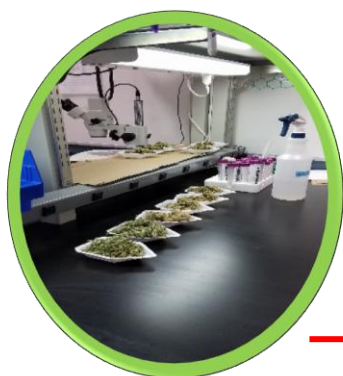
**Sample Prep  
Total Time  
Ready for  
Injection**

# Standard Quechers Pesticide Workflow

- Lots of Manual Steps and Human Interaction
  - More Error Prone due to interaction
- Labor and Solvent Intensive
  - Costs money
- Time Consuming Process
- Users Complain of Inconsistent Results



# PLE Extraction and Cleanup for Pesticides Workflow



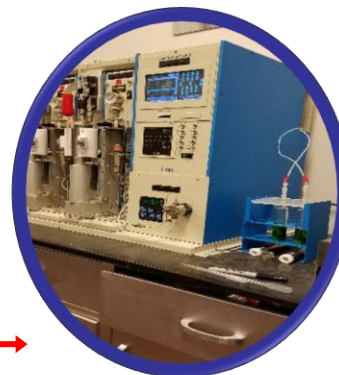
**2 minutes**

**Weigh the Sample**



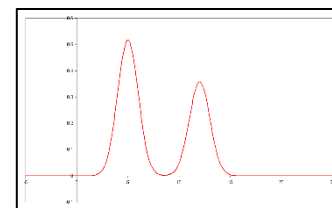
**2 minutes**

**Load the XtractClean™ and  
Sample into the Extraction Cell**



**8 minutes**

**Pesticide  
Extraction and  
In Cell Cleanup**



**=**

**12 minutes**

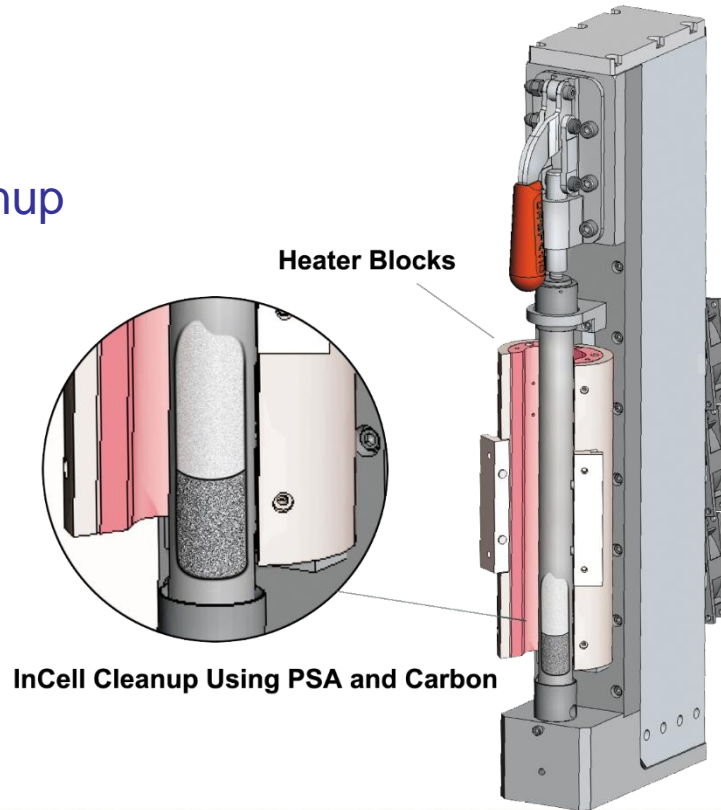
**Sample Prep  
Total Time  
Ready for Injection**



