Overview of California Pesticide Residue Monitoring Program

Presentation at the Pesticide Registration and Evaluation Committee Meeting
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Outline

- History of Pesticide Residue Monitoring in California
- Program Targets & Goals
- Sampling and Laboratory Analyses
- Pesticide Residues and Tolerances
- 2016 Pesticide Residue Monitoring Results
- Consequences of Illegal Residues
- Organic samples
- Glyphosate Pilot Project
History of CA Pesticide Residue Monitoring Program
History of CA Pesticide Residue Monitoring Program

1926 – California began analyzing small quantities of produce in response of threat of British embargo

1927- Chemical Spray Residue Act

- Illegal to Pack, Ship or Sell
- Established a spray residue monitoring program
- US Bureau of Chemistry set 1st federal tolerances
History of CA Pesticide Residue Monitoring Program

1940s - California’s Residue Monitoring Program expanded to include synthetic pesticides such as DDT.

1953 - California Legislature amended the Spray Residue Act to cover grains fed to poultry and livestock.

July 1985 - Widespread illnesses reported in consumers of California-grown watermelons.
1989 - 12,500 produce samples collected and analyzed (peak year for sampling).

1991 - Cal EPA was formed. The Department of Pesticide Regulation was created. CDFA contracts with DPR for analytical services.
History of CA Pesticide Residue Monitoring Program

2012 - CDFA implemented LC-MSMS & GC-MSMS pesticide residue screens.

2018 - CDFA laboratories analyze more than 400 pesticide compounds
Pesticide Residue Monitoring Today
Program Targets & Goals

Monitor pesticide residues in fresh produce throughout the California food supply

- Fruits and vegetables highly consumed by children

- Select commodities and sampling sites to reflect differences in consumption patterns among ethnic and socioeconomic groups.

- Select commodities treated with pesticides listed as carcinogens and reproductive toxicants.
Program Targets & Goals

- Sample fruit and vegetables that have higher incidences of illegal residues
- Generate residue data to help with dietary risk assessments
- Help keep produce with illegal residues out of the marketplace
Sampling

California Pesticide Residue Monitoring Program
Sampling Locations

DPR staff collect samples “throughout the channels of trade”: • Wholesale and retail outlets
• Distribution centers
• Farmers’ markets
Sampling Produce

We test “produce” in its raw or natural state intended for consumer use without any or further processing.
Strawberries are hulled

Bananas analyzed with peel but ends removed

Pits and seeds are removed

Tea leaves are not analyzed because they are considered ‘processed’ because they are dried
DPR Delivers Samples to CDFA Lab
DPR contracts with the California Department of Food & Agriculture to analyze ~3600 samples yearly
California Department of Food & Agriculture Laboratories

Sacramento Lab

Anaheim Lab
Samples are Prepared For Analysis
Sample Analysis

- Pesticides Detected using LC/MSMS & GC/MSMS
- > 400 Residues in Multi-Residue Screen
Residues and Tolerances

Residue = actual amount of pesticide detected

Tolerance = maximum amount of residue allowed
(most countries call “MRL”)

- Tolerances are set by U.S. EPA and published in the Code of Federal Regulations (title 40, part 180)

- U.S. EPA establishes a tolerance for a particular pesticide on a particular food crop before California approves the use of that pesticide on that crop.
Illegal Residues

- Over Tolerance (OT)
- No Tolerance Established (NTE)
2016
DPR Pesticide Residue Monitoring Results
2028 Samples had Legal Residues
1408 Samples had No Residues
149 Samples had Illegal Residues

Sampling in 2016

- 39% of samples had Legal Residues
- 57% of samples had No Residues
- 4% of samples had Illegal Residues

n = 3,585
96% of the Produce Tested had Legal or No Residues Detected
% of Domestic & Imported Sampled

- Number of Domestic Samples Tested (2228) - 62%
- Number of Imported Samples Tested (1320) - 37%
- Number of Undetermined Origin (37) - 1%

n = 3,585
### Domestic Numbers

<table>
<thead>
<tr>
<th>State of Origin</th>
<th>Number of Samples Tested</th>
<th>State's % of Total Domestic</th>
<th>Number of Commodities Sampled</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>1253</td>
<td>56.2%</td>
<td>120</td>
</tr>
<tr>
<td>CA</td>
<td>869</td>
<td>39.0%</td>
<td>108</td>
</tr>
<tr>
<td>WA</td>
<td>65</td>
<td>2.92%</td>
<td>15</td>
</tr>
<tr>
<td>HI</td>
<td>15</td>
<td>0.63%</td>
<td>5</td>
</tr>
<tr>
<td>OR</td>
<td>7</td>
<td>0.31%</td>
<td>6</td>
</tr>
<tr>
<td>AZ</td>
<td>4</td>
<td>0.18%</td>
<td>2</td>
</tr>
<tr>
<td>FL</td>
<td>4</td>
<td>0.18%</td>
<td>4</td>
</tr>
<tr>
<td>ID</td>
<td>4</td>
<td>0.18%</td>
<td>1</td>
</tr>
<tr>
<td>TX</td>
<td>3</td>
<td>0.13%</td>
<td>2</td>
</tr>
<tr>
<td>GA</td>
<td>2</td>
<td>0.09%</td>
<td>2</td>
</tr>
<tr>
<td>MI</td>
<td>1</td>
<td>0.04%</td>
<td>1</td>
</tr>
<tr>
<td>WI</td>
<td>1</td>
<td>0.04%</td>
<td>1</td>
</tr>
</tbody>
</table>

