


# Pesticides in food



# Super-Duper Quiz

1. Who tests for pesticide residues in food?
2. What percent of produce has pesticide residues?
3. Which specific item tests positive most frequently?
4. Is DDT still in your food? If so, from where??
5. How does residue on imported produce compare with residue on domestic produce?

# What do consumers take into consideration when selecting produce?\*

appearance	97%
freshness	96%
price	70%
 pesticide residues	68%
nutrition	66%
shelf life	60%
convenience	51%
calories	26%
organic	22%
brand name	10%

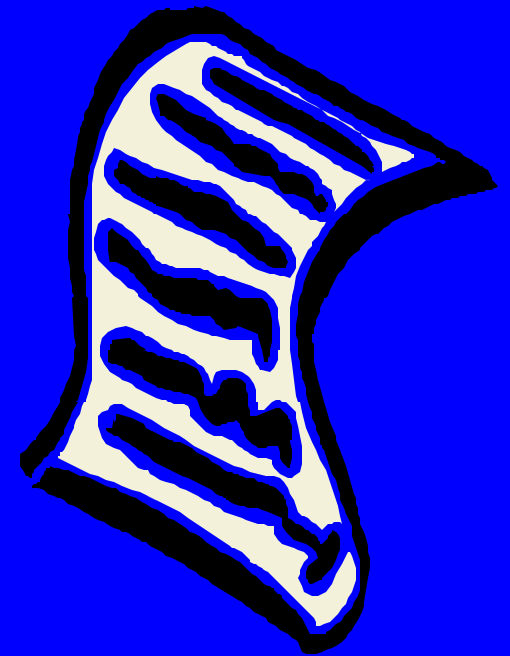
\* van Ravenswaay, 1992 survey

**40%** of people believe  
the risk of pesticide residues in food  
outweighs the health benefits  
of eating fresh fruits & vegetables.

**the**  
**Food Quality Protection Act of 1996**  
**has renewed interest in the**  
**amount of pesticide residue in food**

**real residue data is needed  
to model or make decisions about:**

- **kids safety factors**
- **aggregate exposure**
- **retaining/ eliminating products**
- **Section 18s**
- **changing use patterns**
- **finding alternatives**



# Pesticide Data Program PDP

- USDA-funded program (1991)
- target = food from *terminal locations*
- actual sampling/ testing done by cooperating Departments of Ag



