1865 THE UNIVERSITY OF MAINE
Cooperative Extension
Pest Management Unit

Maine Tree Fruit Newsletter

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*** Corrections and Additions, April 7**

PFAS Update

UMaine Cooperative Extension maintains a website with current information about detection and regulation of PFAS contamination in soil, water, and agricultural commodities. The "Guide to Investigating PFAS Risk on Your Farm" by Richard Kersbergen is online at https://extension.umaine.edu/agriculture/guide-to-investigating-pfas-risk-on-your-farm/#1

The Maine Department of Environmental Protection is the lead state agency for investigating the PFAS situation. The DEP has a PFAS information page at https://www.maine.gov/dep/spills/topics/pfas/#:~:text=PFAS%20have%20been%20found%20in,and%20remediation%20and%20cleanup%20sites. The Maine DEP contact for PFAS is David Madore, David.Madore@maine.gov, 207-287-5842, or pfas.dep@maine.gov

A map of sites where PFAS contaminated sludge may have been spread is at https://maine.maps.arcgis.com/apps/webappviewer/index.html?id=468a9f7ddcd54309bc1ae8ba173965c7. Just because a site is listed there does NOT mean that sludge was applied, or that if sludge was applied that it was contaminated with PFAS.

If you live near a DEP-licensed sludge or septage land application site in Maine, you can request that the DEP sample your well. The request form is at https://www.maine.gov/dep/spills/topics/pfas/fairfield/well-test-request.html

Water testing is available from Maine Environmental Lab in Yarmouth. https://maineenvironmentallaboratory.com/?page_id=4833

If you have been following the Maine PFAS situation, and the heart breaking stories about soil and water contamination from sludge applications on dairy and vegetable farms, you may wonder why this is worth discussing in a tree fruit newsletter. Especially given that preliminary studies show that even in PFAS contaminated soil, the vast majority of PFAS that shows up in plants is in the vegetative tissue (stems and leaves), with very little showing up in fruit and grain tissue. But there are reasons for commercial tree fruit growers in Maine to pay attention to this issue.

1. PFAS contamination in soil becomes PFAS in water, and water moves off site. So even if you know that sludge was never applied on your property, there is still the possibility that applications to nearby locations could affect your water source(s), including both surface and groundwater used for irrigation, spraying, or washing fruit.

This is exacerbated by the extremely low detection levels that are considered reason for concern and actionable. For example, the Maine Interim Residential Drinking Water Standard Screening level for residential drinking water is 20 parts per Trillion. Moreover, some states have already gone to a lower level of 2 parts per Trillion. And there is talk of at least one state looking at a level of 0.6 part per Trillion. For comparison, most EPA pesticide residue tolerances range from about 0.1 to 10 parts per Million.

It is difficult to comprehend how small 20 ppt really is. 1 part per million (ppm) = 1,000,000 parts per trillion (ppt). The ratio of 1 ppm is like 1 minute in two years. 1 ppt is equivalent to one second in 37,710 years. A drinking water tolerance of 20 parts per Trillion = 0.00002 ppm. If that level is reduced to 2 ppt, the tolerance would be 10X lower at 0.000002 ppm. It does not take much to exceed such a low threshold. And keep in mind that the nickname for the PFAS group is the “forever chemicals”, so waiting a few years is not going to make the problem go away from natural degradation.

Please note that this discussion is NOT in any way to be interpreted as a statement about the toxicological significance of PFAS levels found in Maine. You can read about that at the Extension and Maine DEP sites linked above. The point is simply to note how low the detection and action levels are, and to demonstrate that even if soil to fruit movement of PFAS is negligible, because of the potential for off-site movement and the extremely low screening threshold levels for PFAS in water sources, this is an issue that deserves attention.

2. The federal EPA definition of a PFAS with respect to pesticides is any material with two or more fully fluorinated carbon atoms. But the Maine legal code states that:
Perfluoroalkyl and polyfluoroalkyl substances" or "PFAS" means substances that include any member of the class of fluorinated organic chemicals containing at least one fully fluorinated carbon atom.

As with any law, that definition may be changed in the future. But that is how it stands for now, and it seems likely to still be in place when the 2022 Maine Legislature session ends in a few weeks. Another Maine law passed in 2019 requires the Maine DEP to review any and all products that intentionally contain PFAS and to ban sale or distribution by January 1, 2030 unless the material is deemed to be essential. That will be a long difficult process given the number of affected compounds and products, and nobody knows at this time how that process will evolve. Note that the law does not say those products are allowed until at least 2030. It says that their continued use or removal must be decided upon and enacted by no later than 1/1/2030, so the winnowing process would have to start before then.

PFAS has been in the news, and it is likely to stay in the news for years to come. Here is a recent example of what "in the news" looks like. It is the front page headline and first paragraph from the March 31 edition of the Penobscot Times newspaper:

"PFAS is flowing into Maine waters, but no one knows the level of contamination – Treatment plants release millions of gallons of wastewater into Maine's waterways each day that could contain elevated levels of so-called forever chemicals that are used in a wide variety of consumer products and have been linked to long-term health and environmental risks."

The Maine Board of Pesticides Control (BPC) recently issued a list of pesticide active ingredients registered in Maine that are classified as being a PFAS by the Maine statutory definition. There are many products on that list familiar to tree fruit growers.

The purpose in providing this list is NOT to express an opinion about whether there is toxicological risk associated with the materials on that list. Or to argue for or against use of any of these materials. The label use requirements for these materials have been approved by the EPA as being compatible with safety guidelines to protect human health and the environment. Growers in other states are not looking at a list like this because their state uses the Federal definition for what is, or is not, a PFAS. The Maine definition for what is to be identified and regulated as a PFAS is more inclusive than the Federal definition.

Here in Maine, three ingredients for public concern about "PFAS" contamination of fruit crops are occurring at the same time:

A) Media coverage about PFAS contamination in Maine soils, waters, farmland, and food products.

B) The Maine legislature has passed laws defining any compound with a single fully fluorinated carbon as being a "PFAS", and requiring the evaluation and possible prohibition of any product that intentionally contains a "PFAS".

C) The Maine Board of Pesticides Control has issued a list identifying which pesticide active ingredients fit that definition.

So let's put A, B, and C together to see what kind of impression this might create. Come harvest time in fall 2022, people in Maine are still going to be concerned about PFAS contamination. The active ingredient in Avaunt is defined as a PFAS in Maine. The label rate of 0.11 pound of Avaunt active ingredient per acre mixed into 50 gallons of water has a concentration greater than 263,618,000 ppt, which is more than 13 million times the Maine residential drinking water standard. Of course dilution and wash-off would reduce residue from a spray application that was made long before harvest. But like beauty, toxicity is in the eye of the beholder. Based on those numbers, an Avaunt application could be interpreted by some people as inconsistent with their definition of natural, healthy food; or not the kind of place they want to take their kids or grandkids to for together time in the fresh air to pick apples.

An even more extreme legally defined "PFAS" level would arise from a postharvest dip application of Scholar fungicide to prevent storage rot. The label rate of Scholar for 100 gallons of postharvest dip solution is more than 287,500,000,000 ppt. That is more than 14 'Billion with a B' times larger than the current Maine residential drinking water standard. And there is little opportunity for residue depletion between a postharvest treatment and the consumer. A postharvest dip is designed to apply a residue to the fruit.