Samples tested labeled as Product of US with no specific state origin notated.
## Import Numbers

<table>
<thead>
<tr>
<th>Country of Origin</th>
<th>Number of Samples Tested</th>
<th>Country's Percentage of Total Imports Sampled</th>
<th>Number of Different Commodities Sampled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico</td>
<td>805</td>
<td>61.0%</td>
<td>83</td>
</tr>
<tr>
<td>China</td>
<td>115</td>
<td>8.7%</td>
<td>12</td>
</tr>
<tr>
<td>Chile</td>
<td>88</td>
<td>6.7%</td>
<td>14</td>
</tr>
<tr>
<td>Ecuador</td>
<td>64</td>
<td>4.8%</td>
<td>3</td>
</tr>
<tr>
<td>Peru</td>
<td>56</td>
<td>4.2%</td>
<td>10</td>
</tr>
<tr>
<td>Guatemala</td>
<td>45</td>
<td>3.4%</td>
<td>9</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>43</td>
<td>3.3%</td>
<td>9</td>
</tr>
<tr>
<td>New Zealand</td>
<td>17</td>
<td>1.3%</td>
<td>3</td>
</tr>
<tr>
<td>Vietnam</td>
<td>15</td>
<td>1.1%</td>
<td>2</td>
</tr>
<tr>
<td>Brazil</td>
<td>12</td>
<td>0.9%</td>
<td>3</td>
</tr>
<tr>
<td>Canada</td>
<td>12</td>
<td>0.9%</td>
<td>4</td>
</tr>
<tr>
<td>Italy</td>
<td>10</td>
<td>0.8%</td>
<td>1</td>
</tr>
</tbody>
</table>

Number of samples tested > 10
US Agricultural Import Numbers¹

- **Mexico is the largest supplier of agricultural products into the United States**
  
  Fresh fruits & vegetables 10.5 billion dollars

- **China is our 3rd largest supplier of agricultural imports.**
  
  Fresh vegetables 205 million dollars

- **Chile is our 9th largest supplier of agricultural imports**
  
  Fresh fruits 1.9 billion dollars

* agricultural imports include fresh fruits & vegetables, processed fruit & vegetables, fruit & vegetable juices, snack foods, tea, wine & beer, meats & live animals

¹Office of the United States Trade Representative, https://ustr.gov/countries-regions/americas/canada
238 illegal Residues were found on 149 Samples

109 Samples had No Tolerance Established

20 Samples had Over Tolerances

20 Samples had both NTE & OT residues

n = 149
Sampling in 2016

% of Foreign & Domestic Samples with Illegal Residues

- Number of Domestic Grown Samples with Illegal Residues (47)
- Number of Imported Samples with Illegal Residues (99)
- Number of Samples with Illegal Residues from Unknown Origins (3)

n = 149
## Commodities with Highest Frequency of Illegal Residues

<table>
<thead>
<tr>
<th>Commodity &amp; Origin</th>
<th>Number of Illegal Samples</th>
<th>Total Number Sampled</th>
<th>% Illegal</th>
</tr>
</thead>
<tbody>
<tr>
<td>LONGAN</td>
<td>10</td>
<td>12</td>
<td>83%</td>
</tr>
<tr>
<td>OTHER TROPICAL FRUIT</td>
<td>4</td>
<td>7</td>
<td>57%</td>
</tr>
<tr>
<td>LITCHI NUTS</td>
<td>6</td>
<td>13</td>
<td>46%</td>
</tr>
<tr>
<td>CACTUS PADS</td>
<td>7</td>
<td>28</td>
<td>25%</td>
</tr>
<tr>
<td>PEA, SNOW</td>
<td>7</td>
<td>37</td>
<td>19%</td>
</tr>
<tr>
<td>GINGER ROOT</td>
<td>9</td>
<td>62</td>
<td>15%</td>
</tr>
<tr>
<td>CACTUS PEAR</td>
<td>2</td>
<td>14</td>
<td>14%</td>
</tr>
<tr>
<td>TOMATILLO</td>
<td>8</td>
<td>68</td>
<td>12%</td>
</tr>
</tbody>
</table>
## Commodities with Highest Frequency of Illegal Residues

