An Evaluation of Organic Food

Clayton Yoakum

Beloit College, Beloit, Wisconsin

Abstract

Organic food has become a growing commodity in the United States because people are becoming concerned about possible harmful effects of pesticides and herbicides. The aim of this study is to investigate the level of pesticides found in conventional foods, the hazard of those pesticides to human health, and the effect of eating organic foods. In a peer-reviewed article, the pesticide levels of 23 Mercer Island Children, ages 3-11, were studied after consuming conventional foods and then organic foods. Significant levels of pesticides were detected in the children after consumption of conventional foods, which subsequently decreased after consumption of organic foods. Studies in humans have shown that the chemicals in pesticides are known to disrupt the hormone, nervous, and immune systems. Consequently, studies conclude that organic foods are safer and more nutritious than conventional food.

Introduction

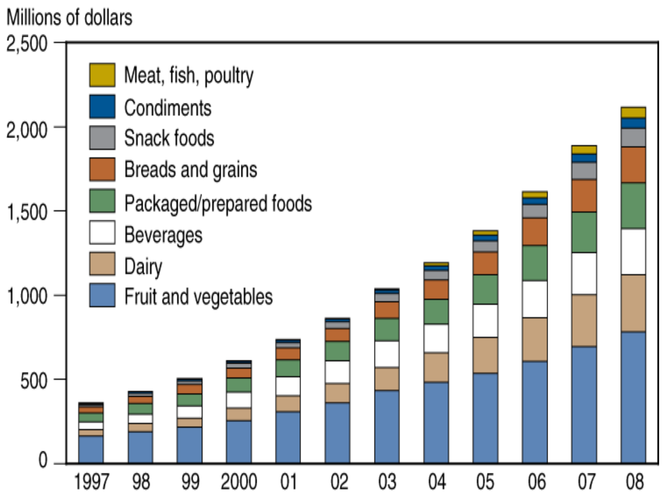
The sales of organic food in the United States have risen rapidly, as shown in Figure 1. So-called "industrially" produced foods utilize genetically-engineered species of plants and animals manipulated by fertilizer, pesticides, herbicides, hormones, and growing conditions. "Organic" food is produced and regulated by the Federal Government to be without these amendments.[3] There are hazards to human health associated with the various herbicides and pesticides. Some of those are listed in Table 1. My hypothesis is regularly produced foods contain pesticides that are harmful to your health and can cause many diseases that can be avoided by eating organic foods.

Method

Peer-reviewed literature was reviewed to test the hypothesis that regularly produced foods contain pesticides that are harmful to your health and can cause many diseases that can be avoided by eating organic foods.

Figure 1:

U.S. retail sales of organic food products increase from 1997 to 2008



Source: *Nutrition Business Journal*, 2009.

Results

The detection (Table 2) for 5 organophosphorus (OP) metabolites in 724 urine samples collected from 23 children differed during the conventional diet phases and varied significantly between conventional and organic diet phases for two metabolites [malathion dicarboxylic acid (MDA), a metabolite of malathion; 3, 5, 6-tricholoro-2-pyridinol (TCPY), a metabolite of chlorpyrifos (Lu *et al*]. The distributions of daily volume-weighted average (DVWA) concentrations for MDA and TCPY during the three study phases (shown in Figures 2 and 3) highlight the effect of organic food consumption on OP pesticide exposures in children. All 23 children's urine samples contained MDA and TCPY when they enrolled in the study. Immediately after consumption of organic food the median urinary MDA and TCPY concentrations decreased to the nondetectable (ND) level. These levels remained until conventional diets were reintroduced after 5 days of organic food consumption. The DVWAs for MDA and TCPY in the organic diet phase were significantly lower than the levels in either conventional diet phase.