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*Before continuing: If you need a relaxation break from all these numbers, here is a 3-minute respite from the late great Cornell/NASA scientist Dr. Carl "Buhillions and Buhillions" Sagan that puts it all in perspective: https://www.youtube.com/watch?v=HZmafy_v8g8

As anyone who was around during the national Alar scare back in 1989 will remember, public perception of risk has very real consequences. Around the same time, there was a local public relations fiasco in Maine arising from newspapers publishing a list of Maine orchards where the miticide Plictran had been used during the growing season prior to its cancellation by the EPA. That incident also had very real impact on some Maine orchards.

Many Maine orchards rely on direct retail and personal customer relations. This makes concern about public relations even more acute. One opinion expressed in discussing this situation with colleagues is that bringing attention to the Maine 'PFAS Pesticide' list only exacerbates the possibility for a public relations problem. But in listing pesticide options for the coming growing season, it would be incomplete and misleading not to mention the potential for public relations consequences that could arise from use of the products involved. This situation is not fair to the manufacturers and dealers for those products. But fairness is not the issue. Awareness of possible ramifications from pesticide selection is the issue.

The list below is publicly available from the Maine Board of Pesticides Control. You can disregard this newsletter and get the information straight from the source. It is provided here with additional notes about brand names to assist your consideration. I am not aware of similar lists being promulgated for other agricultural commodities in Maine. Maybe it is over-reactive to bring attention to this issue. That is for you to decide. Preparation is better than repair, especially when it comes public relations. Or as Ben Franklin said, "An ounce of prevention is worth a pound of cure." Thomas Paine had a good one too (slightly revised): "Reputation is much easier kept than recovered."

Tree fruit pesticide active ingredients defined as PFAS by Maine law. 2nd chemical name in ( ) is NOT defined as a PFAS		
Active ingredient	**Brand Name(s)**	**Brief Notes about use on tree fruit** (just a few comments to help identify products)
Insecticides and Miticides		
Bifenthrin	**Brigade 2 EC, Brigade WSB , Sniper, Tundra** + others	Registered on pears. Effective against Brown Marmorated Stinkbug, and has been allowed for BMSB control on other crops with Special local needs registration in other states.
Cyflumetofen	**Nealta Miticide**	Rescue miticide alternative with top ratings against ERM and TSM, lower beneficial toxicity than some alternative miticides.
Flonicamid	**Beleaf 50 SG**	The only non-pyrethroid effective against TPB on pome and stone fruit. Also effective against WAA.
Flupyradifurone	**Sivanto 200 SL, Sivanto Prime**	Soft insecticide alternative for leafhoppers, WAA, SJS, pear psylla, RAA.
Gamma-Cyhalothrin	**Proaxis, Declare**	Pyrethroid registered on pome and stone fruit.
Indoxacarb	**Avaunt Evo, Avaunt**	Major insecticide, a common choice for plum curculio control.
Lambda-Cyhalothrin	**Lambda-Cy Ag, Silencer, Warrior II, Karate, Lamcap, Lambda-T**	Broad spectrum pyrethroid insecticide. Detrimental to beneficial arthropod predators, parasitoids, and pollinators, but still used because of pest efficacy, low human toxicity, and cost.
Lambda-Cyhalothrin (+Chlorantraniliprole)	**Besiege**	Broad spectrum insecticide on pome and stone fruit.
Lambda-Cyhalothrin (+Thiamethoxam)	**Endigo ZC**	Broad spectrum insecticide on pome and stone fruit.
Novaluron	**Rimon 0.83 EC, Rimon 10 EC, Cormoran**	Soft IGR alternative for CM, OBLR, OFM and pear psylla. Registered for apples, and with special instructions for pears and stone fruit. Most effective as residue applied in place before most egglaying occurs.
Pyrifluquinazon	**PQZ**	New aphicide, but not for WAA which is the only aphid that occasionally needs control in Maine apple orchards.
Fungicides		
Benzovindiflupyr	**Aprovia, Aprovia Top**	SDHI fungicide, rotation or tankmix alternative.
Cyflufenamid	**Torino**	Effective only for powdery mildew. Registered on pome fruit and cherries.
Fludioxonil	**Scholar EZ, Scholar SC, Academy**	Postharvest - Prestorage dip/drench to prevent blue mold, gray mold and other storage rots on apples and stone fruit.
Fluopyram (+Pyrimethanil)	**Luna Tranquility**	SDHI + anilinopyrimidine combination, broad spectrum fungicide.
Fluopyram + Trifloxystrobin	**Luna Sensation**	SDHI + strobilurin combination, broad spectrum fungicide, esp. for summer disease control. Both active ingredients are on the Maine PFAS list.

Fluxapyroxad	**Sercadis Xemium**	SDHI fungicide, rotation or tankmix alternative.
Fluxapyroxad (+Pyraclostrobin)	**Merivon Xemium**	SDHI+strobilurin combination fungicide with for scab, SBFS, bitter rot and black rot. Better on Bitter rot and Calyx end rot than Flint or Sovran and similar to Pristine as best option for final preharvest apple fungicide.
Inpyrfluxam	**Excalia**	Newer SDHI protectant scab, translaminar locally systemic. Not for summer diseases.
Mefentrifluconazole	**Cevya**	New generation DMI for broad spectrum disease control.
Penthiopyrad	**Fontelis**	1st gen SDHI broad spectrum scab fungicide. Also labeled for bitter rot on apple and pear, + brown rot & gray mold on stone fruit. Tank mix recommended for scab control.
Pydiflumetofen	**Miravis**	SDHI with broad disease control on pome and stone fruit.
Trifloxystrobin	**Flint, Flint Extra**	Strobilurin fungicide effective against scab, SBFS, bitter rot, black rot & storage rot suppression for apple. Also used on stone fruit..
Triflumizole	**Procure 480 SC**	Older DMI scab fungicide with postinfection activity, used as tankmix partner.
Herbicides		
Carfentrazone-ethyl	**Aim, Shark**	Broadleaf weed burndown registered for all tree fruits.
Fluazifop-P-butyl	**Fusilade**	Postemergence perennial and annual grass. Registered on nonbearing apple, pear & on bearing stone fruit.
Norflurazon	**Solicam**	Preemergent control of annual grasses and some broadleaf weeds for apples and stone fruit.
Oxyfluorfen	**Goal, Collide, Galigan, GoalTender, Oxyflo, Oxystar**	Selective pre and post emergent control of certain grass and broadleaf weeds. Contact and light needed. Unique combination of pre- and postemergent effect on broadleaf annuals. Use only on dormant trees. Postemergent control of seedling weeds.
Pyraflufen-ethyl	**Venue, Vida**	Nonselective postemergent broadleaf weed control on pome and stone fruit for dormant, prebloom timing, up to 3 postbloom applications, or postharvest. For trees in orchard over 1 year. Also for postharvest control of green nonwoody suckers.
Saflufenacil	**Treevix, Sharpen**	Broad spectrum broadleaf burndown, some preemergent control for trees in ground over 9 months. Not effective on grasses or sedges. Trunk guards needed on trees less than 3-4 years old. Can be used multiple times per year.
Trifluralin (+Isoxaben)	**Snapshot 2.5 TG, Snapshot DG, Trust,** + other names.	Broad spectrum broadleaf and grass weed control for site preparation or nonbearing fruit trees. Requires soil incorporation which limits use in established orchards.

Many tree fruit growers also produce other agricultural commodities that involve use of pesticides that are affected by the same PFAS concerns described above. Here is the list of pesticide active ingredient common names registered in Maine that are categorized as being a PFAS under Maine law as identified by the Maine Board of Pesticides Control in March 2022.