**for a given commodity,  
PDP provides information on:**

- **frequency of residues**

**how often are residues found**

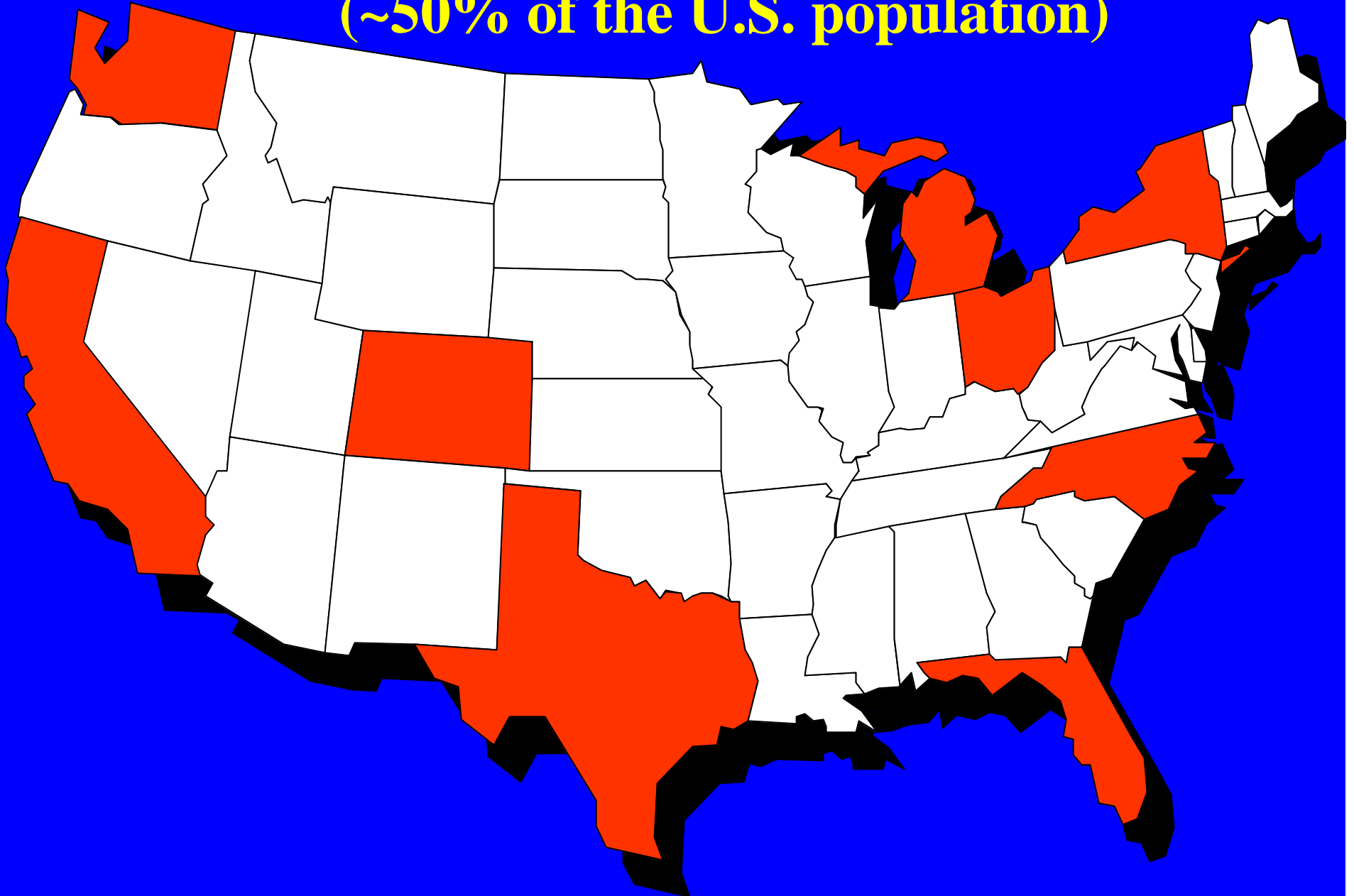
- **kinds of residue**

**# & types different pesticides detected**

- **level of residue**

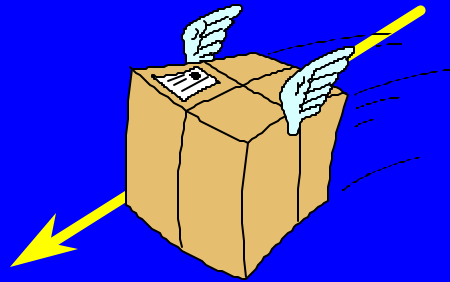
**how much is there**

**Nine states participate in PDP  
(~50% of the U.S. population)**



# Sampling Protocol

large grocery stores  
terminal markets



Department of Ag  
laboratories

examination of samples

preparation to mimic consumer

washing: fruits, vegies

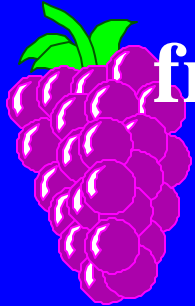
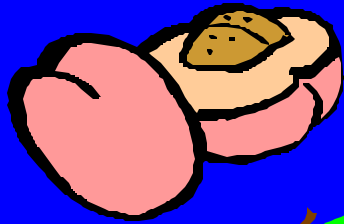
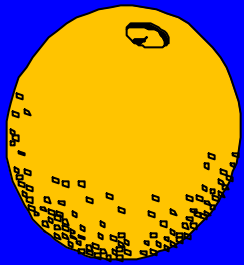
peeling: bananas, oranges

coring: apples, peaches

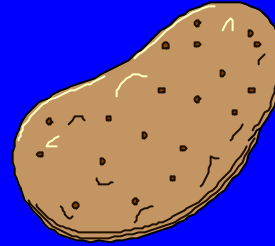
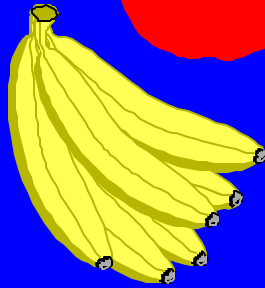
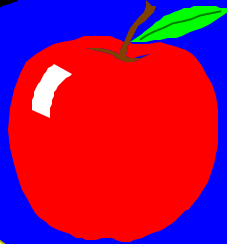
grinding: wheat