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Total # Collected</th>
<th>Total # Illegal</th>
<th>% Illegal</th>
<th>Illegal Samples Country of Origin</th>
<th>Legal Samples Country of Origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>LONGAN</td>
<td>12</td>
<td>10</td>
<td>83%</td>
<td>VN (10)</td>
<td>US (1); VN(1)</td>
</tr>
<tr>
<td>OTHER TROPICAL FRUIT</td>
<td>7</td>
<td>4</td>
<td>57%</td>
<td>VN (4)</td>
<td>GU (1); ME (2)</td>
</tr>
<tr>
<td>LITCHI NUTS</td>
<td>13</td>
<td>6</td>
<td>46%</td>
<td>CN (6)</td>
<td>ME (5); US (2)</td>
</tr>
<tr>
<td>CACTUS PADS</td>
<td>28</td>
<td>10</td>
<td>36%</td>
<td>US (2); ME (7); Unk (1)</td>
<td>ME (16); UNK (2)</td>
</tr>
<tr>
<td>PEA, SNOW</td>
<td>37</td>
<td>11</td>
<td>30%</td>
<td>GU (7); PE (4)</td>
<td>US (6); GU (9); ME (7); PE (4)</td>
</tr>
</tbody>
</table>
Penalties Associated with Illegal Residues

- Quarantine and remove contaminated produce from sale in California.  
  (loss of the value for that produce)

- Publish results annually on DPR website  
  (potential loss of customers)

- Levy civil penalties against repeat offenders  
  (4 separate fines totaling $45,000 in 2016; 1 CA-based grower and 3 importers)
Enforcement Actions on CA Grown Produce

▪ DPR Contacts the Agricultural Commissioner’s Office in County where commodity is grown and provides any information it knows about the source of the commodity.

▪ County will investigate to determine whether residue is the result of a misapplication or drift.

▪ Could result in destruction of crop, stop harvest of crop remaining in the field and/or civil penalties.
Organic Produce

Certified organic produce may have residues of pesticides less than 5% of the U.S. EPA tolerance for that commodity (Code of Federal Regulations, Title 7, Part 205.671).
Organic Produce

Results for Organic Samples 2016

- **8.8%**: No Pesticide Residues Detected
- **3.4%**: Residues Acceptable Under CDFA Organic Program Guidelines
- **1.4%**: Residues Acceptable Under Conventional Guidelines
- **87.2%**: Illegal Pesticides Residues Detected

\( n = 148 \)
### Organic Produce

#### Illegal Organic Produce

<table>
<thead>
<tr>
<th>Origin</th>
<th>Commodity</th>
<th>Pesticide</th>
<th>Residue (ppm)</th>
<th>Tolerance (ppm)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA</td>
<td>CILANTRO</td>
<td>DDE</td>
<td>0.02</td>
<td>.............</td>
<td>NTE</td>
</tr>
<tr>
<td>CA</td>
<td>CARROTS</td>
<td>Heptachlor Epoxide</td>
<td>0.017</td>
<td>0.01</td>
<td>OT</td>
</tr>
</tbody>
</table>
Organic Produce

Origins of Organic Produce

- Imported (32) 22%
- Other US Grown* (60) 40%
- California Grown (56) 38%

Total Organic Samples in 2016

*Samples tested labeled as Product of US with no specific state origin notated.

n = 148
DPR Pilot Study

Glyphosate Pilot Study

- July 2016 - June 2017, DPR specifically sampled produce for glyphosate
- 308 Total Samples Analyzed
- 52 different
- Targeted sampling on:
  - corn (38)
  - sweet potato (39)
  - carrot (41)
  - green beans (33)
DPR Pilot Study

Glyphosate Data

- Samples with No Glyphosate Residues Detected
- Legal Glyphosate Residues Found
- Illegal Glyphosate Residues Found

Number of Illegal Glyphosate Residues Found, 0%

n = 308
## DPR Pilot Study

### Samples with Detected Glyphosate Residues

<table>
<thead>
<tr>
<th>Sample Date</th>
<th>Commodity</th>
<th>Origin</th>
<th>Residue Level (ppm)</th>
<th>US EPA Tolerance (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/10/16</td>
<td>SWEET POTATO</td>
<td>1CA</td>
<td>0.052</td>
<td>3.0</td>
</tr>
<tr>
<td>11/14/16</td>
<td>CACTUS PADS</td>
<td>2ME</td>
<td>0.030</td>
<td>0.5</td>
</tr>
<tr>
<td>03/06/17</td>
<td>ASPARAGUS</td>
<td>2ME</td>
<td>0.064</td>
<td>0.5</td>
</tr>
<tr>
<td>05/08/17</td>
<td>TANGERINE</td>
<td>1US</td>
<td>0.010</td>
<td>0.5</td>
</tr>
</tbody>
</table>
Any questions

Results available at:  
http://www.cdpr.ca.gov

Click on “A-Z Index”, “Residue Monitoring Program”

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