Active ingredients in Maine registered pesticides defined as PFAS by Maine law **Brand name examples in ( ) are NOT comprehensive**, in many cases there are multiple brand names. List provided by the Maine Board of Pesticides Control in March 2022.		
Insecticides and miticides in red, Fungicides in blue, Herbicides in green, Others in black..		
Acifluorfen-sodium (RedEagle Acif.)	Flupyradifurone (Altus, Sivanto)	Picoxystrobin (Approach)
Benfluralin (Benfluralin)	Fluridone (Sonar)	Prodiamine (Barricade, Echelon)
Benzovindiflupyr (Aprovia)	Flurprimidol (Cutless)	Prosulfuron (Peak)
Bicyclopyrone (Acuron)	Flutolanil (Moncut)	Pydiflumetofen (Miravis, Posterity)
Bifenthrin (Brigade)	Fluvalinate (Apistan)	Pyraflufen-ethyl (Octane, Venue)
Bixafen (Lucento)	Fluxapyroxad (Merivon,Sercadis)	Pyrasulfotole (AE 03 17309)
Broflanilide (Cimegra, Nurizma)	Fomesafen (Sinister)	Pyridalyl (Overture)
Bromethalin (Fastrac, Tomcat)	Fomesafen-sodium (Flexstar)	Pyrifluquinazon (PQZ)
Carfentrazone-ethyl (Dismiss, Zeus)	Gamma-Cyhalothrin (Declare)	Pyrimisulfan (Sedge Stop, Vexis)
Chlorfenapyr (Pylon, Spectre)	Hexaflumuron (Shatter)	Pyroxasulfone (Anthem, Authority)
Cyflufenamid (Torino)	Hydramethylnon (Amdro)	Saflufenacil (Kixor, Treevix)
Cyflumetofen (Nealta)	Indoxacarb (Avaunt, Provaunt)	Sedaxane (Vibrance)
Dithiopyr (Dimension)	Inpyrfluxam (Excalia, Zelterra)	Sulfentrazone (Dismiss, Spartan)
Fipronil (Combat, Fiproguard)	Lactofen (Mongoose)	Tefluthrin (Force, Precept)
Flonicamid (Beleaf)	Lambda-Cyhalothrin (Warrior)	Tetraconazole (Domark 230,Trojan)
Fluazifop-P-butyl (Weed & Grass)	Mefentrifluconazole (Cevya)	Tetraniliprole (Tetrino)
Fludioxonil (Maxim, Scholar)	Norflurazon (Evital)	Tiafenacil (Refiton)
Fluensulfone (Nimitz)	Novaluron (Rimon)	Tralopyril (Smart Solution)
Flufenacet (Axiom)	Noviflumuron (Recruit)	Trifloxystrobin (Flint, Gem)
Fluindapyr (Kalida)	Oxathiapiprolin (Orondis Gold)	Triflumizole (Procure, Terraguard)
Flumioxazin (Fierce, Fuerte)	Oxyfluorfen (Collide, Goal)	Trifluralin (Quali-Pro, Treflan)
Fluopicolide (Adorn, Presidio)	Penoxsulam (Galleon)	Triflusulfuron-methyl (Upbeet)
Fluopyram (Luna Sens./ Tranq.)	Penthiopyrad (Fontelis, Velista)	

Dirty Deeds

We might as well get all the bad news out of the way in one newsletter issue. The annual 'Shopper's Guide to Pesticides in Produce' (aka "Dirty Dozen" list) published by the "Environmental Working Group" (EWG) is scheduled to come out soon. Responsible toxicologists and dieticians have expressed serious concerns about the misinterpretation of USDA Pesticide Data Program results by the EWG in producing their annual list. Toxicology is a very complex subject that does not lend itself to bumper sticker simplification. I am no more qualified to lecture on it than the folks at EWG. But you and I can read. And here are some things we can read about the 'Dirty Dozen' list.

From the document itself *"The Shopper's Guide does not incorporate risk assessment into the calculations. All pesticides are weighted equally, and we do not factor in the levels deemed acceptable by the EPA*."

It is striking to see that a document that purports to assess risk says that it "does not incorporate risk assessment".

To be clear, EWG generates no original residue testing to create the report. It reuses data from the USDA Pesticide Data Program (PDP), which publishes an annual report on randomly collected samples of selected fruit and vegetables from across the U.S. that are analyzed for the amount and types of pesticide residue. The EWG makes their own conclusions from the PDP data by focusing on the presence or absence of residues, regardless of the amount detected.

Here is expert perspective about the sensitivity of quantitative chemical detection from Dr. Alan Felsot, Professor, Food and Environmental Quality Laboratory, Washington State University, from a 1998 article titled "Numbers, Numbers Everywhere—And Not a Drop of Meaning". The fact that the article was published over 21 years ago suggests that given subsequent advances in quantitative chemistry, his point about the ability to detect chemicals at extremely low levels is probably even more true today than when the article was originally published.

"Forty-five years ago we had the capability of detecting pesticides in soil and plants at levels of parts per million (ppm); few laboratories could detect anything at levels a thousand-fold lower, or parts per billion. Since then, analytical instrumentation has undergone an evolution in capability that now allows routine detection of not only ppb, but increasingly allows detection of parts per trillion (ppt), and with some sophisticated work, parts per quadrillion (ppq).

As a result of engineering ingenuity permitting detection of nearly inconceivably small amounts, analytical chemists give policy makers reams of numbers. Most policy makers, having never experienced firsthand the art of analysis, treat the numbers as if they are concrete realities, when in fact the numbers represent probabilities. Coupled with a biological understanding that lags behind our ability to measure minuscule concentrations of many chemicals, regulatory standards have begun to overreach the true significance of the numbers, rendering them worthless pawns in an attempt to set an arbitrary social, economic, and political objective."

https://nationalaglawcenter.org/publication/download/felsot-numbers-numbers-everywhere-and-not-a-drop-of-meaning-13-j-environmental-l-litigation-91-113-1998

In addition to critiques of their methodology by toxicologists, the EWG has also received frequent criticism for from dieticians and other health professionals for doing harm to public health by making inaccurate claims about the danger associated with consuming fruits and vegetables.

In 2018 Carrie Dennet, MPH, CD RDN (registered dietitian nutritionist) wrote this in an article titled “Why the ‘Dirty Dozen’ doesn’t mean what you think it means”:

“For years, not only did I recommend the Environmental Working Group’s (EWG) annual ‘Dirty Dozen’ and ‘Clean Fifteen’ lists as a useful guide for prioritizing which fruits and vegetables to buy organic, but I used it as a guide for my own purchases.“

“I dug in and took a deeper look at the methodology behind the list — and was disappointed.”

“The bottom line is that our health benefits from eating adequate fruits and vegetables are most important — don’t let uncertainty about whether to buy organic or conventional scare you away from the produce department.”
https://www.seattletimes.com/life/wellness/why-the-dirty-dozen-doesnt-mean-what-you-think-it-means/

Just a few days ago (March 28, 2022) in preparation for the annual publication of the EWG report, Dennet wrote in an article titled “Why aren’t people eating fruits and veggies? ‘Dirty Dozen’ list may play role”:
“…the ‘Dirty Dozen; conveys the false idea that ‘conventional’ produce is unsafe to eat.“

Similar statements are available from many sources, for example:

“A focus on nutrition in general would be much more beneficial to human health than this misguided focus on extraordinarily small contamination levels of pesticides. Every chemical has toxicity, but it’s all in the dose. The amount of pesticides present as residues on food is miniscule.” - Samuel Cohen, University of Nebraska Medical Center, 2011.