homogenization

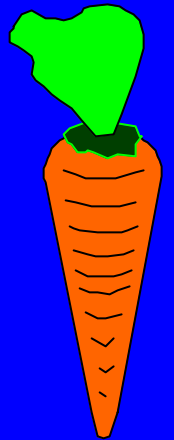
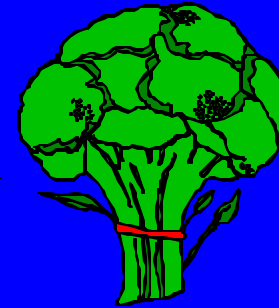
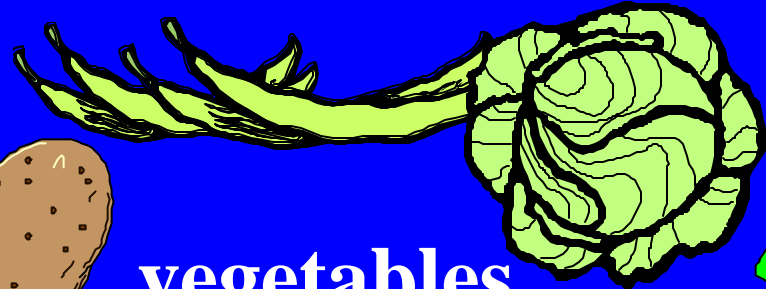
# Foods tested in the PDP



fruit



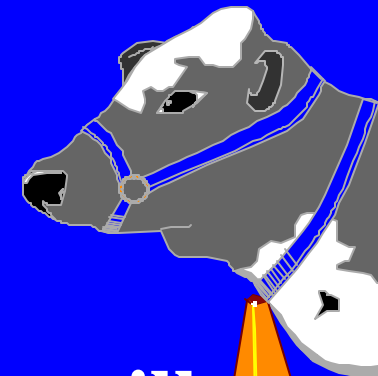
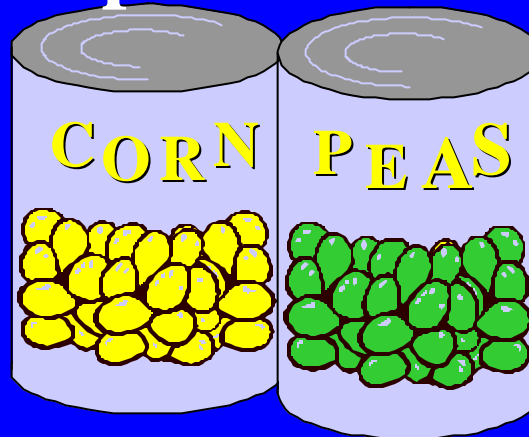
vegetables



