The Organic Center www.organic-center.org
State of Science Review: The Organic Option

Simplifying the Pesticide Risk Equation: The Organic Option

by Charles Benbrook

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Foreword

You hold in your hands a state-of-the-art discussion of how and where Americans are exposed to pesticides in our diet, of the seasonal variations in pesticide risks, and of how these dietary risks can be nearly eliminated by food choices that are within your own control.

You will learn that the average American is exposed to 10 to 13 pesticide residues each day from food, beverages, and drinking water. The levels and risks are very low in most instances. But this is not always the case. Some of these exposures pose clear risks, particularly when they occur during pregnancy, the first years of life, during other vulnerable periods

This is important news as it comes at a time when there is a growing recognition in the scientific and medical communities that pesticide exposure is a major risk factor in the development of neurological conditions from ADHD to Alzheimer's disease.

As a pediatrician, I am often asked by mothers how they might help protect their children from high profile neurodevelopmental disorders like ADHD and autism. Almost every day I come face to face with the children behind the grim statistics on these learning disabilities. When I look in the eyes of these children, or their mothers, I cannot help but feel a sense of urgency in getting the word out about how families can avoid risk factors contributing to these conditions.

Reducing pesticide exposures will help in other ways. It will contribute to a wide range of efforts aimed at lowering the number of premature deliveries and their many associated consequences, and it will help prevent harm to a child's developing immune and reproductive systems.

It's time for action. With strategic organic food choices you have the power to dramatically reduce pesticide exposures to you and your family starting with your very next meal.

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table of contents

Executive Summary

Since the release of our 2004 report comparing the frequency and levels of pesticide residues in conventional and organic food, three questions repeatedly come up:

- Which organic foods should a consumer seek out to avoid possibly dangerous pesticide exposures?
- To what degree might organic food reduce pesticide dietary exposures and risk?
- And the "so-what" question — How will my health, and the health of my family change if we eliminate most pesticide exposure via the diet by consuming organic food?

Because a significant number of new studies have come out since 2004, along with four more years of data on pesticide residues in organic and conventional foods, we are now able to provide direct answers to the first two questions, and a general response to the third.

The answers presented in this report are as detailed and accurate as possible, given the availability of pesticide residue data in organic and conventional food, the state of pesticide risk assessment science, and the capacity of a small nonprofit organization to compile, integrate, and analyze enormous government datasets.

High-Risk Pesticide Food Combinations

Fruits and vegetables account for the majority of pesticide residues and risk in the diet, especially the diets of infants and children, which is why the USDA's Pesticide Data Program (PDP) focuses on these foods. Throughout this report we use PDP information on residues in organic and conventional foods, and in domestically grown and imported foods, to assess levels of dietary risk.

There are clear, and in some cases, dramatic upward spikes in pesticide residue levels and risks during the winter months when imports account for a large share of perishable fresh fruits and vegetables in the market place. For this reason, the list of foods accounting for the greatest pesticide risks per serving differs in the summer, when mostly U.S.-grown produce is consumed, in contrast to winter months, when imports account for a large percent of sales, especially for perishable fruits and vegetables that do not store well for long periods (like grapes, berries, peaches, tomatoes, and spinach).

Accordingly, we provide one list of relatively high-risk foods based on residues found by PDP in domestically grown produce, and a second list reflecting residues in imported foods. The first list should be used during the spring-summer-fall months when domestically grown fresh produce accounts for the majority of sales. The second list, based on residues in imported fruits and vegetables, is most useful during the winter months. Each list is ranked according to a dietary risk index (DRI) score – the bigger the number, the greater the risk.

A Key Point—

Don't let the fear of pesticides reduce your consumption of health-promoting fruits and vegetables. Consumers can minimize pesticide exposures when shopping for organic produce by referring to these two tables —

Conventional Fruits and Vegetables with the Highest Pesticide Dietary Risk Index Scores: Domestically Grown Produce

Fruits	Dietary Risk Index	Vegetables	Dietary Risk Index
Cranberries	178	Green beans	330
Nectarines	97	Sweet bell peppers	132
Peaches	54	Celery	104
Strawberries	56	Cucumbers	93
Pears	48	Potatoes	74
Apples	44	Tomatoes	68
Cherries	32	Peas	66
		Lettuce	54