“You don’t have to eat organic to eat healthily. Eating real food, whether it’s organic or not, is going to do a lot for your health. Any apple is good for you.”
- Michael Pollan, author of many highly regarded books on food, and professor at the University of California, Berkeley, 2012.

“To accurately assess consumer risks from pesticides, one needs to consider three major factors: 1) the amount of residue on the foods,
2) the amount of food consumed, and
3) the toxicity of the pesticides.
The methodology used by EWG ignores all three.”

“The first principle of toxicology is ‘the dose makes the poison. It is the amount of exposure to a chemical, not its presence or absence, that determines the potential for harm.”

“If consumers were exposed to 100,000 times more pesticide residue than they are typically exposed to on a daily basis throughout their lifetimes, their levels of exposure would still be lower than levels that don’t even produce any noticeable toxicological effect in long-term animal toxicology studies.”

“A diet rich in consumption of fruits, vegetables and whole grains has been shown to significantly decrease one’s risk of cancer and heart disease.”

- Dr. Carl Winters, Extension Toxicologist Emeritus, University of California, 2021.
https://www.producebluebook.com/2021/03/17/dirty-dozen-list-scientifically-unsupportable-hurts-consumers/#
https://www.seattletimes.com/life/wellness/is-nonorganic-produce-safe-to-eat-yes-and-heres-why/

The criticism of EWG impugning the safety of fruits and vegetables is based on the concern that such negative publicity is thought to reduce consumption of those foods to the detriment of public health. The Center for Disease Control and Prevention (CDC) tracks food choice patterns because (in their words) “a healthy diet supports healthy immune function, and helps to prevent obesity, type 2 diabetes, cardiovascular diseases, some cancers”, and other conditions that “are among the leading causes of mortality in the United States”.

In January 2022, the CDC published a report on the most recent dietary choices survey data from 49 states. The survey results show that only 12.3% of U.S. adults meet the daily recommendations for consumption of fruits (1.5 to 2 cups per day), and only 10% for vegetables (2-3 cups per day).

The report also shows single state percentages. Based on 7,902 respondents in Maine, the values are 11.9% for fruit and 10.9% for vegetables. The Maine subgroup values for fruit consumption are shown below.

Maine: Percent of respondents meeting recommended fruit consumption guideline*
Center for Disease Control and Prevention. 2022.

Sex		**Age**			**Ratio of income to poverty level**		
Male	**Female**	**18-30**	**31-50**	**>=51**	**<1.25**	**1.25 – 3.49**	**>3.5**
9.3%	**14.5%**	**10.3%**	**12.9%**	**11.9%**	**8.0%**	**9.3%**	**14.5%**

*In addition to other limitations, self-reported dietary behaviors are subject to recall and social desirability biases, whereby different demographic groups might overestimate and others underestimate dietary intake.
https://www.cdc.gov/mmwr/volumes/71/wr/pdfs/mm7101a1-H.pdf

Consumption of fruits and vegetables below recommended dietary guidelines persists despite prolonged efforts of national public health messaging campaigns to increase it. Inaccurate statements about pesticide residue on fresh fruits and vegetables have been shown in peer-reviewed studies to reduce consumption of those products.

Statements about the safety of consuming fruits and vegetables seem to have evolved in the EWG ‘Shopper’s Guide’ over the years. The 2021 edition of the Shopper’s Guide and EWG web page included this statement:

“Everyone should eat plenty of fresh fruits and vegetables, whether organic or conventionally grown. The health benefits of such a diet outweigh the risks of pesticide exposure.”

Despite such apparent moderation, the 2021 EWG report also includes unfounded and inflammatory statements such as: "Current EPA rules still don't protect people's health. Some liken pesticide tolerances to a 500-mph speed limit: If the rules of the road are so loose that it's impossible to violate them, nobody can feel safe."

Up to and including 2021, the messaging of the EWG Shopper's Guide has been:
1) Consuming fruits and vegetables poses danger.
2) You cannot rely on what the USDA or EPA say to protect your health. EWG reports that danger to you.
3) Send a donation to help EWG continue this work.

A panel of experts in pharmacology, toxicology, nutrition, etc. convened in 2010 by the Alliance for Food and Farming (AFF) came to much different conclusions than the EWG about the USDA PDP data. (While sponsoring the report, AFF did not participate in its production.)

"The U.S. EPA's current process for evaluating the potential risks of pesticides on food is rigorous, and health-protective."

"The Panel does not agree with EWG's assertion that …" "…the amount of pesticide residues currently found on food constitutes a significant public health issue."
https://www.safefruitsandveggies.com/wp-content/uploads/2019/01/expert-panel-report.pdf
(The final 3.5 pages of that report also provides an easy to read summary of how EPA regulates pesticide residue on foods.)

Another review (also sponsored by AFF, again without editorial control) was written by Dr. Robert Krieger (Fellow in The Academy of Toxicological Sciences; Director of the Personal Chemical Exposure Program, University of California, Riverside) came to this conclusion:

"It is groundless to suggest that the Shopper's Guide can be used to meaningfully predict risk. The testing that is used to identify the inherent hazards of pesticides also yields a measure of exposure that is not associated with any detectable adverse effects (toxicity). The pesticide exposures that result from consumption of hundreds to thousands of servings of produce with the very highest residues measured represent ***no effect levels of exposure."*** *(Emphasis as shown in original report)*
https://www.safefruitsandveggies.com/wp-content/uploads/2019/01/pesticides-in-perspective-1.pdf

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What does the USDA PDP conclude from their testing of pesticide residues on fruits and vegetables? Similar to previous years, the 2022 PDP summary reports that:

"The full results for more than 2.6 million analyses, representing each pesticide monitored on each commodity reaches the conclusion that ..." "…over 99 percent of the samples tested had residues below the tolerances established by the EPA with 30.0 percent having no detectable residue."

"Residues exceeding a tolerance were detected in 0.49 percent (47 samples) of the total samples tested (9,600 samples)."

"The data reported by PDP illustrate that residues found in agricultural products sampled are at levels that do not pose risk to consumers' health and are safe according to EPA and FDA."

The 2020 PDP report explains how EPA Tolerances are created.

"Before a company can sell or distribute any pesticide in the United States, the Environmental Protection Agency (EPA) reviews studies on the pesticide to ensure that it will not pose unreasonable risks to human health or the environment, while considering the economic, social, and environmental costs and benefits of the use of any pesticide. Once EPA has made that determination, it will license or register that pesticide for use in strict accordance with label directions. Before allowing a pesticide to be used on a food commodity, EPA sets limits on how much of a pesticide may be used on food during growing, processing, and storage, and how much can remain on the food that reaches the consumer. In setting the tolerance, or maximum residue limit in food, EPA makes a safety finding that the pesticide can be used with a reasonable certainty of no harm by considering the toxicity of the pesticide, how much of the pesticide is applied and how often, how much of the pesticide remains in or on food by the time it is marketed and prepared, and all possible routes of exposure including use on crops, exposure from drinking water, and residential exposure."

The precautionary approach taken in setting EPA tolerances is both laudable and necessary. There is a lot we do not know about the how chemicals act in the human body and the environment. It is better to be cautious than sorry. A reference to compare against is necessary. But the fact that a residue can be detected does not mean that the number has meaning. Absolutism in pesticide measurement is no more workable than anywhere else.

That is why the basic tenet of toxicology "The dose makes the poison" is so important. It is not the mere detectable presence or absence of molecules that indicates risk. Zero tolerance is not necessary or helpful. If everything is a priority, then there are no priorities. EPA and other government regulators define acceptable tolerances so that detection of pesticide residues can be interpreted in a meaningful way.