wheat



processed



milk

**PDP samples both domestic and imported produce  
(usually ~ 85% U.S. / 15% import)**



## **Pesticides tested for under PDP**

- **50-70 standard pesticides**

**ex: chlothalonil, Guthion, malathion**

- **metabolites**

**ex. DDD, DDE**

- **various targeted pesticides**

**ex. benomyl on apples**

**abamectin on oranges**

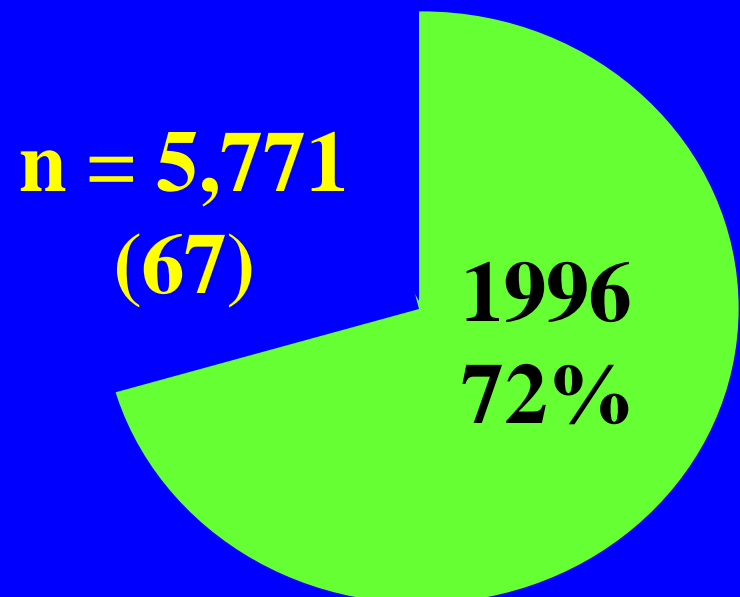
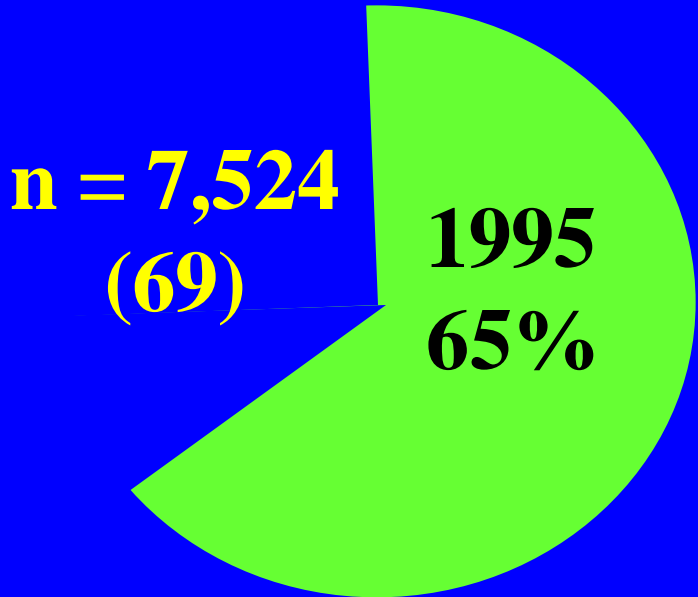
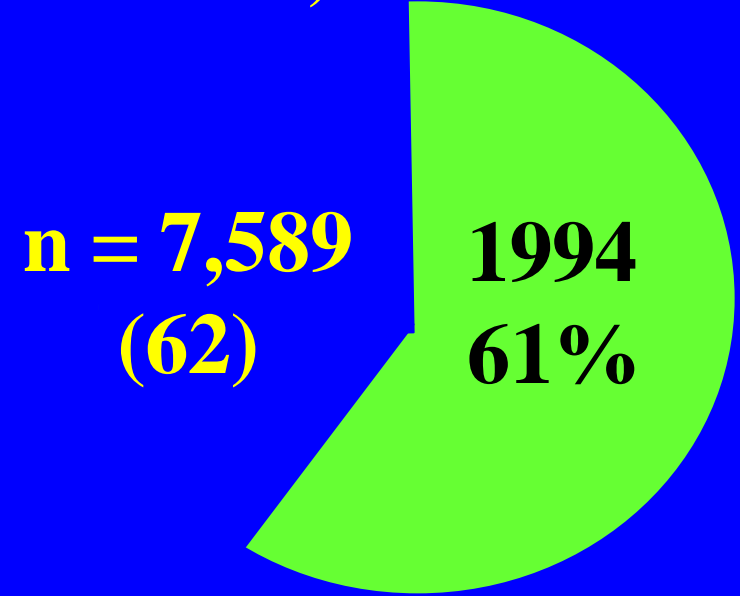
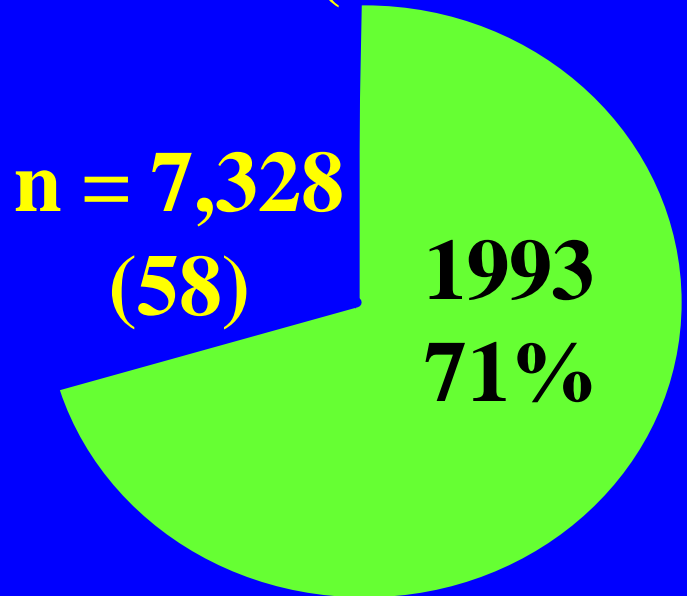
- *may test for up to several hundred compounds*
- *obvious emphasis on insecticides*