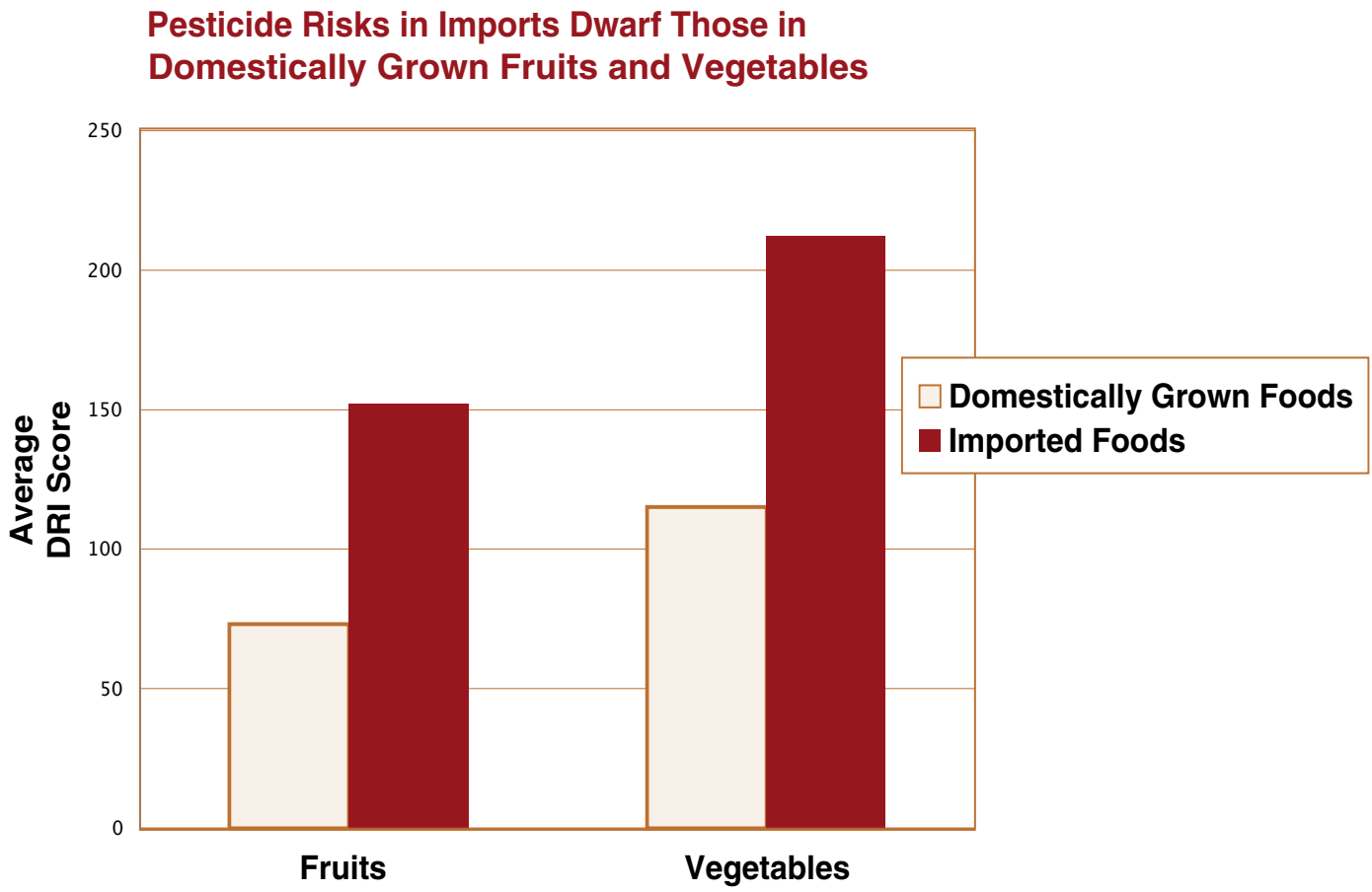
Imported Fruits and Vegetables with the Highest Pesticide Dietary Risk Index Scores

Fruits	Dietary Risk Index	Vegetables	Dietary Risk Index
Grapes	282	Sweet bell peppers	720
Nectarines	281	Lettuce	326
Peaches	266	Cucumbers	317
Pears	221	Celery	170
Strawberries	78	Tomatoes	142
Cherries	31	Green beans	93
Cantaloupe	31	Broccoli	62
Apples	30	Peas*	48
		Carrots	30

* Ratio of DRI value in fresh to processed peas, domestic production (6), multiplied by imported value for processed peas (8). PDP has not tested fresh imported peas.

DRI scores in the above tables come from a 2006 report by the Environmental Protection Agency's (EPA) Office of Inspector General (OIG). The DRI draws on EPA risk assessment methods and data. It integrates the level of residues in food with a pesticide's toxicity, to produce a relative risk index. DRIs can be calculated for single food-pesticide combinations (e.g., acephate in pears), or all the pesticide residues found in a particular food.

Figure 1.



Note the large difference between some domestically grown fruit and vegetable DRI scores and those for the same imported produce. Imported conventional sweet bell peppers have a DRI score of 720, more than twice the also high domestic pepper score of 330. The imported cucumber score is more than three-times higher than the DRI for domestic cucumbers.

The average DRI score for the seven conventional, domestically grown fruits in the first list is 73, while the eight imported fruits average 152, just over twice as high. For the vegetables, the average domestic DRI value is 115, compared to 212 for imports, as shown in Figure 1.