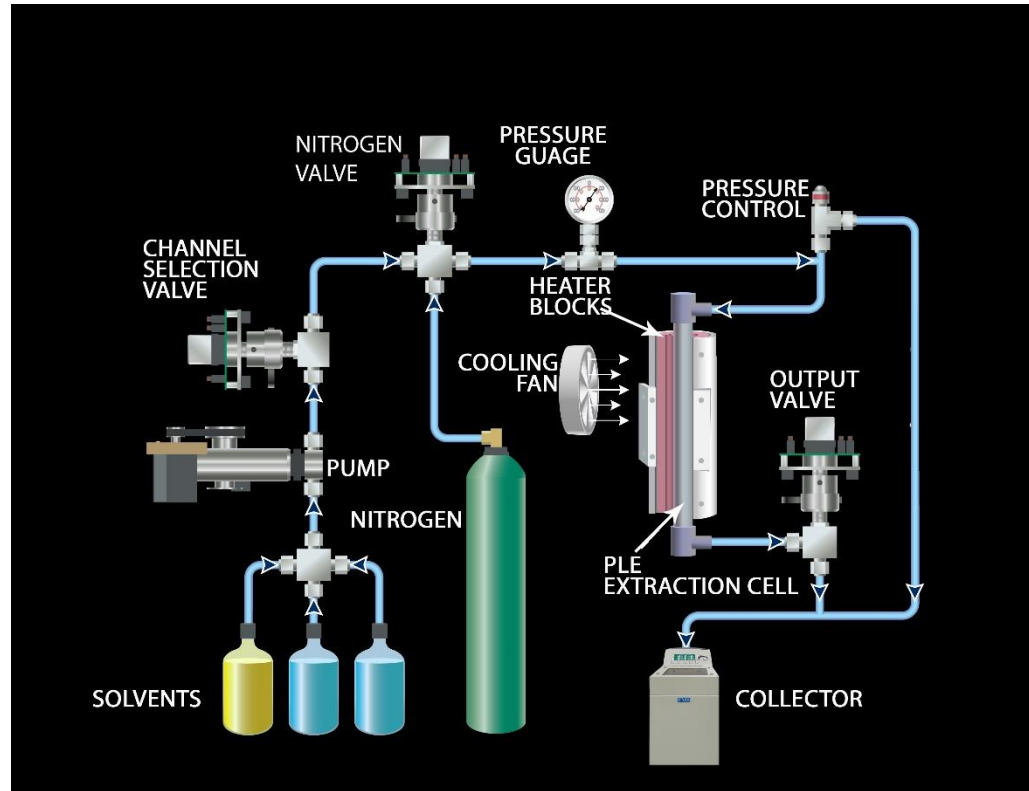
# InCell Cleanup for Pesticides

Eliminates Manual cleanup

**XtractClean™**

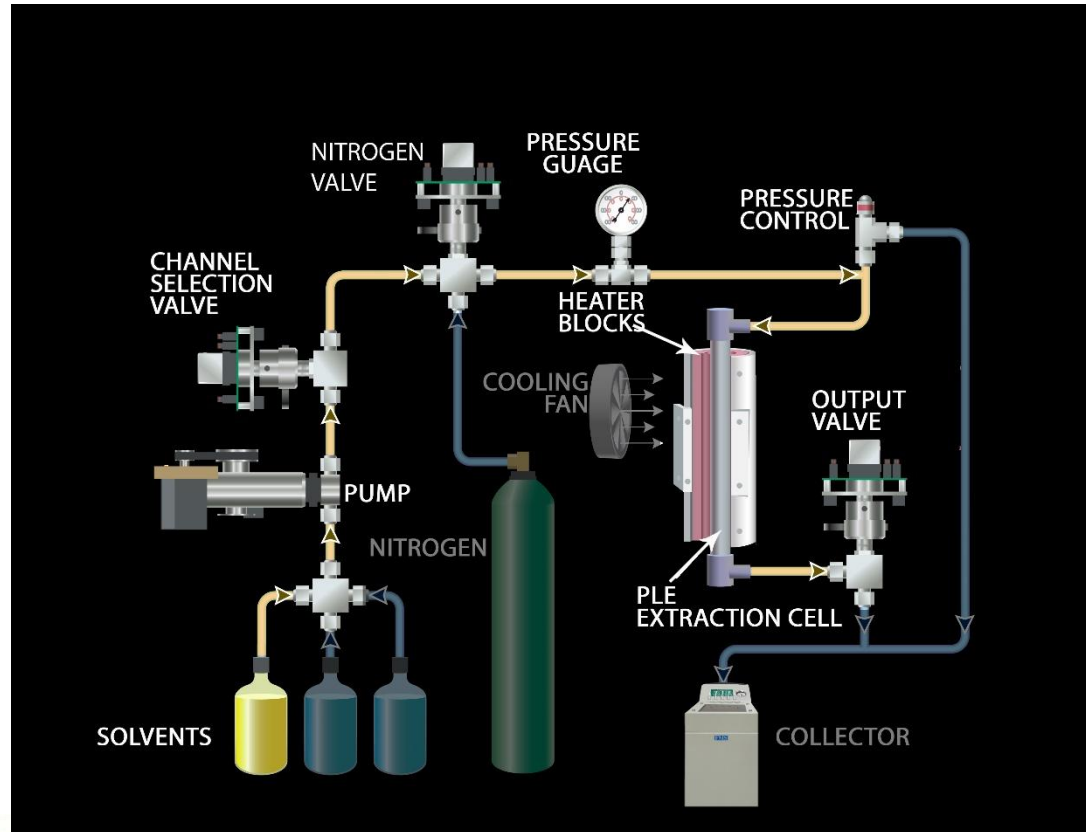


# Filling the Cell with Acetonitrile

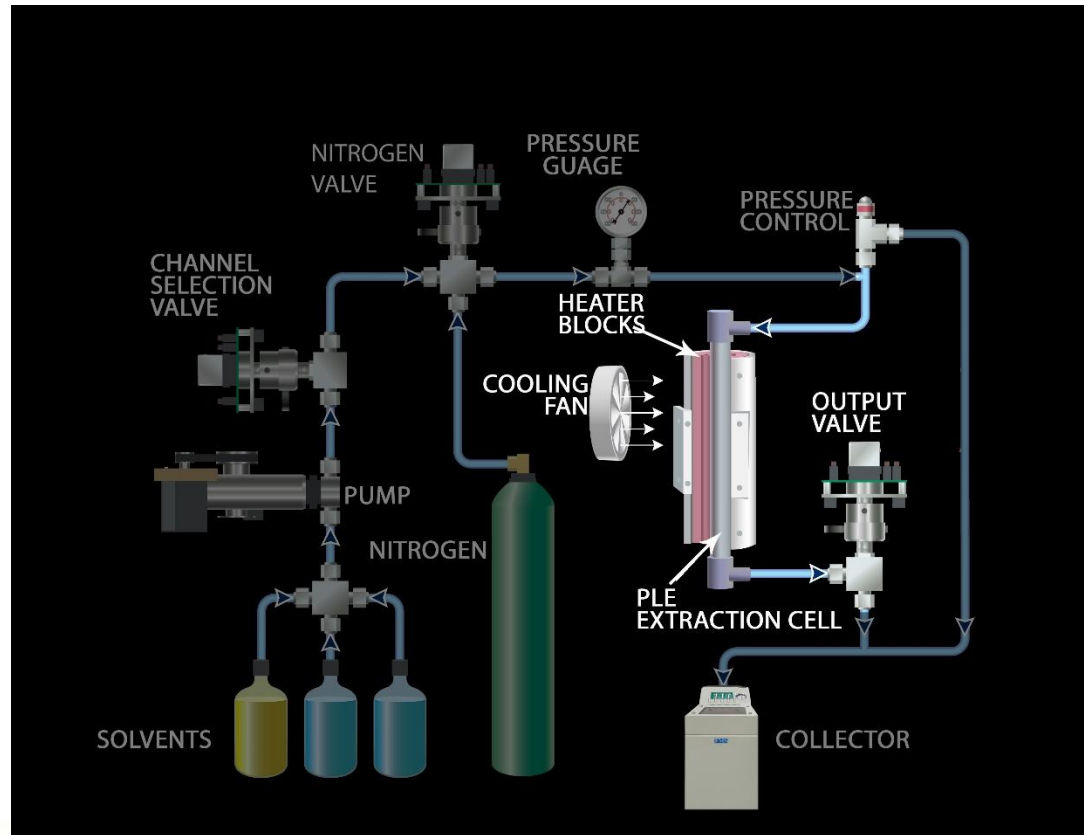




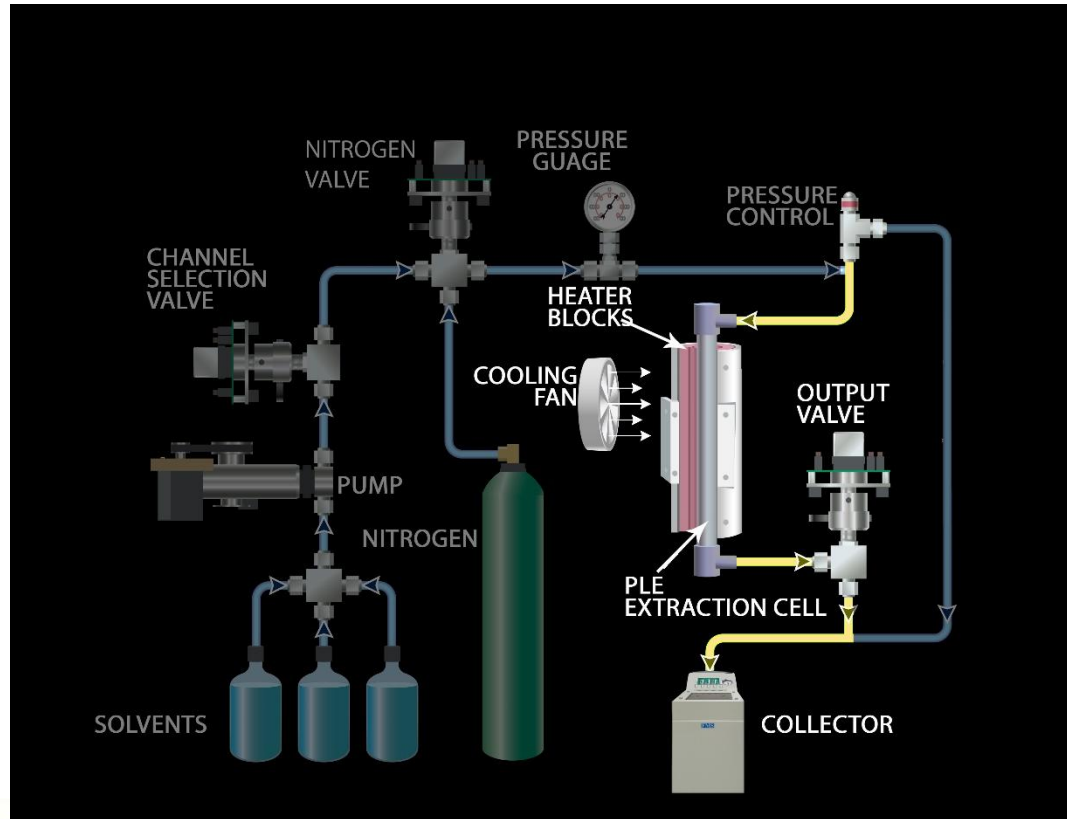