## **Residue frequency**

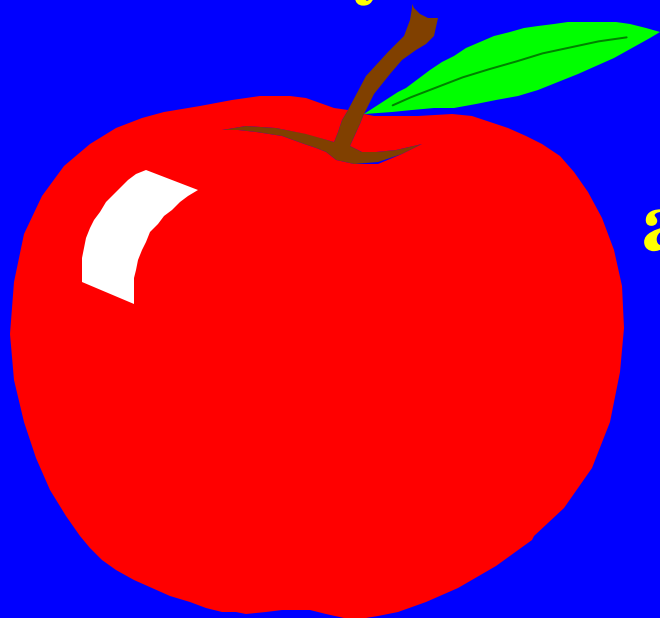
**PDP data, 1994**

<b><u>Commodity</u></b>	<b><u>% samples w/ residue</u></b>
<b>apples</b>	<b>95</b>
<b>bananas</b>	<b>55</b>
<b>broccoli</b>	<b>26</b>
<b>carrots</b>	<b>69</b>
<b>celery</b>	<b>96</b>
<b>grapes</b>	<b>75</b>
<b>green bean</b>	<b>61</b>
<b>lettuce</b>	<b>53</b>
<b>oranges</b>	<b>86</b>
<b>peaches</b>	<b>93</b>
<b>potato</b>	<b>78</b>
<b>corn - processed</b>	<b>&lt;1</b>
<b>peas - processed</b>	<b>10</b>

# Percent of samples with at least 1 residue (# different residues detected)



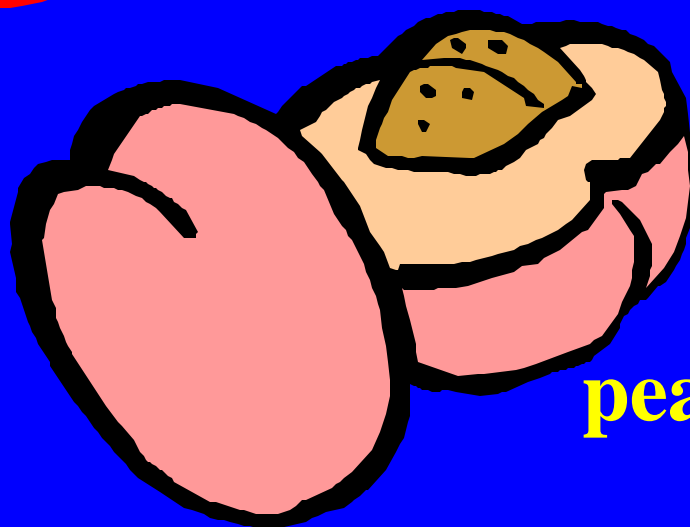
**Crops with highest frequency of residues**  
**- consistently over 90% of samples have residue**



**apples**



**celery**



**peaches**

## **Kinds of residues**

**PDP data, 1994**

<b><u>Commodity</u></b>	<b><u># of different residues</u></b>
<b>apples</b>	<b>29</b>
<b>bananas</b>	<b>2</b>
<b>broccoli</b>	<b>12</b>
<b>carrots</b>	<b>23</b>
<b>celery</b>	<b>16</b>
<b>grapes</b>	<b>29</b>
<b>green bean</b>	<b>28</b>
<b>lettuce</b>	<b>17</b>
<b>oranges</b>	<b>18</b>
<b>peaches</b>	<b>30</b>
<b>potato</b>	<b>24</b>
<b>corn - processed</b>	<b>2</b>
<b>peas - processed</b>	<b>8</b>

# Post-harvest residues

tend to be very common

## fungicides:

dicloran (Botran, DCNA)

diphenylamine (No-Scald)

imazalil

thiabendazole (Arbotec, TBZ)

## growth regulators:

chlorpropham (Sprout-Nip)

**20-30% of all PDP residue detections  
are post-harvest products**

## Other commonly detected pesticides: (>10% of crop)

acephate

azinphos methyl

captan

carbaryl

chlorpyrifos

dimethoate

iprodione

methamidophos

permethrin

propargite

trifluralin

Orthene

Guthion

(many)