Figure 4: Chemical Structures of Pesticides

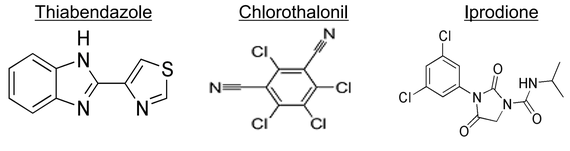


Table 1: Pesticides that are present in certain food products, the year the product was tested, the number of samples taken, the percent of the product containing the pesticide, and the symptoms that can be a factor from consuming that particular pesticide.

Product	Year	Pesticide	Number of Samples	Percent Positive	Symptom
Apples	1996	Thiabendazole	502	74.1%	Paresthesia
Celery	1994	Chlorothalonil	172	67.4%	Contact dermatitis
Grapes	1996	Iprodione	279	66.7%	Nausea, vomiting, abdominal pain, loss of coordination
Green Beans	1994	Endosulfan	83	57.8%	Convulsions, nervous system effects, death
Oranges	1996	Imazalil	511	58.1%	Nausea
Peaches	1996	Azinphos-methyl	126	72.2%	Abdominal cramps, diarrhea, vomiting, blurred vision
Soybeans	1997	Chlorpyrifos	157	80.3%	Abdominal cramps, diarrhea, nausea, unconsciousness, vomiting
Spinach, fresh	1995	Permethrin	593	61.6%	Burning sensation, diarrhea, vomiting
Tomatoes	1997	Endosulfan II	192	43.2%	Blue lips or fingernails, confusion, convulsions, diarrhea, dizziness, headache, labored breathing, nausea, unconsciousness, vomiting, weakness
Squash, frozen	1997	Dieldrin	91	73.6%	Convulsions, dizziness, headache, nausea, vomiting, muscle twitching

Table 2: Descriptive statistics for the DVWA concentrations of urinary metabolites for selected OP pesticides in the three study phases.

Study phase	No.	Frequency of detection (%)	Median (μg/L)	Mean ± SD (μg/L)	Maximum (μg/L)
MDA (LOD = 0.3 μg/L)					
1	87	60	1.5	2.9 ± 5.0*	96.5
2	116	22	0	0.3 ± 0.9*	7.4
3	156	60	1.6	4.4 ± 12.4*	263.1
TCPY (LOD = 0.2 μg/L)					
1	87	78	6.0	7.2 ± 5.8**	31.1
2	116	50	0.9	1.7 ± 2.7**	17.1
3	155	78	4.3	5.8 ± 5.4**	25.3
IMPY (LOD = 0.7 μg/L)					
1	71	14	0	< LOD ± 0.2	1.2
2	107	9	0	< LOD ± 0.1	0.4
3	148	14	0	< LOD ± 1.3	14.6
DEAMPY (LOD = 0.2 μg/L)					
1	70	25	0	0.37 ± 2.2	17.4
2	103	25	0	< LOD ± 0.1	0.8
3	146	25	0	< LOD ± 0.3	2.3
CMHC (LOD = 0.2 μg/L)					
1	87	25	0	< LOD ± 0.03	0.2
2	115	25	0	< LOD ± 0.03	0.2
3	156	25	0	< LOD ± 0.04	0.2

Abbreviations: CMHC, 3-chloro-4-methyl-7-hydroxycoumarin; DEAMPY, 2-diethylamino-6-methylpyrimidin-4-ol; IMPY, 2-isopropyl-6-methyl-pyrimidin-4-ol; MDA, malathion dicarboxylic acid; TCPY, 3,5,6-trichloro-2-pyridinol.
*Significantly different (one-way ANOVA, $p < 0.01$; Tukey test, phase 2 level significantly lower than levels in phase 1 and 3).
**Significantly different (one-way ANOVA, $p < 0.001$; Tukey test, phase 2 level significantly lower than phase 1 and 3 levels).
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Figure 2: Box plots of DVWA of MDA concentrations in 23 children 3–11 years of age for 15 consecutive days in which conventional and organic diets were consumed. The top row of numbers on the *x*-axis represents numbers of children.