# Pressurize the Cell



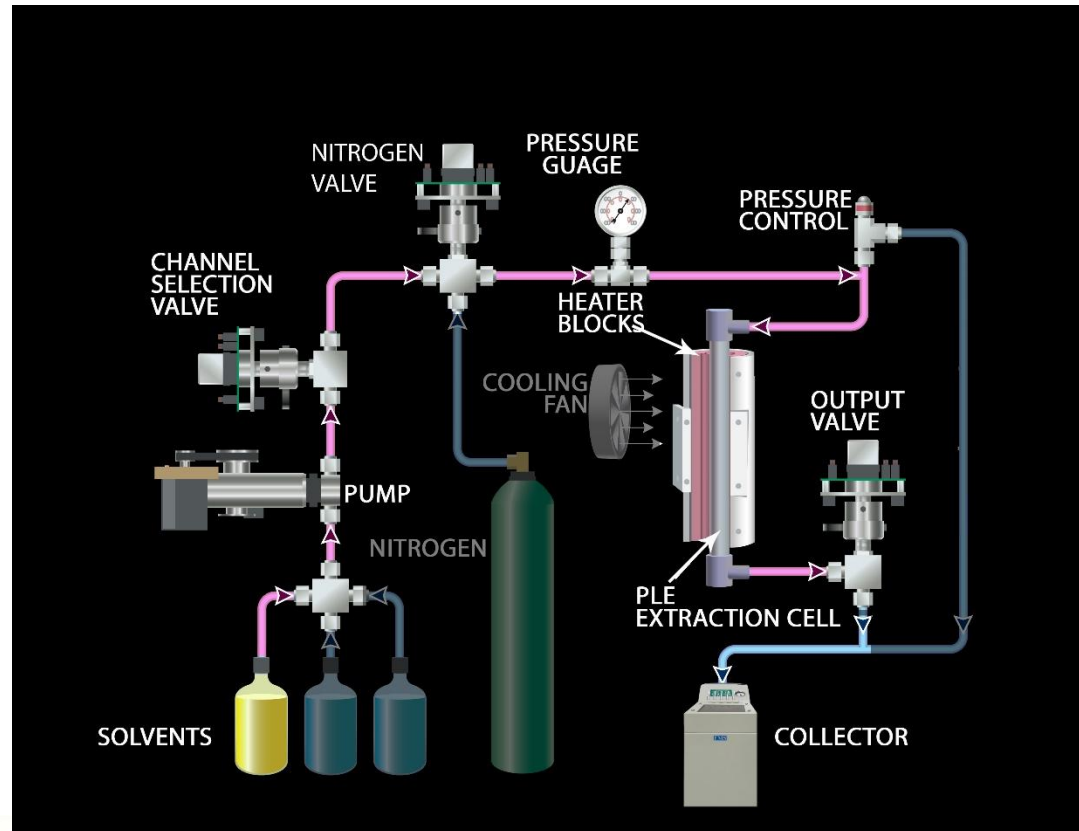
# Maintain Pressure



# Depressurize the Cell



# Deliver the Extract to the Collection Vessel



## **GC/MS-MS Conditions**

**Thermo Trace GC w/PTV**

**TSQ Quantum Ultra**

**30 meter, .25mm, .25 $\mu$ m Column w/5 meter Guard column**

**203 Pesticides