Here are some results from recent USDA PDP reports. These are the same data that EWG will use to state conclusions in the upcoming 2022 "Shopper's Guide' about apples, apple sauce, apple juice, pears, and peaches. The PDP does not have the resources to test every commodity every year. High consumption and high priority product like apples are retested about every five years.

All PDP reports are online at [https://www.ams.usda.gov/reports/pdp-annual-summary-reports.](https://www.ams.usda.gov/reports/pdp-annual-summary-reports) The most recent PDP report published in January 2022 defines a tolerance violation. "In the PDP evaluation, a tolerance violation occurs when a residue is found that exceeds the tolerance level or when a certain residue is found for which there is no established tolerance. Unlike enforcement programs, PDP emphasizes determination of residues at low levels of detection levels rather than quick turn-around times. When PDP identifies samples with residues exceeding the tolerance or with residues for which there is no established tolerance, these detections are reported to FDA's headquarters office."

The PDP sampling and testing years for some tree fruit products are as follows.

Commodity	Most recent PDP sampling dates
APPLE JUICE	2020. Most recent report, issued January 2022.
APPLESAUCE	2017
APPLES (FRESH FRUIT)	2016
PEARS	2016. Sampling and testing begun in 2021 is ongoing.
APPLES (FRESH FRUIT)	2015
PEACHES	2015. Sampling and testing begun in 2021 is ongoing.
APPLESAUCE (BABY FOOD)	2013

The PDP results have repeatedly confirmed the safety of the U.S. fruit and vegetable food supply, including tree fruit products. Four of the seven tree fruit commodity examples shown below (Apple juice 2020, Applesauce 2017, Apples 2016, Applesauce Baby Food 2013) had such low residue levels that on a hypothetical "pesticide residue-only basis" those products would qualify for sale as organic produce. This is hypothetical because there is no such classification. The USDA National Organic Program requirements include more factors than pesticide residue. But it serves to show that the level of residues on randomly selected tree fruit products are very low relative to EPA tolerances that are themselves set very low to provide a safety buffer that minimizes risk.

For two the other examples (Pears 2016, Apples 2015) a postharvest fungicide residue (5%, and 6%) was just above a hypothetical threshold for residues of less than 5% of EPA tolerance qualifying for sale as 'organic'. In the final example (Peaches 2015), two postharvest fungicide residues (6%, 10%) were over the 5% criterion.

The EWG characterization of these same residue data has been quite different. Apples, peaches, and pears were ranked as #4, 5, 6 as the most dangerous fruit and vegetable products in the 2017 EWG report based on the 2016 PDP data. The 2021 edition ranked apples, peaches and pears at #5, 8, & 9 in the "Dirty Dozen". The first line of the 2021 edition is: "Nearly 70 percent of the non-organic fresh produce sold in the U.S. contains residues of potentially harmful chemical pesticides". Farther down on the first page EWG appears to placate their critics but still get in their fundraising pitch: "…fruits and vegetables are critical components of a healthy diet. However, many crops contain potentially harmful pesticides, even after washing, peeling or scrubbing." In other words, "Eat fruits and vegetables even though thanks to us you now know how dangerous they are. Please donate."

As noted many pages earlier, toxicology is in the eye of the beholder. The perspective expressed in this newsletter is a good faith effort at representing the objective facts. It would be incorrect to interpret this article as suggesting that there is no need for concern about pesticide residues. Even with assurance from EPA regulation and USDA PDP monitoring that fruits and vegetables are safe, there are good reasons to continue monitoring, increase efforts to protect public health from pesticide residue, and to promote healthy food choices.

USDA Pesticide Data Program. APPLE JUICE

Sample unit and preparation: 100% apple juice. Single strength, ready-to-serve in cartons, jars, cans, pouches, or plastic containers. Reconstituted from concentrate or not from concentrate. May be pasteurized. Individual single-serving box containers are acceptable as long as the sample size requirement is met. May contain ascorbic acid/Vitamin C as added ingredient. Ensure that the sample is evenly mixed to obtain a homogeneous mixture. For concentrates, dilute juice in a dry, clean container with cold running tap water, according to label directions.

Number of samples tested: 724. **Testing year and sourcing:** **2020**, 52.7% domestic, 46.7% foreign, 0.6% unknown.

Display: Commodity x Pesticide pairings with detects on at least 5% of samples.

Pesticide panel: 584 pesticide active ingredients, metabolites, degradates, and isomers, plus 21 environmental contaminants.

Pesticide active ingredient & Example brand name & pesticide group*	% of samples with detectable residue	Mean detection Level ppm	Limit of Detection (LOD) ppm	Estimated total sample average residue[X] ppm	EPA tolerance ppm	Estimated sample average as % of EPA tolerance[XX]	Was estimated sample average below 5% tol. 'organic' threshold[XXX]
Acetamiprid (Assail) I	12.6	0.013	0.007	0.003	1	0.32%	✓ Yes
Diphenylamine (DPA) P	6.9	0.017	0.006	0.003	10	0.03%	✓ Yes
Fludioxonil (Scholar) P	6.9	0.019	0.007	0.003	5	0.06%	✓ Yes
Pyrimethanil (Penbotec) P	26.9	0.23	0.002	0.062	15	0.41%	✓ Yes
Tetrahydrophthalimide** (Captan) F	28.9	0.1	0.007	0.030	25	0.12%	✓ Yes
Thiabendazole (Mertect) P	22.2	0.03	0.003	0.007	5	0.14%	✓ Yes
Each of the other 578 tested pesticides							✓ Yes
Distribution of cumulative tolerance across pesticide groups: Fungicides 11%, Insecticide 29%, Postharvest treatments 60%							

* F = Fungicide, I = Insecticide, M = Miticide, P = Postharvest treatment (fungicide or scald inhibitor).
Chemicals with residue on <5% of samples are not shown.

** = Metabolite of captan

X = The residue was assumed to be zero for half of the non-detect samples, and at one half the Limit of Detection (LOD) for the other half of the non-detect samples. Thus, an average of ¼ the LOD for the non-detect samples. Sample average calculated from the weighted average of the mean level on detect samples (weighted as percent of sample with detections) and ¼ of the LOD on the non-detect residue levels (weighted as percent of samples without detections).

XX = The value shown is an estimated sample average residue as % of the EPA tolerance. The % of the No Observed Adverse Effect Level (NOAEL) would be no greater than 0.01 x the value shown for **"% EPA tolerance".** The EPA tolerance cannot be no greater than the NOAEL divided by 100. If an extra child safety factor is required, the EPA tolerance must be no more than the NOAEL/1000. Moreover, while the EPA tolerance can be no higher than the NOAEL/100, a tolerance can be set at any level lower than that, especially if it is determined that a lower residue is feasible based on field studies and to accommodate multiple product uses. In addition, the use of the NOAEL for setting tolerances instead of the LOAEL (Lowest Observed Adverse Effect Level) adds another layer of precaution. It is expensive to evaluate toxicological profiles, so only a limited number of dose levels can feasibly be tested. There can be a large gap between the NOAEL and LOAEL. As a result, it is not known how much incrementally higher the NOAEL might be. The use of a lower NOAEL results in a lower maximum value for an EPA food tolerance based on that NOAEL.

