# *FAQs on Pesticides in Milk*

Developed by:
The Organic Center

**Why the new concern about pesticides in milk?**

The USDA's Pesticide Data Program (PDP) is the most sophisticated government program in the world that tests food for pesticide residues. PDP focuses on foods commonly consumed by infants and children. Milk was tested for pesticide residues in 1996, 1997, and 1998. Very few residues were found. In fact, only about 15 percent of the samples tested in each of those years had a single residue; about 85 percent of the samples contained no detectable residues.

About 95 percent of the residues found were DDE, a breakdown product of the well-known chlorinated hydrocarbon insecticide DDT, which was banned from agricultural use in the early 1970s. DDT is very persistence and remains in many cropland soils. It is also in the body fat of all Americans and most farm animals and wildlife. Conventional and organic farmers can do little to avoid the DDE residues in milk. Over the next thirty to fifty years these residues will gradually decline below limits of detection (LODs).

Based on these findings, milk has enjoyed a relatively clean "bill of health" in terms of pesticide residues and risk.

Milk dropped out of the PDP after the 1998 testing, but returned in 2004-2005. In February 2006, the results of the 2004 testing were released. All 739 milk samples tested contained residues, and in fact the average sample had 2.88 residues – a HUGE jump from the testing just eight years earlier.

(Tables reporting the pesticides found in PDP testing of milk in 1996, 1997, 1998, and 2004 appear at the end of these FAQs)

**What pesticides did PDP find in milk in 2004?**

DDE was found in 96 percent of the samples. Diphenylamine (DPA) was found in 98 percent of the samples. Another long-banned chlorinated hydrocarbon insecticide, dieldrin, was found in 41 percent of the samples.

A synthetic pyrethroid insecticide was found in 24 percent of the samples.

The endocrine disrupting insecticide endosulfan was found in 18 percent of the samples.

A breakdown product of the highly toxic carbamate insecticide carbofuran was found in 9 percent of the samples.

**And what about residues in 2005 PDP testing?**

DDE and diphenylamine (DPA) were found in 85% and 92% of 746 samples. The synthetic pyrethroids cyhalothrin (21%), permethrin (2.8%) and bifenthrin (2.3%), so almost 25% of the samples contained a synthetic pyrethroid residue. No pyrethroid residues were found in 1996, 1997, 1998 testing.

Other pesticides were found at about the same frequencies as in 2004 testing.

**Why the big increase in pesticide residues in milk in 2004?**

Between 1998 and 2004, the PDP adopted much more sensitive analytical chemistry methods. As a result, the limits of detection (LOD) for nearly all pesticides fell dramatically between the 1996-1998 testing and the samples run in 2004. A table at the end of these FAQs shows the reduction in LODs for each pesticide found in 2004 testing.

For example, the methods used to test milk in 2004 were 100-times more sensitive in picking up DPA residues, and 17-times more sensitive in detecting DDE and endosulfan than the methods used in 1996-1998.

It is virtually certain that the use of much more sensitive methods by the PDP in 2004 testing explains most, if not all of the increase in pesticide residues found per sample of milk tested.

**How did DDE and DPA get into nearly all milk tested in 2004?**

As explained above, DDE remains bound in the soil from uses more than thirty years ago. It is taken up by certain crops and grasses, and can be found in the fat of virtually all people and dairy cattle around the world.

The discovery of diphenylamine in almost all milk samples was a big surprise. DPA is a “high volume” industrial chemical used for many purposes in manufacturing rubber and plastic parts, and in making certain drugs. It is also a pesticide that is used as an apple plant growth regulator. DPA is applied to apples as they are placed into storage and helps delay ripening and preserves apple fruit quality.

EPA estimates that only about one-third of apples are treated with DPA. Given that only a small percentage of milking dairy cows might be fed apple wastes at any one time, it is extremely unlikely that the pesticide use of DPA is the source of residues in 98.5 percent of milk samples tested in 2004. Instead,

the DPA must be finding its way into milk through some other route or routes. Possibilities include –

- Animal drug use,
- Rubber and/or plastic products used on dairy farms or in milk processing plants, or
- Ingredients used in milk cartons and packaging.

**Do the pesticides found in milk pose health risks?**

The good news is that the levels of DDE, DPA, and other pesticides found in milk in 2004 were very low. Most fell below one part per billion (ppb). The highest residue levels found were, at most, one-quarter of the applicable EPA tolerance (the maximum allowable limit of a pesticide in a given food).