scanned (414 transitions)**



## **Sample Preparation for Extractions**

**Samples weighed and prepared.**

**Analyzed un-spiked and spiked to ensure no native pesticides of interest present**

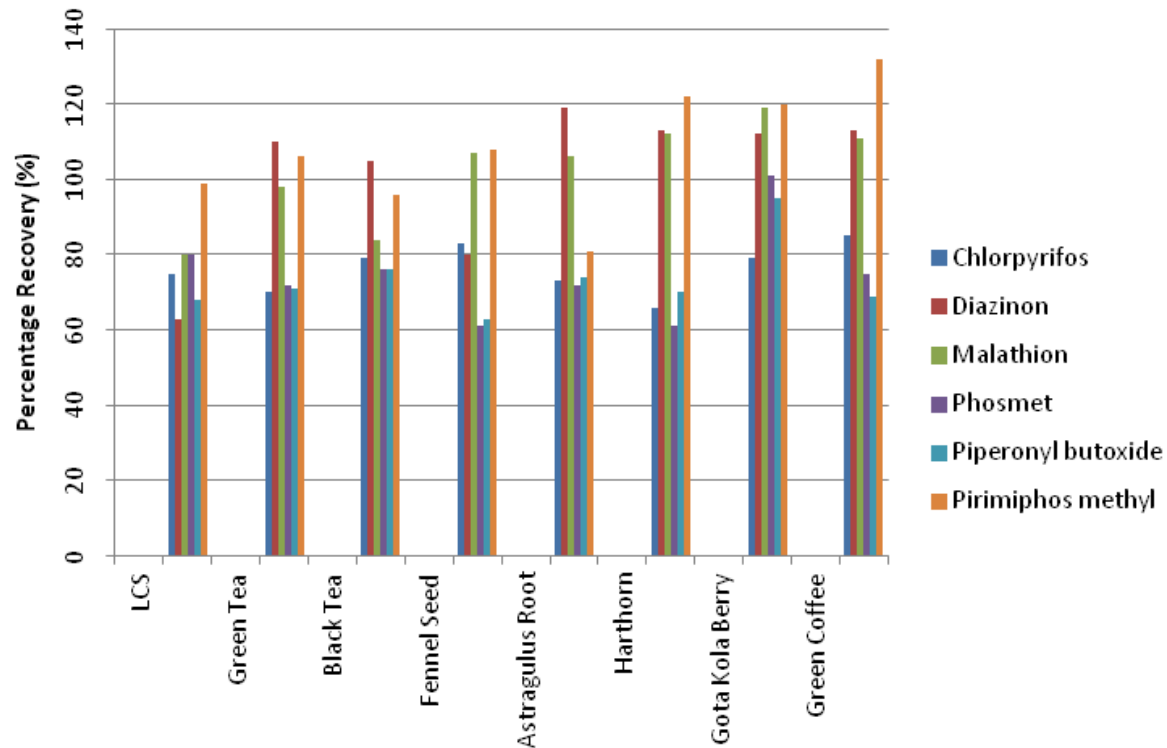
**Samples spiked at .1 ug/g**

**Samples directly loaded onto GC with no evaporation.