XXX = This is a hypothetical qualification for organic sale with respect to pesticide residues only. Organic qualification includes other criteria beyond residue status. Samples are selected without regard to country of origin, variety, growing season, or organic labeling. The portion of tested samples that are "conventional" vs. "organic" is not reported. Organic pesticide residues are allowed on organic produce up to the EPA Tolerance for those materials. Conventional pesticide residues are also allowed on organic produce as long the levels are below 5% of the tolerance level for each material as defined by the EPA. If present at less than 5% of their EPA tolerance, even though they are not organically certified, conventional pesticide residue is considered "unintentional," and the produce can be sold as organic.
Code of Federal Regulations 7cfr part 205 section 205.671. https://www.law.cornell.edu/cfr/text/7/205.671.

These tables show all residues found on more than 5% of samples. The average residue levels on materials found on less than 5% of samples would all have qualified for a "✓ Yes" in the last column if they had been included.

Y = Environmental contaminants include pesticides whose uses have been canceled in the United States and for which there is no established tolerance. Detection at any level is therefore a tolerance violation. PDP uses an Action Level determined by FDA for comparison when there is no EPA Tolerance.

No 2020 apple juice samples exceeded an established tolerance. There is no tolerance established for chlordane in apple juice. Chlordane was detected in 1 sample out of the 724 tested at <20% of the action threshold for that compound.

USDA Pesticide Data Program. APPLESAUCE
Sample unit and preparation: Processed applesauce; regular or chunky; sweetened/unsweetened/lite varieties. Plastic, glass, or metal containers.
Number of samples tested: 570. **Testing year and sourcing: 2017**, 93.0% domestic, 6.1% foreign, 0.9% unknown.
Display: Commodity x Pesticide pairings with detects on at least 5% of samples.
Pesticide panel: 512 pesticide active ingredients, metabolites, degradates, and isomers, plus 21 environmental contaminants.

Pesticide active ingredient & example brand name & pesticide group*	% of samples with detectable residue	Mean detection Level ppm	Limit of Detection (LOD) ppm	Estimated total sample average residue[X] ppm	EPA tolerance ppm	Estimated sample average as % of EPA tolerance[XX]	Was estimated sample average below 5% tol. 'organic' threshold[XXX]
Acetamiprid (Assail) I	77.2	0.013	0.002	0.010	1.0	1.02%	✓ Yes
Boscalid (Pristine) F	6.7	0.007	0.003	0.001	3.0	0.04%	✓ Yes
Carbendazim*** (Topsin M) F	67.0	0.013	0.001	0.009	2.0	0.44%	✓ Yes
Cyprodinil (Inspire Super) F	10.4	0.007	0.005	0.002	1.7	0.11%	✓ Yes
Diphenylamine (DPA) P	48.9	0.016	0.002	0.008	10.0	0.08%	✓ Yes
Flubendiamide (Belt) I	21.2	0.006	0.004	0.002	1.5	0.14%	✓ Yes
Fludioxonil (Scholar) P	14.0	0.081	0.025	0.017	5.0	0.33%	✓ Yes
Imidacloprid (Admire) I	8.2	0.007	0.003	0.001	0.5	0.25%	✓ Yes
Pyrimethanil (Penbotec, Scala) F, P	24.4	0.308	0.050	0.085	15.0	0.56%	✓ Yes
Tetrahydrophthalimide** (Captan) F	69.1	0.068	0.010	0.048	25.0	0.19%	✓ Yes
Thiabendazole (Mertect) P	32.3	0.077	0.002	0.025	5.0	0.50%	✓ Yes
Each of the other 501 tested pesticides							✓ Yes
Distribution of cumulative tolerance across pesticide groups: Fungicides 21%, Insecticides 38%, Postharvest treatments 40%							

None of the 2017 apple sauce samples had residue at above tolerance or present without an established tolerance.
See the 2020 data table for other footnote descriptions.
*** = Metabolite of Topsin M

USDA Pesticide Data Program. APPLES **Sample unit and preparation: Whole fresh apples.** Wash and drain. Do not peel. Remove the stem. Remove the core. **Number of samples tested:** 531. **Testing year and sourcing:** **2016**, 94% domestic, 6% foreign. **Display:** Commodity x Pesticide pairings with detects on at least 5% of samples. **Pesticide panel:** 480 pesticide active ingredients, metabolites, degradates, and isomers, plus 22 environmental contaminants.							
Pesticide active ingredient & example brand name & pesticide group*	**% of samples with detectable residue**	**Mean detection Level ppm**	**Limit of Detection (LOD) ppm**	**Estimated Total sample average residue[x] ppm**	**EPA tolerance ppm**	**Estimated sample average as % of EPA tolerance[xx]**	**Was estimated sample average below 5% 'organic' threshold[xxx]**
Acetamiprid (Assail) I	32.6	0.026	0.002	0.009	1.0	0.9%	✓ Yes
Boscalid (Pristine) F	22.8	0.057	0.003	0.014	3.0	0.5%	✓ Yes
Carbendazim*** (Topsin M) F	14.1	0.028	0.001	0.004	2.0	0.2%	✓ Yes
Chlorantraniliprole (Altacor) I	25.2	0.023	0.010	0.008	1.2	0.6%	✓ Yes
Cyhalothrin(Warrior) I	5.1	0.013	0.005	0.002	0.3	0.6%	✓ Yes
Diphenylamine (DPA) P	80.2	0.283	0.002	0.227	10.0	2.3%	✓ Yes
Flubendiamide (Belt) I	5.1	0.034	0.004	0.003	1.5	0.2%	✓ Yes
Fludioxonil (Scholar) P	35.0	0.417	0.025	0.150	5.0	3.0%	✓ Yes
Hexythiazox (Savey) M	6.8	0.013	0.002	0.001	0.4	0.3%	✓ Yes
Imidacloprid (Admire) I	7.5	0.007	0.003	0.001	0.5	0.2%	✓ Yes
Pyraclostrobin (Pristine) F	20.5	0.033	0.003	0.007	1.5	0.5%	✓ Yes
Pyrimethanil (Penbotec, Scala) F,P	33.9	1.668	0.050	0.574	15.0	3.8%	✓ Yes
Spirodiclofen (Envidor) M	14.3	0.027	0.010	0.006	0.8	0.8%	✓ Yes
Tetrahydrophthalimide** (Captan) F	12.2	0.133	0.010	0.018	25.0	0.1%	✓ Yes
Thiabendazole (Mertect) P	62.9	0.391	0.002	0.246	5.0	4.9%	✓ Yes
Trifloxystrobin (Flint) F	9.2	0.005	0.002	0.001	0.5	0.2%	✓ Yes
Each of the other 464 tested pesticides							✓ Yes
Distribution of cumulative tolerance across pesticide groups[xxxx]: Fungicides 7%, Insecticides & Miticides 19%, Postharvest treatments 73%							

None of the 2016 apple samples had residue above tolerance or present without an established tolerance.
See the 2020 data table for other footnote descriptions.
*** = Metabolite of Topsin M

USDA Pesticide Data Program. PEARS
Sample unit and preparation: Any fresh, whole pears. **Number of samples tested:** 707.
Testing year and sourcing: **2016**, 86.4% domestic, 13.6% foreign. **Display:** Commodity x Pesticide pairings with detects on at least 5% of samples.
Pesticide panel: 480 pesticide active ingredients, metabolites, degradates, and isomers, plus 22 environmental contaminants.