Sevin

Lorsban

Cygon

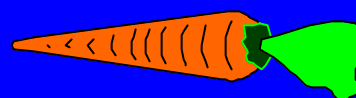
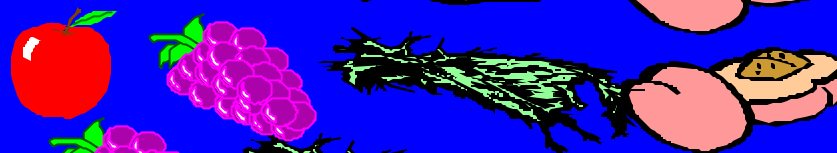
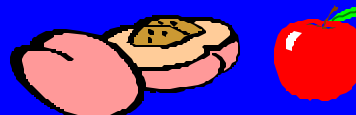
Chipco, Rovral

Monitor

Ambush, Pounce

Comite, Omite

Treflan

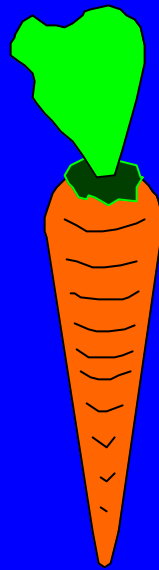


(1996)

# DDT

(and its metabolites, DDD & DDE)  
is still found in produce

1993  
5.6%



carrots

18-23%

potato

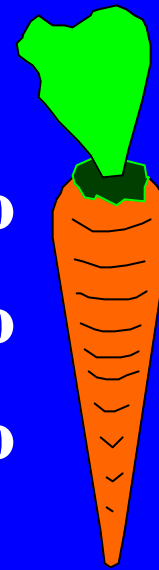
8-41%

spinach

53-86%



1994  
5.5%



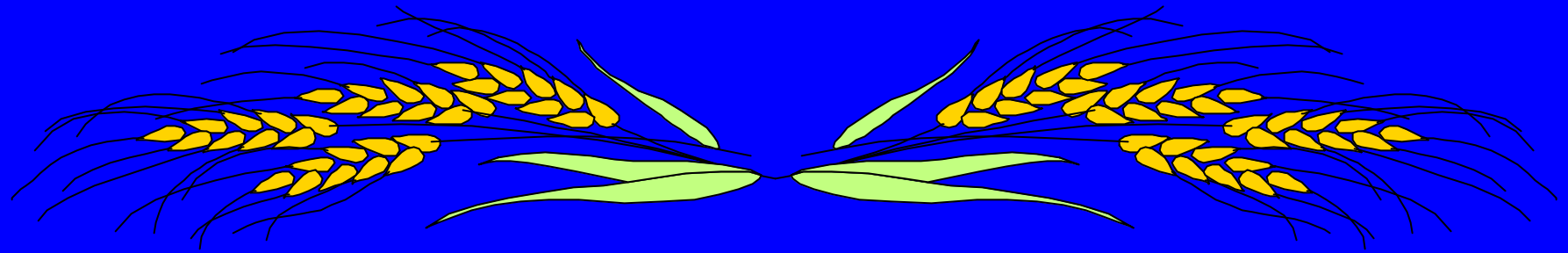
1996  
11.0%

1995  
10.0%

\* these are domestic sources



# Pesticides are often detected in wheat samples:



**1995**

**600 samples**

**79% had residue**

**1 fungicide**

**3 herbicides**

**6 insecticides**

**1996**

**340 samples**

**91% had residue**

**2 fungicides**

**3 herbicides**

**11 insecticides**

**Several insecticides  
account for the majority of detections:**

**1995**

**1996**

**19%**

**chlorpyrifos  
(Lorsban)**

**14%**

**54%**

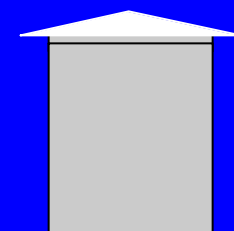
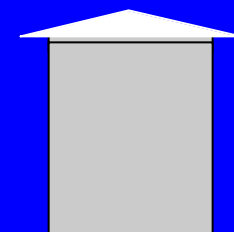
**chlorpyrifos methyl  
(Reldan)**

**73%**

**71%**

**Malathion**

**70%**



**account for over 90% of the residue on wheat**

**Yes,  
there are pesticides in milk**

**1996 PDP  
575 samples  
18% had residue**



**DDE = DDT metabolite, 17%**  
**dieldrin = insecticide with livestock uses**  
**phenylphenol = post-harvest fungicide**  
**thiabendazole = post-harvest fungicide**