**

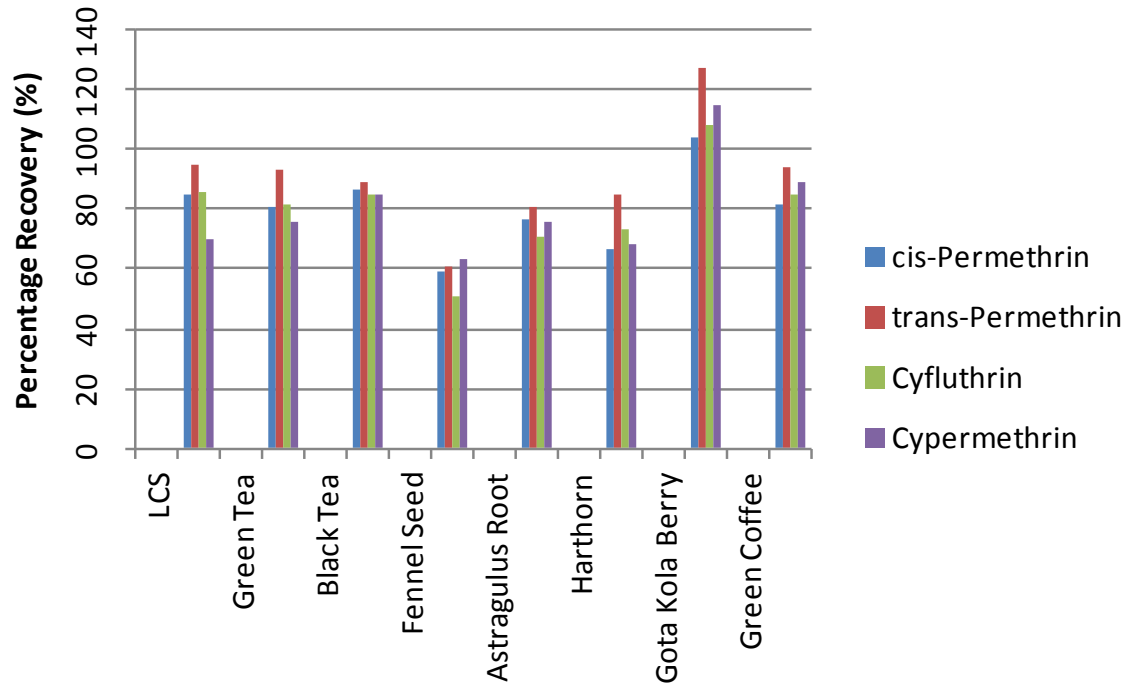




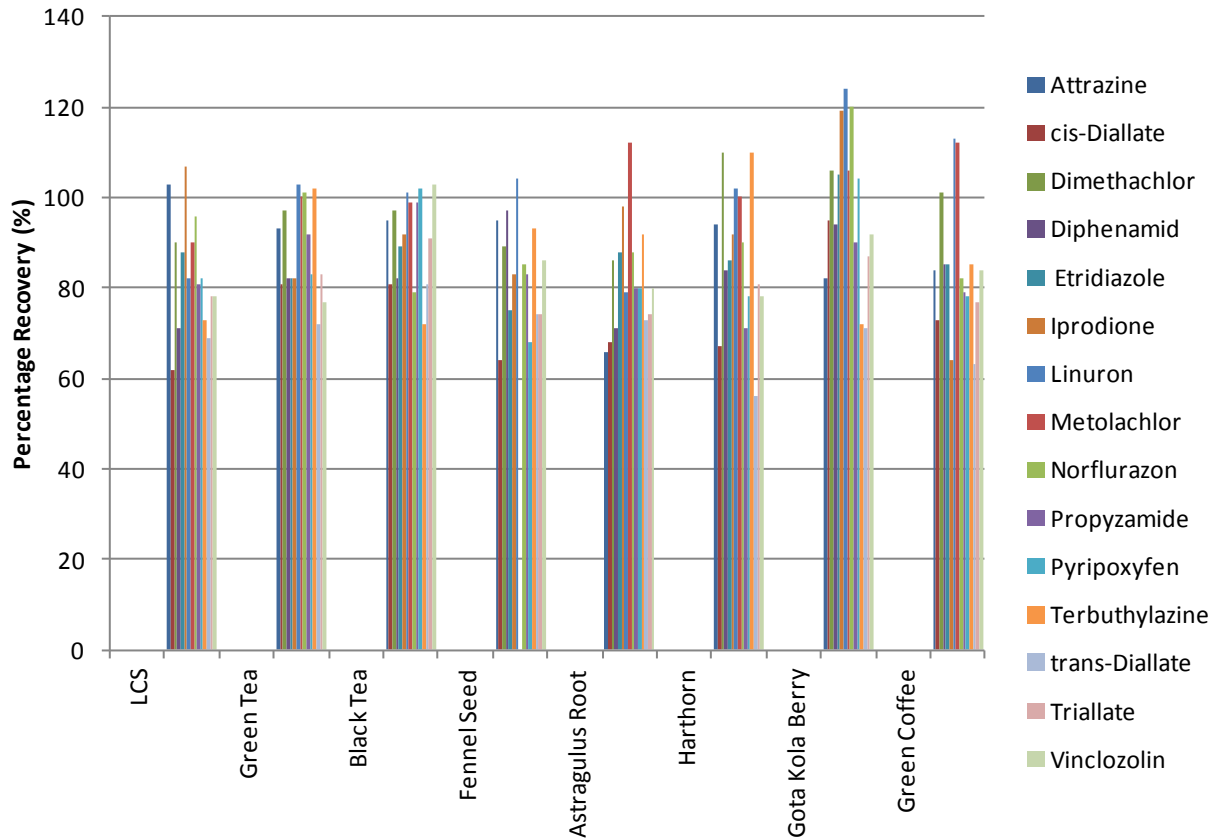
# Results: Organophosphorus Pesticides



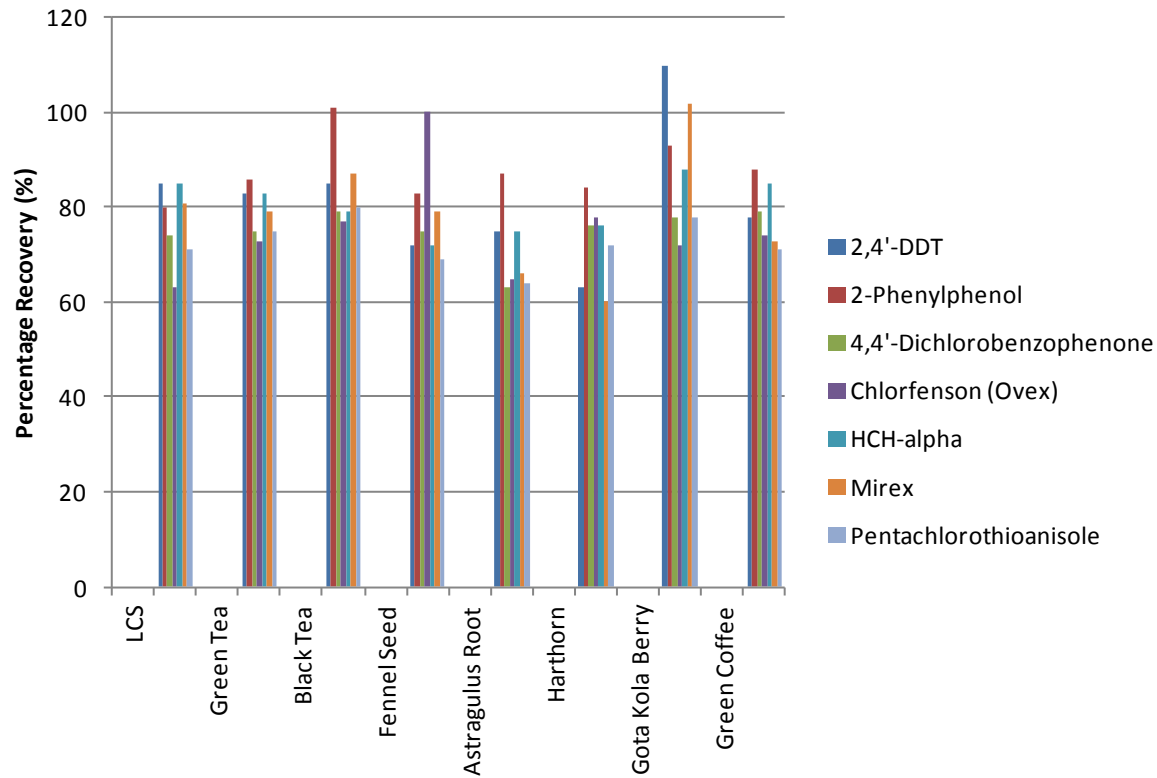
# Pyrethroid Pesticides



# Organonitrogen Pesticides

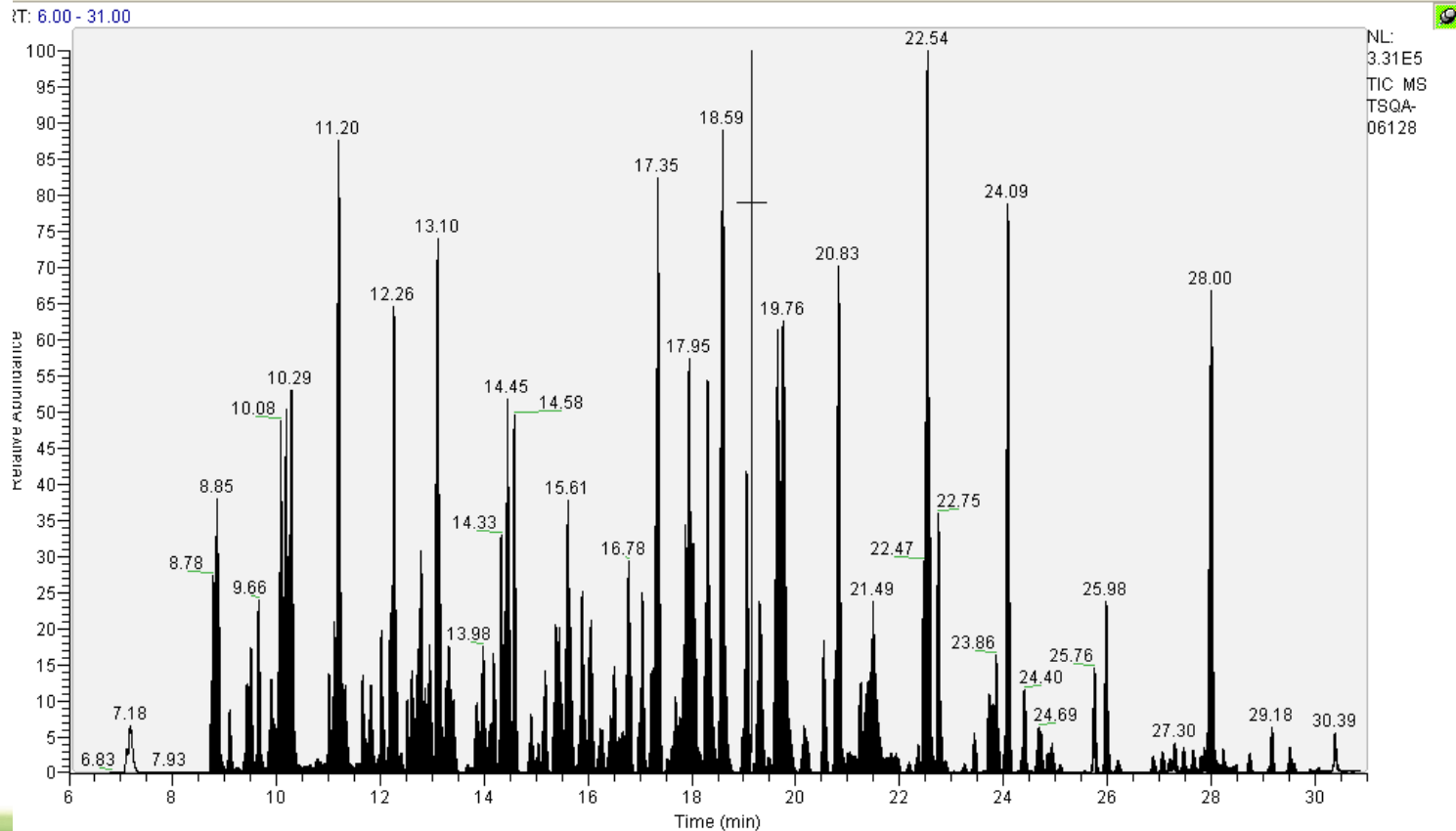


# Organochlorine Pesticides & Methylated Herbicides



# Results

## TIC of Spiked Green Tea Extract from the PLE w/In-Cell Clean-up



# PLE for the Analysis of Pesticides

- High Throughput Pesticide Analysis
  - 20 minutes per run up to 24 samples per hour
  - 192 samples per 8 hour Shift
- One Extraction Method for all Matrices
- One/Same Extraction for GC/MS and LC/MS analysis
- Eliminate Manual Steps and Human Error
  - Automated Extraction and Cleanup





- Using the PLE®
  - Sample Prep processes are combined into one step
    - Extraction
    - Cleanup
  - Put the sample in get it out and directly inject it
  - Consistent, Reproducible, Results
  - Increased productivity



- Faster and easier operator training
- Automatic documentation of extraction and cleanup and concentration conditions
- Reduced errors due to mistakes eliminating manual steps and conditions.
- Reduced solvent usage and disposal costs.

