

Pesticides in Food - What is the Real Story

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Slide 1: Pesticides in Food

Developed by Chris DiFonzo. Pesticide Education Coordinator and Field Crops Entomologist. Michigan State University. Based on USDA's PDP reports from 1993-1996.

Slide 2: A **quick quiz** before we begin.... [answers will be found throughout the presentation]

Slide 3: MSU Survey

Survey from Eileen van Ravenswaay, 1992, Michigan State University. 68% of consumers said they take residues into consideration when buying produce (although how they would know the residue content is a mystery!). Also, van Ravenswaay's survey found that 40% of people surveyed believed the risk of pesticide residues in food outweighs the risk of eating a healthy diet of fresh fruits and veggies. By this line of reasoning, eating a Twinky is safer than eating an orange!

Slide 4: Who tests for pesticides in food?

Since 1991, the USDA has run the Pesticide Data Program, PDP. The PDP food sampling program targets food from terminal locations, such as grocery stores and markets. The actual food sampling and laboratory testing is done by cooperating state departments of agriculture.

Slide 5: The PDP program provides info on

- the frequency of residues detection, ie. how often residues are found;
- the number and types of different pesticides detected;
- how much residue is present.

Slide 6: PDP sampling is done annually in 9 states.

These states are geographically spread around the U.S., and include states with the highest crop diversity (CA, FL, MI, WA). Over 50% of the U.S. population lives in these 9 states.

Slide 7: Sampling scheme

Samples are taken in grocery stores and terminal markets, and shipped to cooperating laboratories. There the samples are examined, prepared to mimic the minimum a consumer might do (for example, peeling bananas, or pitting peaches), homogenized, and then tested for pesticides.

Slide 8: What types of food items are tested?

The pictures show the fruits and veggies tested in the PDP program over the past several years. Wheat, milk, and processed vegetables have also been tested in certain years, but the majority of samples are of fresh produce.

Slide 9: Where do samples come from?

All over the world. Each year, approximately 85% of the samples are domestic and 15% from other countries, including Canada, Mexico, Central and South America, Europe, Israel, South

Africa, Thailand, Australia, and New Zealand. Sampling produce from many countries allows the PDP to make comparisons of domestic and imported food.

Slide 10: What sorts of pesticides does PDP look for in food samples?

Many common pesticides, like Guthion and malathion, are tested for under PDP each year. Metabolites - break down products of pesticides - are also tested for in certain cases. DDD and DDE, for example, are metabolites of DDT. Other pesticides may be targeted for testing in a given year because of Section 18s or considerations by EPA. In total, PDP looks for several hundred residues each year, with an obvious emphasis on insecticides (which usually show greater human toxicity than other types of pesticides).

Slide 11: So, what does the PDP find out about the frequency of pesticide residues in food?

Data from 1994 is shown to illustrate the % of samples with residue for a number of commodities. Notice that processed corn and peas have a much lower frequency of samples with detected residue, because processing reduces the amount present.

Slide 12: PDP Results

For the years 1993-96, the % of produce samples with at least one residue remained very similar, between 69 and 70%. In other words, about 2/3 of fruit and veggie samples in the PDP program have at least one residue detection. The sample size for each year follows the "n". Laboratories test thousands of PDP samples each year. The number of different residues detected each year (x) also was quite similar from year to year, between 58-69 different compounds.

Slide 13: What foods in the PDP have the most detections?

Year after year, apples, peaches, and celery have over 90% of samples with at least one residue. Residues on apples and peaches may be accounted for by late season sprays for insects (consumers don't like wormy apples).

Slide 14: How many different kinds of residues are found? (1994 data illustrates)

Within a given commodity, many different pesticides are usually detected. Apples and peaches again exhibit a large number of residues. Spinach (not tested in 1994) also generally shows a large number of residues. Note that processing reduces residue numbers by several fold.

Slide 15: Exactly what types of residues are found?

Interestingly, pesticides applied post harvest are very common. Such products include fungicides used to protect produce in storage, and growth regulators like chlorpropham, applied to potatoes to prevent sprouting in storage. 20-30% of all residues detected in the PDP program are from post-harvest applications.

Slide 16: Common detections

Data from 1996 is used to illustrate some of the other commonly detected pesticides in PDP. Common and trade names are listed. Pictures indicate the crops these residues are most often found. Common detections include insecticides (Orthene, Guthion, Sevin, Lorsban, Cygon, Monitor, permethrin), a miticide (propargite), fungicides (captan, iprodione), and a herbicide (Treflan). Residues are found particularly on apples, peaches, grapes, and spinach.

Slide 17: Levels of DDT

DDT and its metabolites are found each year in the PDP; detections range from 5.5 to 11.0% of the samples testing positive for DDT, DDD, or DDE residue in 1993-1996. Crops grown in or on the ground, like carrots, potatoes, and spinach, tend to have more DDT residue. Samples of these crops in the PDP program were domestic, not imported. Thus DDT sprayed in the U.S. in the 1950s and 60s is still present in the food chain in the 90s. While there are likely imported sources of DDT in our diet, there is plenty of DDT right here at home to contribute to residues.

Slide 18: Wheat Sampling

Wheat is the only field crop tested in the PDP program from 1993-1996. Wheat samples were taken from across the U.S. The samples were ground, then tested for residue.