But milk is a very important food in the diet of infants and children. The presence of any chemical in milk is cause for concern and great strides are taken throughout the diary industry to assure the purity of milk. The presence of multiple chemicals in virtually all samples of milk raises new questions about the possible toxicological impacts of chemical mixtures on an infant's developing nervous and immune systems, as well as on reproductive organs. During key stages of development, these parts of the body are known to be very sensitive to exposures to chemicals, including many pesticides.

**How do the DPA levels in milk compare to residues found in apples?**

The PDP found diphenylamine in 79.2 percent of the fresh apple samples tested. The limit of detection for DPA in apple samples was 0.01 parts per million in one lab, and 0.0029 ppm in a second laboratory. Accordingly, the methods used to test milk for DPA were far more sensitive than the method used when apples were tested, as clear in the following table that reports limits of detections in common units – parts per billion (ppb).

| **Food** | **LOD (ppb)** |
|---|---|
| Milk | 0.06 |
| Apples (lab 1) | 10 |
| Apples (lab 2) | 2.9 |

The method used in testing milk for DPA was 48 to 167-times more sensitive than the methods used to test for DPA in apples.

The average level of DPA found in positive milk samples was 0.19 ppb.

The average level of DPA found in positive apple samples was 352 ppb.

It is not useful to directly compare the average level found in milk to the average level in apples because of the differences in the limits of detection.

Because PDP milk testing was so much more sensitive, more samples were found to contain very low levels. These low-level samples, in turn, reduce the average level found in milk, compared to the average level in apples.

A more accurate way to compare the levels in milk and apples is to assess the distribution of levels, focusing on the samples with the highest residue levels. The 100 apple samples with the highest levels of DPA contained, on average, residues equal to 1,210 ppb. The average DPA level in the 100 milk samples at the upper end of the residue distribution was 0.5 ppb – a difference of over 2,000-fold.

To the extent that there is any human health risk from DPA in the food supply, it is clear that residues in apples account for the vast majority of such risk.

**What were the differences between conventional and organic milk in 2004 PDP testing?**

Ten out of 739 samples of milk tested by the PDP in 2004 were reported as "organic." Just like virtually all samples, all 10 samples contained DPA and nine had DDE residues.

There were two big differences between organic and conventional milk in the testing carried out by the PDP in 2004. Synthetic pyrethroids were found in 24 percent of conventional samples, and in no organic sample. A breakdown product of the insecticide carbofuran was found in 8.8 percent of the conventional milk samples, but in no organic sample.

EPA is currently carrying out a cumulative risk assessment of the synthetic pyrethroids to determine whether contemporary uses and residues in food comply with the Food Quality Protection Act's "reasonable certainty of no harm" standard. The recent detection of synthetic pyrethroids in a significant portion of the nation's milk supply will be addressed through that assessment.

| Pesticide Residues in Milk - 1996 Testing by the USDA's Pesticide Data Program (PDP) | | | | |
|---|---|---|---|---|
| Pesticide | Number of Positives | Number of Samples | Percent Positive | Mean of the Positives (ppb) |
| DDE | 99 | 570 | 17.4% | 0.002 |
| Dichlorvos (DDVP) | 1 | 570 | 0.2% | 0.00 |
| o-phenylphenol | 1 | 202 | 0.5% | 0.010 |
| Thiabendazole | 4 | 536 | 0.7% | 0.05 |
| Total Residues Found | 105 | | | |
| Average Residues per Sample* | 0.18 | | | |
| * Average based on maximum number of samples tested for a single pesticide (570). Accordingly, this average is biased downward because fewer than 570 samples were tested for other pesticides. | | | | |

| Pesticide Residues in Milk - 1997 Testing by the USDA's Pesticide Data Program (PDP) | | | | |
|---|---|---|---|---|
| Pesticide | Number of Positives | Number of Samples | Percent Positive | Mean of the Positives (ppb) |
| DDE | 103 | 727 | 14.2% | 0.003 |
| Diphenylamine | 1 | 665 | 0.2% | 0.01 |
| Ivermectin | 1 | 424 | 0.2% | 0.002 |
| 0-phenylphenol | 5 | 273 | 1.8% | 0.011 |
| Thiabendazole | 2 | 543 | 0.4% | 0.05 |
| Total Residues Found | 112 | | | |
| Average Residues per Sample* | 0.15 | | | |
| * Average based on maximum number of samples tested for a single pesticide (727). Accordingly, this average is biased downward because fewer than 727 samples were tested for other pesticides. | | | | |