## Tolerance:

Max amount of residue permitted on the crop



### Two types of tolerance violations:

- **no tolerance:** drift, tank not clean, rotation, rarely illegal use
- **over tolerance:** more serious violation

## Violation rate in the PDP (fruits/ vegetables)

<u>year</u>	<u>below tolerance</u>	<u>above tolerance</u>	<u>no tolerance</u>
1993	98.5	0.1	1.4
1994	98.8	0.1	1.2
1995	96.2	0.1	3.7
1996	96.5	0.1	3.4



# Crops with highest number of violations

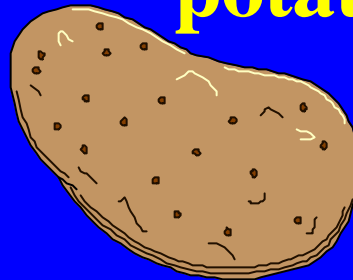
spinach  
1/2 of all  
violations



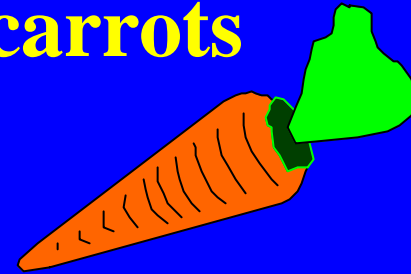
green beans



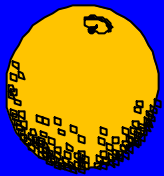
potato



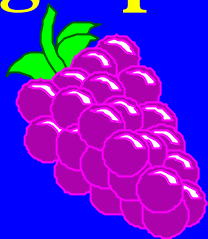
carrots



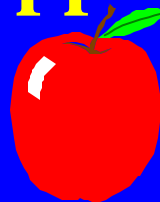
oranges



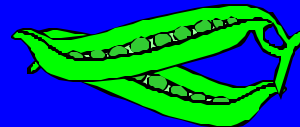
grapes



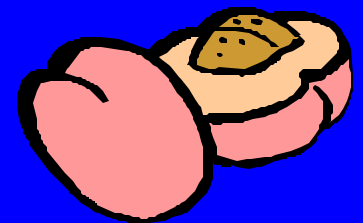
apples



peas

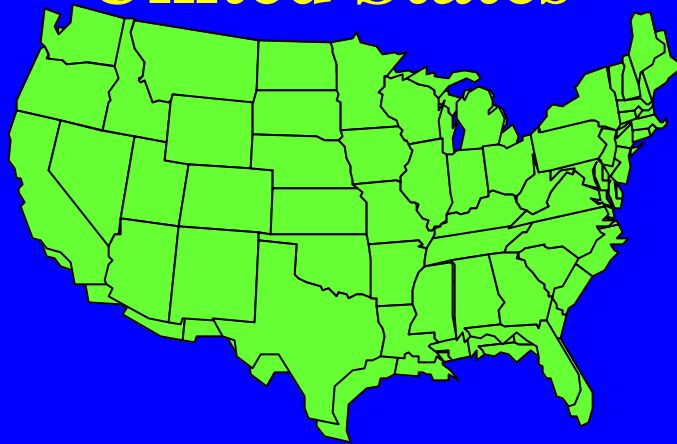


peaches



# Percent of produce with violations

## United States



vs.

## The World



<u>year</u>	<u>domestic</u>	<u>import</u>
1993	1.3	2.4
<b>1994</b>	<b>1.1</b>	<b>1.7</b>
1995	4.0	2.3
<b>1996</b>	<b>3.9</b>	<b>4.0</b>