People also want to know which foods contain relatively few residues and pose only modest pesticide risks. Hundreds of thousands of samples of food show consistently that several foods contain far fewer and generally less risky pesticide residues than the fresh fruits and vegetables on our lists:

- Citrus fruits (the grapefruit DRI for 2006 is around 2),
- Bananas and pineapples, with DRI scores less than one,
- Onions, DRI far less than one,
- Beef, pork, lamb, and poultry meats,
- Grains and grain-based products, except for relatively low levels of insecticides used during storage, and
- Most processed foods and several dried fruits (e.g., raisin DRI in 2006 was less than 5, and tomato paste was 15-times lower than tomatoes).

A 97% Solution

DRI scores can be used to estimate the probable reduction in pesticide dietary risk from consumption of organic food, in contrast to conventionally grown food. Most of the pesticide risk in the diet stems from residues on fresh fruit and vegetables. Today, organic fresh produce sales account for close to 9% of retail sales, and are substantially reducing pesticide exposures for millions of Americans.

More progress is bound to occur since several major fruit and vegetable producers in the Western U.S. are moving ahead with ambitious plans to convert a significant share, and in some cases all or most of their acreage to organic

production. In tree-fruits, Stemilt Growers, a major Washington-State based grower-packer is leading the way and has committed to the conversion of 100% of the acres of some fruits to organic production within the next few years, and expects that half or more of its apples will be grown organically within a decade.

In fact, the only thing holding back the conversion of most fruit and vegetable production west of the Mississippi River to certified organic is consumer demand, coupled of course with a pay price for growers that includes a meaningful premium (i.e., at least 20%). The growing systems and technology are available and generally are as reliable as conventional systems, and the infrastructure available to help transitioning and already-organic producers is rapidly catching up to that supporting conventional farmers.

The transition of fruit and vegetable acreage to organic systems east of the Mississippi River poses more difficult challenges because farmers face much more intense insect and plant disease pressure. Still, some innovative farmers have found ways to profitably grow organic crops in the humid regions in the eastern U.S., and ongoing research will hopefully provide new strategies and tools for dealing with problem pests.

Fruits and vegetables are grown on less than 8 million acres in the U.S., less than 3% of the nation's cropland. If just this critical 3% were converted to organic production, what would the impact be on today's levels of pesticide dietary risks?

For domestically grown fruits and vegetables consumed regularly by infants and children, and tested by the PDP in the last four years, we project that risks would drop by at least 97%.

Imported fruits and vegetables, unless grown organically, will remain a major pesticide dietary risk concern, especially in the winter and for perishable fruits and vegetables.

Section IV describes the analysis leading to this encouraging conclusion. In short, we calculated DRI scores for all organic food-year combinations in which USDA tested one or more samples in the last four years of PDP testing, taking into account all residues found in those samples. DRI scores were calculated in the same way for the conventional samples of these same foods, again taking into account all the pesticide residues found in the samples. We added together the total DRI scores across all food-year combinations for both the organic and conventional samples, and then estimated the total reduction across all organic food.

Achieving such a dramatic reduction in pesticide dietary risks will require that the vast majority of domestically grown and imported fruits and

vegetables become certified organic. Recent strong growth in organic fruit and vegetable production will surely continue, rising from today's approximate 9% market share to between 30% and 50% of total sales, but growth beyond that threshold will require new investments and technology, and both strong and steady consumer demand.

Would a 97% Reduction in Pesticide Dietary Risk Improve Public Health?

For healthy adult individuals and couples that are not pregnant, or trying to become pregnant, it is not possible to say with certainty whether, and to what degree a 97% reduction in pesticide risk, as currently understood and measured, would improve public health.

Recent science suggests probable links between adult exposures to pesticides and diabetes, cancer, and several neurological diseases of aging. But the links are not strong enough to project the consequences of a significant drop in pesticide dietary exposures. Almost certainly there will be benefits for healthy adults, we just cannot predict or quantify them, given the present state of knowledge.

But for the four million pregnant women, the four million fathers-to-be, and the nearly 40 million children age 12 and under, there will almost certainly be significant health benefits following a substantial reduction in pesticide residues in food.

There will be more full-term births and fewer underweight babies. The rate of several birth defects should go down, in some cases perhaps by one-quarter or more.

But above all else, there will likely be a significant decline in the often subtle, but still adverse impacts of pesticides on the developing baby, as a result of the mother's exposures to pesticides. Any substantial decline in dietary pesticide risks will dramatically reduce pesticide impacts on a child's developing immune, reproductive, and nervous systems.

Benefits from avoiding pesticide exposures begin approximately six months before conception and run through young adulthood, and indeed for some health problems, throughout life. This is because many of the developmental deficits triggered by prenatal and early pesticide exposures increase the risks of chronic diseases, and metabolic and neurological problems that erode well-being much later in life.

A November 2007 scientific consensus statement issued by the Collaborative on Health and the Environment reports that 5% to 15% of all children under the age of 18 are impacted by learning and developmental disabilities. Mental retardation impacts about 1.4 million children, and ADHD (attention deficit hyperactivity disorder) inflicts 8.7% of 8- to 15-year-old children.

A substantial reduction in pesticide exposure will remove, or markedly lessen, an important risk factor for these sorts of developmental problems. The positive impact for millions of children could well be significant, and surely will be well worth the effort.