BACKGROUND INFORMATION

- **Chlorpyrifos**: organophosphate insecticide commonly used (Britton et al. 2016)
- Acetylcholinesterase inhibitor
- Acetylcholine is a neurotransmitter that can overstimulate the nervous system if not inhibited
- **Symptoms**: Seizures, fatal paralysis, and cell failure
- The US, European Union, Brazil, and China are the four regions that produce the most agricultural pesticides and agriculture in the world.
  - US coming in second just after China
  - Common targets in US: alfalfa (Ellsworth et al. 2016), kale, strawberries, and pepper variants such as spicy peppers (USDA 2019)
  - Pesticide regulation is getting better in the US, but other countries may be unregulated
- Chlorpyrifos: 5.25% usage rate in Mexico in 2018 (Gonzalez et al. 2018)
- **Continued ingestion** may lead to aggregate organophosphate buildup (Pang et al. 2002)
- As such, we researched pesticide residues on jalapeño peppers (Capsicum annuum) grown in Mexico & sold in AZ, concentrating on Chlorpyrifos
- This resulted in a student-led method development for residue extraction and organic compound cleanup

HYPOTHESES

- If pesticide isn’t water soluble, then pesticide residues are more likely to be on the outside of the sample than in the internal tissue.
- Jalapeños will have chlorpyrifos residue less than or equal to the regulation cut off of the EPA (1 ng/mL), because they’re being imported and sold in the US.

METHOD DEVELOPMENT OF RESIDUALS ON JALAPEÑOS

Miguel Karlo Dote, Symone Griffith, & Dr. Karen H. Watanabe

METHODOLOGY

- **Surface Wash with Acetonitrile**
- **Homogenization with Quechers (AOAC Method)**
- **Activated Charcoal Pigment Cleanup**
- **Nitrogenous Evaporation**
- **Surface Wash**
- **Evaporation**
- **Calibration Curve Dilutions**
- **GC-MS Analysis**

RESULTS

- The outer washes of the pepper did not show any peaks other than the recovery standards
- Chlorpyrifos was not significantly found internally or externally
- Most prominent chemicals found in extracts included waxes and capsaicin
- All market sources were identical under GC-MS analysis (Fry’s, Safeway, Sprouts, Whole Foods)
- Experiment requires further method development: removal of pigment, analyte recovery, and process streamlining

DISCUSSION

- **Sample choice** shifted due to pepper availability: study dependent on season and domestic farming areas
- Method development became essential to process, given student-directed experimental design, with additions such as:
  - Washing the exterior of the pepper with acetonitrile
  - Using activated charcoal as a means to remove pigment from prepared sample containing the analyte
- Upon further experimentation, activated charcoal was effective in removing pigment from homogenous samples
- However, after running said samples in the GC/MS it was found that the recovery rate was significantly reduced
  - From ~65% to ~15% chlorpyrifos
- **Further research** will be conducted in the fall to shift focus from a single pesticide to a multi-residual pesticide study

**Table 1**: Values of chlorpyrifos detected for each sample, calculated using a calibration curve and approximated to the hundredths. Samples labelled “spiked” were spiked with chlorpyrifos as a positive control.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Chlorpyrifos Detected (ng/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-WF1 Charcoal (Treated)</td>
<td>4.41</td>
</tr>
<tr>
<td>-WF1 No Charcoal (Treated)</td>
<td>4.41</td>
</tr>
<tr>
<td>-WF2 Pre-test</td>
<td>4.41</td>
</tr>
<tr>
<td>-BF1</td>
<td>0</td>
</tr>
<tr>
<td>-BF2</td>
<td>0</td>
</tr>
<tr>
<td>-BF3</td>
<td>0</td>
</tr>
<tr>
<td>-BF3 (Treated)</td>
<td>0</td>
</tr>
<tr>
<td>-BF4</td>
<td>0</td>
</tr>
<tr>
<td>-BF5</td>
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<td>-BF8</td>
<td>0</td>
</tr>
<tr>
<td>-BF9</td>
<td>0</td>
</tr>
</tbody>
</table>

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CITATIONS

Full Protocol