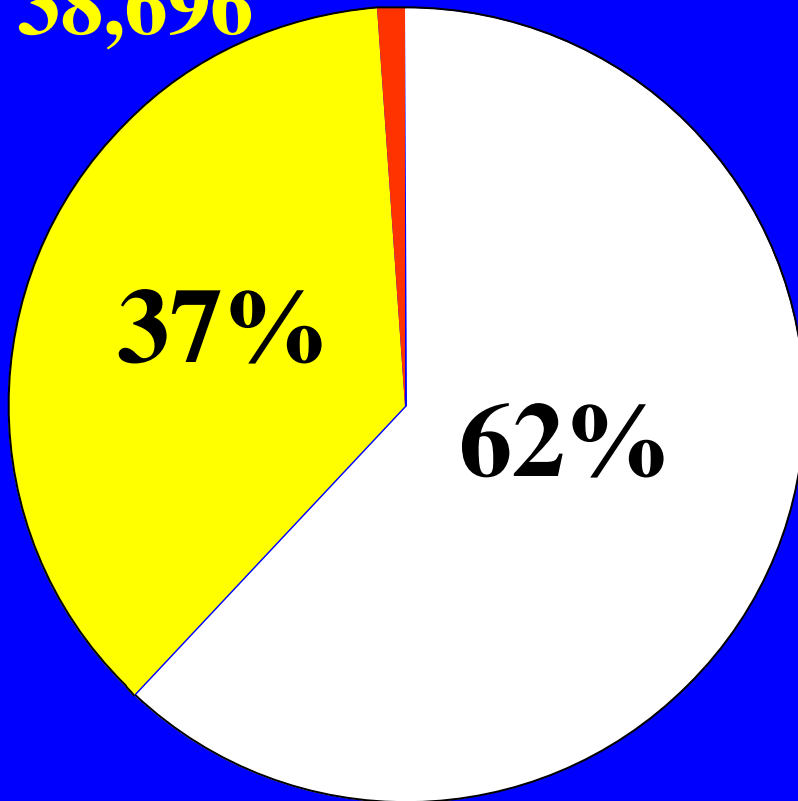
# Total Diet Study

- FDA program
- examines residues after processing
- sampling done quarterly  
food prepared in a kitchen

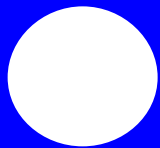
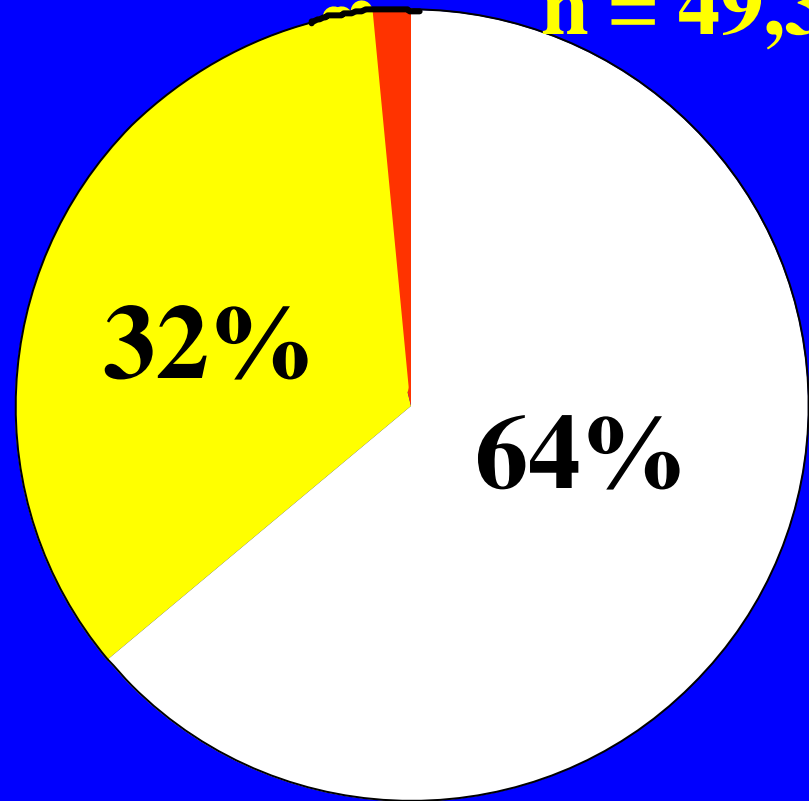


# Results of TDS, 1987-1991

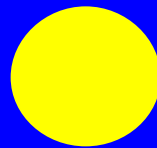
**domestic**  
**n = 38,696**



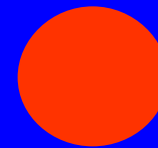
**import**  
**n = 49,383**



**non-detectable**



**below tolerance**



**violation**

**Total Diet Study demonstrates  
reduction in residues during handling/ processing  
crop / % reduction**

**shipping**

peppers 14%  
celery 86%

**trimming**

lettuce 89%  
cabbage 93%

**washing**

apples 14%  
grapes 36%  
peaches 73%  
tomatoes 83%

**processing**

spuds, baking 61%  
spuds, chipping 86%  
beans, canned 72%  
beans, frozen 92%

## Take-home messages

- residues detected in ~ 2/3 of PDP samples and 1/3 of TDS samples
- ~20-30% detections are post-harvest pesticides
- majority of residues are below tolerance
- 1-3% of samples violate tolerances
- handling/ processing significantly reduce residues
- domestic and imported produce have about the same violation rate