Pesticide & example brand name & pesticide group*	% of samples with detectable residue	Mean detection Level ppm	Limit of Detection (LOD) ppm	Estimated total sample average residue[X] ppm	EPA tolerance ppm	Estimated sample average as % of EPA tolerance[XX]	Was estimated sample average below 5% tol. 'organic' threshold[XXX]
Acetamiprid (Assail) I	14.4	0.060	0.010	0.011	1.0	1.08%	✓ Yes
Boscalid (Pristine) F	22.5	0.073	0.005	0.017	3.0	0.58%	✓ Yes
Carbendazim*** (Topsin M) F	25.7	0.043	0.010	0.013	3.0	0.43%	✓ Yes
Chlorantraniliprole (Altacor) I	12.9	0.030	0.015	0.007	1.2	0.59%	✓ Yes
Diphenylamine (DPA) P	10.7	0.041	0.004	0.005	5.0	0.11%	✓ Yes
Ethoxyquin (Xedaquin) P	26.3	0.212	0.006	0.057	3.0	1.90%	✓ Yes
Etoxazole (Zeal) M	20.9	0.008	0.001	0.002	0.2	0.93%	✓ Yes
Fenbutatin oxide (Vendex) M	10.7	0.121	0.010	0.015	15.0	0.10%	✓ Yes
Fenpyroximate (Portal) M	19.4	0.026	0.001	0.005	0.3	1.75%	✓ Yes
Fludioxonil (Scholar) P	41.9	0.597	0.020	0.253	5.0	5.06%	No
Imidacloprid (Admire) I	10.1	0.095	0.025	0.015	0.6	2.54%	✓ Yes
Novaluron (Rimon) I	5.8	0.029	0.007	0.003	3.0	0.11%	✓ Yes
Ortho-Phenylphenol (Dowcide) P	20.1	0.940	0.002	0.189	25.0	0.76%	✓ Yes
Pyraclostrobin (Pristine) F	21.5	0.038	0.003	0.009	1.5	0.58%	✓ Yes
Pyridaben (Nexter) M	6.5	0.015	0.002	0.001	0.75	0.19%	✓ Yes
Pyrimethanil (Penbotec, Scala) F,P	52.5	1.101	0.005	0.579	15	3.86%	✓ Yes
Spinetoram (Delegate) I	5.0	0.035	0.020	0.007	0.2	3.25%	✓ Yes
Spirodiclofen (Envidor) M	11.5	0.030	0.005	0.005	0.8	0.57%	✓ Yes
Spirotetramat (Movento) I	20.2	0.007	0.002	0.002	0.7	0.26%	✓ Yes
Thiabendazole (Mertect) P	32.8	0.421	0.003	0.139	5.0	2.77%	✓ Yes
Each of the other 460 tested pesticides							✓ Yes
Distribution of cumulative tolerance across pesticide groups: Fungicides 6%, Insecticides & Miticides 35%, Postharvest treatments 59%							

None of the 2016 pear samples had residue above tolerance or present without an established tolerance.
See the 2020 data table for other footnote descriptions.
*** = Metabolite of Topsin M

USDA Pesticide Data Program. APPLES **Sample unit and preparation: Whole fresh apples.** Wash and drain. Do not peel. Remove the stem. Remove the core. **Number of samples tested:** 708. **Testing year and sourcing: 2015**, 94.9% domestic, 4.8% foreign, 0.3% unknown. **Display:** Commodity x Pesticide pairings with detects on at least 5% of samples. **Pesticide panel:** 465 pesticide active ingredients, metabolites, degradates, and isomers, plus 23 environmental contaminants.							
Pesticide active ingredient & example brand name & pesticide group*	**% of samples with detectable residue**	**Mean detection Level ppm**	**Limit of Detection (LOD) ppm**	**Estimated total sample average residue[x] ppm**	**EPA tolerance ppm**	**Estimated sample average as % of EPA tolerance[xx]**	**Was estimated sample average below 5% tol. 'organic' threshold[xxx]**
Acetamiprid (Assail) I	27.7	0.035	0.002	0.010	1.0	1.01%	✓ Yes
Boscalid (Pristine) F	25.3	0.039	0.003	0.010	3.0	0.35%	✓ Yes
Carbendazim*** (Topsin M) F	18.5	0.029	0.001	0.006	2.0	0.28%	✓ Yes
Chlorantraniliprole (Altacor) I	18.9	0.022	0.010	0.006	1.2	0.52%	✓ Yes
Diphenylamine (DPA) P	82.2	0.332	0.002	0.273	10.0	2.73%	✓ Yes
Fludioxonil (Scholar) P	35.5	0.419	0.025	0.153	5.0	3.06%	✓ Yes
Hexythiazox (Savey) M	5.1	0.013	0.002	0.001	0.4	0.28%	✓ Yes
Imidacloprid (Admire) I	13.6	0.008	0.003	0.002	0.5	0.35%	✓ Yes
Phosmet (Imidan) I	5.8	0.084	0.010	0.007	10.0	0.07%	✓ Yes
Pyraclostrobin (Pristine) F	18.8	0.026	0.003	0.005	1.5	0.37%	✓ Yes
Pyrimethanil (Penbotec, Scala) F,P	24.4	1.620	0.050	0.405	15.0	2.70%	✓ Yes
Spirodiclofen (Envidor) M	19.4	0.036	0.010	0.009	0.8	1.12%	✓ Yes
Tetrahydrophthalimide** (Captan) F	14.4	0.198	0.010	0.031	25.0	0.12%	✓ Yes
Thiabendazole (Mertect) P	67.7	0.444	0.002	0.301	5.0	6.01%	No
Thiacloprid (Calypso) I	12.1	0.007	0.001	0.001	0.3	0.36%	✓ Yes
Trifloxystrobin (Flint) F	5.6	0.005	0.002	0.001	0.5	0.15%	✓ Yes
Each of the other 449 tested pesticides							✓ Yes
Distribution of cumulative tolerance across pesticide groups[xxxx]: Fungicides 19%, Insecticides & Miticides 6%, Postharvest treatments 74%							

None of the 2015 apple samples had residue above tolerance or present without an established tolerance.

See the 2020 data table for other footnote descriptions.

*** = Metabolite of Topsin M

USDA Pesticide Data Program. <u>PEACHES</u> **Sample unit and preparation:** Fresh whole peaches. Red, white, or yellow. Clingstone, freestone, or semi-freestone. Attempt to select peaches that are not overly ripe or soft to the touch. **Number of samples tested:** 362. **Testing year and sourcing:** **<u>2015</u>**, 50.8% domestic, 48.9% foreign, 0.8% unknown. **Display:** Commodity x Pesticide pairings with detects on at least 5% of samples. **Pesticide panel:** 465 pesticide active ingredients, metabolites, degradates, and isomers, plus 23 environmental contaminants.							
Pesticide & example brand name & pesticide group*	**% of samples with detectable residue**	**Mean detection Level ppm**	**Limit of Detection (LOD) ppm**	**Estimated total sample average residue[X] ppm**	**EPA tolerance ppm**	**Estimated sample average as % of EPA tolerance[XX]**	**Was estimated sample average below 5% tol. 'organic' threshold[XXX]**
Acetamiprid (Assail) I	16.9	0.04	0.010	0.009	1.2	0.74%	✓ Yes
Chlorantraniliprole (Altacor) I	10.2	0.029	0.020	0.007	4.0	0.19%	✓ Yes
Chlorpyrifos (Lorsban) I	9.1	0.040	0.005	0.005	0.1	4.78%	✓ Yes
Cyfluthrin (Baythroid) I	6.4	0.036	0.005	0.003	0.3	1.16%	✓ Yes
Cyhalothrin (Warrior) I	21.0	0.015	0.008	0.005	0.5	0.95%	✓ Yes
Cyprodinil (Inspire Super) F	6.4	0.151	0.005	0.011	2.0	0.54%	✓ Yes
Fludioxonil (Scholar) P	65.2	0.745	0.005	0.486	5.0	9.72%	No
Indoxacarb (Avaunt) I	10.5	0.032	0.010	0.006	0.9	0.62%	✓ Yes
Iprodione (Rovral) F	46.4	0.672	0.005	0.312	20.0	1.56%	✓ Yes
Methoxyfenozide (Intrepid) I	13.0	0.030	0.010	0.006	3.0	0.20%	✓ Yes
Myclobutanil (Rally) F	7.2	0.025	0.005	0.003	2.0	0.15%	✓ Yes
Propiconazole (Tilt) F	20.7	0.062	0.010	0.015	4.0	0.37%	✓ Yes
Pyraclostrobin (Pristine) F	6.4	0.043	0.003	0.003	2.5	0.14%	✓ Yes
Pyrimethanil (Penbotec, Scala) F,P	35.1	0.393	0.003	0.138	10.0	1.38%	✓ Yes
Spirodiclofen (Envidor) M	8.3	0.047	0.010	0.006	1.0	0.62%	✓ Yes
Tebuconazole (Orius) F,P	39.0	0.156	0.005	0.062	1.0	6.16%	No
Each of the other 449 tested chemicals							✓ Yes
Distribution of cumulative tolerance across pesticide groups: Fungicides 9%, Insecticides & Miticides 32%, Postharvest fungicide 59%							