| Pesticide Residues in Milk - 1998 Testing by the USDA's Pesticide Data Program (PDP) | | | | |
|---|---|---|---|---|
| Pesticide | Number of Positives | Number of Samples | Percent Positive | Mean of the Positives (ppb) |
| Chlorpropham | 1 | 594 | 0.2% | 0.002 |
| DDE p,p' | 82 | 595 | 13.8% | 0.003 |
| Diphenylamine | 1 | 595 | 0.2% | 0.017 |
| Lindane | 1 | 594 | 0.2% | 0.002 |
| 0-phenylphenol | 5 | 218 | 2.3% | 0.010 |
| Total Residues Found | 90 | | | |
| Average Residues per Sample | 0.15 | | | |
| * Average based on maximum number of samples tested for a single pesticide (595). Accordingly, this average is biased downward because fewer than 595 samples were tested for other pesticides. | | | | |

| Pesticide Residues in Milk - 2004 Testing by the USDA's Pesticide Data Program (PDP) | | | | |
|---|---|---|---|---|
| Pesticide | Number of Positives | Percent Positive | Mean of the Positives (ppb) | Mean of the Positives (ppm) |
| 3-hydroxycarbofuran | 65 | 8.8% | 0.34 | 0.0003 |
| Bifenthrin | 3 | 0.4% | 0.10 | 0.0001 |
| Cyfluthrin | 11 | 1.5% | 1.00 | 0.0010 |
| Cyhalothrin, Total | 128 | 17.3% | 0.48 | 0.0005 |
| Cypermethrin | 1 | 0.1% | 1.00 | 0.0010 |
| DDE p,p' | 710 | 96.1% | 0.51 | 0.0005 |
| Dieldrin | 307 | 41.5% | 0.20 | 0.0002 |
| Dimethoate | 6 | 0.8% | 0.12 | 0.0001 |
| Diphenylamine | 728 | 98.5% | 0.19 | 0.0002 |
| Endosulfan sulfate | 134 | 18.1% | 0.22 | 0.0002 |
| Fluvalinate | 3 | 0.4% | 1.82 | 0.0018 |
| Permethrin, Total | 33 | 4.5% | 1.07 | 0.0011 |
| Total Residues Found | 2,129 | | | |
| Average Residues per Sample | 2.88 | | | |
| * Average based on 739 samples tested for all pesticides. | | | | |

| Pesticide Residues in Milk - 2005 Testing by the USDA's Pesticide Data Program (PDP | | | |
|---|---|---|---|
| Pesticide | Number of positives | Percent Positive | Mean of the Positives (ppb) |
| 3-hydroxycarbofuran | 45 | 6.0% | 0.2196 |
| Bifenthrin | 3 | 0.4% | 0.1471 |
| Carbaryl | 2 | 0.3% | 0.0830 |
| Cyfluthrin | 6 | 0.8% | 1.0000 |
| Cyhalothrin, Total | 155 | 20.8% | 0.3133 |
| DDE p,p' | 637 | 85.4% | 0.4988 |
| Dieldrin | 173 | 23.2% | 0.1330 |
| Dimethoate | 1 | 0.1% | 0.1000 |
| Diphenylamine | 683 | 91.6% | 0.3460 |
| Endosulfan sulfate | 115 | 15.4% | 0.1435 |
| Permethrin, Total | 21 | 2.8% | 1.2524 |
| Tetrachlorvinphos | 2 | 0.3% | 0.2700 |
| Total Residues Found | 1,843 | | |
| Average Residues per Sample | 2.43 | | |
| Total samples of milk in 2004 were 746, all domestic samples. | | | |

| Detection Limits for Selected Pesticides Found in Milk: PDP Testing in 1996, 1997, 1998, and 2004 | | | | | |
|---|---|---|---|---|---|
| Pesticide | Detection Limits (ppb) | | | | |
| | 1996 | 1997 | 1998 | 2004 | Difference Between 1996 to 2004 |
| 3-hydroxycarbofuran | 4.0 | 4.0 | 4.0 | 0.12 | 33 |
| Cyfluthrin | 20.0 | 20.0 | 20.0 | 0.60 | 33 |
| Cyhalothrin, Total | NA | NA | NA | 0.15 | NA |
| DDE p,p' | 1.0 | 1.0 | 1.0 | 0.06 | 17 |
| Dieldrin | 1.0 | 1.0 | 1.0 | 0.12 | 8 |
| Dimethoate | 1.0 | 1.0 | 1.0 | 0.07 | 14 |
| Diphenylamine | 6.0 | 6.0 | 6.0 | 0.06 | 100 |
| Endosulfan sulfate | 1.0 | 1.0 | 1.0 | 0.06 | 17 |
| Permethrin, Total | 2.0 | 3.0 | 2.0 | 0.60 | 3 |