Slide 19: Wheat results

In 1995, 79% of the 600 wheat samples had residue, and in 1996, 91% of 340 samples. Detections include fungicides, herbicides, and insecticides.

Slide 20: Common wheat detections

However, the majority (> 90%) of pesticides detected are insecticides. Lorsban is used in the field, and was found in 14-19% of the samples. Reldan and malathion are post-harvest insecticides applied to wheat in storage to protect the grain from infestation by a number of insects such as weevils and grain beetles. Post-harvest applications are particularly made in the southern U.S. , where higher temperatures favor insect infestation and reproduction in bins. Post-harvest applications do not have the chance to break down in UV light, and are made closer to the time of processing than applications made during the field season. Thus it makes sense that Reldan and malathion is detected on wheat coming from storage. Note that the wheat tested in the PDP was simply ground, and was not cooked or baked in any way. We would expect residues to be less or none in flour and in baked goods.

Slide 21: Pesticide residues were also found in milk tested in the PDP in 1996.

About 18% of the 575 samples had a residue. DDE was found in 17% of the samples. Diclorvos, an insecticide often used in cow ear tags to control flies, was also found, as well as several fungicides likely applied post harvest to grain fed to cows.

Slide 22: Pesticide residues are indeed present in fresh produce, wheat, & milk. Is this a concern?

The Environmental Protection Agency (EPA) is the federal agency responsible for regulating pesticides. EPA sets tolerances for pesticide residues on crops , i.e. legal maximum limits for residue on a crop. Tolerances are based on review of health, safety, and exposure data, and now under FQPA, are supposed to provide a “reasonable certainty that no harm will result from aggregate exposure”. There are 2 kinds of violations of the legal tolerance that can occur. 1) no tolerance = a pesticide is found on crop for which it is not registered. This can occur from drift, not cleaning the spray tank well between applications, crop rotation (the pesticide is in the soil from a previous application), or because of an intentional illegal application. Imported samples can also contain residues of products not registered in the U.S. 2) over tolerance = the pesticide is registered for the crop, but the residue found exceeds the tolerance. The later violation is more

serious because the amount of residue exceeds a safety threshold; PDP is particularly interested in this type of violation.

Slide 23: Violations

Between 1993-1996, over 96% of the samples taken in the PDP had no residue, or residue below the tolerance. About 1-4% of samples have residues for which there is no tolerance. Generally, although these samples are technically in violation, the amount of residue is small, and below the tolerances set on other crops. The more important violation is residue above the tolerance. Year after year, 0.1% of samples (about 1 in a 1000) have more than the legal limit of residue. Remember - this is before processing, cooking, or other activities that reduce residue amounts.

Slide 24: Most violations

Which crops have the most violations? In the years in which it was tested, spinach accounted for over 50% of the violations. [this makes you wonder about Popeye....]. Spinach apparently picks up many pesticides from the soil. Other crops with high numbers of violations are potatoes and carrots (again, root crops in contact with the soil) and grapes, apples, and peaches which may be sprayed later into the season to protect against insect infestation, or with fungicides for storage.

Slide 25: What about domestic food versus imported food?

PDP routinely tried to take 15-20% imported samples each year. Between 1993-1996, the total violation rate for samples from the U.S. versus the rest of the world was remarkably similar, within several percentage points of each other. Thus, at least in this USDA program, imported produce does not contain more or different pesticides than homegrown fruits and vegetables. Much of the produce coming into the U.S. from abroad is grown by large companies like Del Monte and Dole. These companies are quite aware of pesticide regulations in the U.S. and Europe, and adjust their production practices accordingly.

Slide 26: Another federal program that tests food is the FDA's Total Diet Study.

The TDS is unique because it examines residues before and after processing. It actually prepares food samples in a kitchen to simulate a consumer.

Slide 27: TDS Results

Between 1987 and 1991, for example, the TDS tested over 38,000 domestic and 49,000 imported food samples for residue. The study found that 2/3 of samples (white) had no detectable residue. About 1/3 of samples (yellow) had at least one detection. The violation rate (red) was 1% for domestic and 4% for imported produce, i.e. similar.

Slide 28: Residue reduction

The Total Diet Study also allows us to see reductions in residues from various activities. For example, shipping produce reduced residue by 14% in peppers and 86% in celery, simply because of handling the produce and increasing time to its destination. Trimming (for example, removing outer leaves of cabbage) and washing also reduce residue. Finally, processing - for example, baking, freezing, or canning, further break down or remove residues.

Take Home Lessons from federal food testing data:

- Residues are found on 2/3 of the PDP samples versus 1/3 of the TDS samples. Remember, the PDP samples are the “worst case”, taken directly from a store and tested for residue. TDS samples are handled and processed to simulate consumer preparation before eating.
- Many of the residues on food represent post-harvest applications, applied as produce or grain enters storage. These products are necessary to prevent insect infestation or spoilage in storage. But the residues do not have the opportunity to break down as quickly, and thus are still present at the grocery store.
- Although many residues are found, the majority (>96%) are below - often many times below - EPA’s tolerance; however, 1-4% of the samples do violate a tolerance, usually by the detection of an unregistered product in the sample.
- Any kind of handling or processing reduces residue. Thus residue levels at the point of consumption are usually far less than residues directly after harvest
- Imported samples DO NOT violate U.S. pesticide tolerances at a greater frequency than domestic samples.