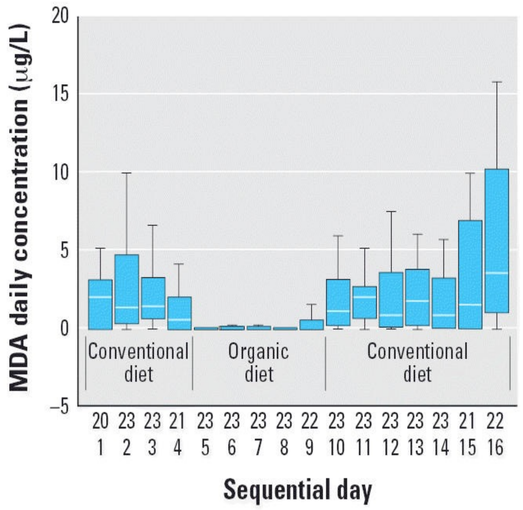

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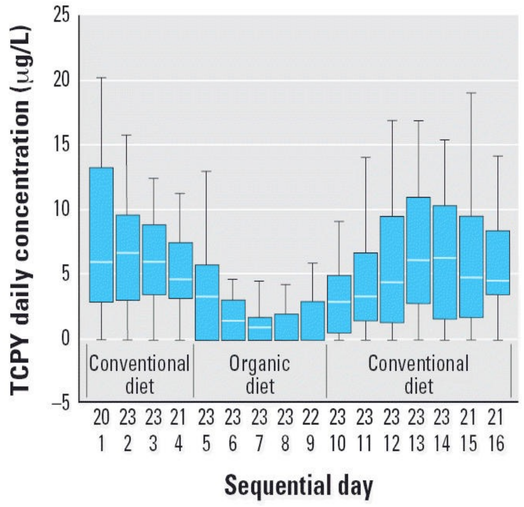
Figure 3: Box plots of DVWA of TCPY concentrations in 23 children 3–11 years of age for 15 consecutive days in which conventional and organic diets were consumed. The top row of numbers on the *x*-axis represents numbers of children.



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Discussion

In the 1970s, Bruce Ames developed the first simple and inexpensive test for carcinogens using bacteria. In the 1990s, he showed that fruits and vegetables also contain potent anti-carcinogens.[1] On this basis, he urged people to consume fruits and vegetables despite the traces of carcinogens caused by pesticide and herbicide residues. In more recent times, Richter and Chlamtac make the case that continuing use of current levels of pesticides refute Ames' contentions. The National Research Council (NRC) report recognized that dietary intake of pesticides represents the major source of exposure for infants and children and concluded that the differences in dietary exposure to pesticide residues account for most of the differences in pesticide-related health risks that were found to exist between children and adults.[2] The NRC concluded organic diets provide a protective mechanism against OP pesticide exposure in young children whose diets regularly consist of fresh fruits and vegetables, fruit juices, and wheat-containing items. Such protection is dramatic and immediate.[2] This is particularly true for certain OP pesticides, such as chlorpyrifos and malathion, as measured in this study, and is probably true for other OP pesticides such as azinphosmethyl, dimethoate, and acephate, which are registered only for agricultural production.[2]

This novel study design provided a convincing demonstration of the ability of organic diets to reduce OP pesticide exposure and the health risks that may be associated with these exposures.[2] This reduction in exposure was dramatic and immediate for the OP pesticides malathion and chlorpyrifos, which are commonly and predominantly used in agricultural production.[2] The increase in cancers such as lymphoma, leukemia, breast, uterine, and prostate cancers are connected to agricultural and synthetic chemicals used in production.[5]

One must note that the pesticides are non-polar substances that dissolve in fatty tissues. So although residues disappeared quickly from the urine, they are likely to accumulate over a lifetime in the body, continuing to cause health hazard even after switching to an organic diet.

Conclusion

Organic food does not contain harmful pesticides that can be found in conventional foods. By eating organic food, one can avoid the health risks of pesticides found in conventional foods.

References

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