None of the 2015 peach samples had residue without an established tolerance. One of the 362 peach samples in 2015 had chlorpyrifos residue at 0.38 ppm vs. the 0.10 ppm EPA tolerance.

See the 2020 data table for footnote descriptions.

USDA Pesticide Data Program. APPLESAUCE - BABY FOOD **Sample unit and preparation:** Pureed Stage 1 (First Food) or Stage 2 (Second Food) apples/applesauce baby food. Container may be glass or plastic. May contain docosahexaenoic acid (DHA), arachidonic acid (ARA), choline, vitamin E or gelatin. **Number of samples tested:** 379. **Testing year and sourcing: 2013**, 95.5% domestic, 4% foreign, 0.5% unknown. **Display:** Commodity x Pesticide pairings with detects on at least 5% of samples. **Pesticide panel:** 207 pesticide active ingredients, metabolites, degradates, and isomers, plus 13 environmental contaminants.							
Pesticide active ingredient & example brand name & pesticide group*	**% of samples with detectable residue**	**Mean detection Level ppm**	**Limit of Detection (LOD) ppm**	**Estimated total sample average residue[X] ppm**	**EPA tolerance ppm**	**Estimated sample average as % of EPA tolerance[XX]**	**Was estimated sample average below 5% tol. 'organic' threshold[XXX]**
Acetamiprid (Assail) I	23.5	0.021	0.010	0.007	1.0	0.68%	✓ Yes
Carbendazim** (Topsin M) F	10.0	0.026	0.010	0.005	2.0	0.24%	✓ Yes
Fenpropathrin (Danitol) I	6.6	0.002	0.001	0.000	5.0	0.01%	✓ Yes
Myclobutanil (Rally) F	9.5	0.002	0.001	0.000	0.5	0.08%	✓ Yes
Pyridaben (Nexter) M	5.5	0.002	0.001	0.000	0.5	0.07%	✓ Yes
Pyrimethanil (Penbotec, Scala) F,P	8.4	0.020	0.003	0.002	14.0	0.02%	✓ Yes
Thiabendazole (Mertect) P	6.9	0.055	0.010	0.006	5.0	0.12%	✓ Yes
Each of the other 200 tested pesticides							✓ Yes
Distribution of cumulative tolerance across pesticide groups: Fungicides 27%, Insecticides & Miticides 62%, Postharvest fungicide 11%							

None of the 2013 Applesauce Baby Food samples had residue above an established tolerance. One of the 357 samples had iprodione residue present at 0.002 ppm without an established tolerance. There is no EPA Tolerance or FDA Action Threshold for comparison. The EPA Tolerance for nine different fruit and vegetable foods in the data ranged from 2.0 to 60.0 ppm.

See the 2020 data table for other footnote descriptions.

EPA Endocrine Disruptor Evaluation

In July 2021 the EPA Office of Inspector General issued a report critical of progress in meeting mandated timelines for increasing surveillance of possible endocrine disruptor effects attributable to pesticides.
https://www.epa.gov/system/files/documents/2021-07/_epaoig_20210728-21-e-0186.pdf

The report found that:

"Twenty-four years after the Food Quality Protection Without Act of 1996 amendments were passed, the Office of Chemical Safety and Pollution Prevention has not implemented Section 408(p)(3)(A) of the Federal controls, the EPA Food, Drug, and Cosmetic Act to test all pesticide chemicals for endocrine-disruption activity.

Endocrine Disruptor Screening Program testing delays are inconsistent with the Federal Food, Drug, and Cosmetic Act, which directs the EPA to take appropriate action to protect public health if a substance is found to have an effect on the human endocrine system.

Without the required testing and an effective system of internal controls, the EPA cannot make measurable progress toward complying with statutory requirements or safeguarding human health and the environment against risks from endocrine-disrupting chemicals."

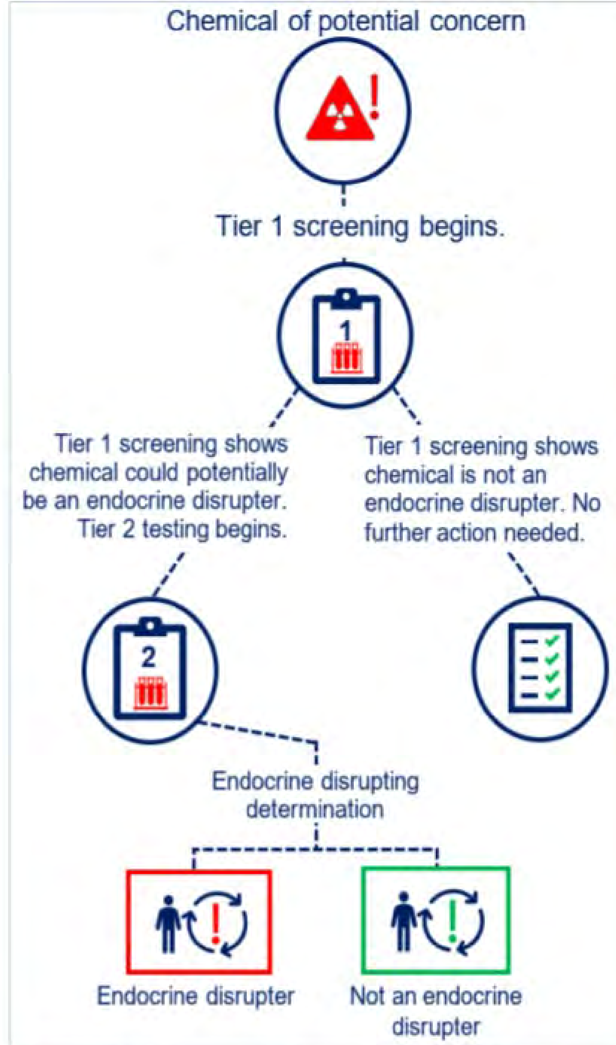
Table 1: Prioritization of chemicals for tiered testing

	TIER 1 Identifies substances and chemicals that may interact with the endocrine system.	TIER 2 Determines whether a substance or chemical adversely affects the endocrine system, if warranted by the Tier 1 screening results.
LIST 1	The first group of 52 chemicals identified for testing. The EPA issued Tier 1 test orders. ✓	The EPA recommended additional testing, known as Tier 2 testing, for 18 out of the 52 chemicals from List 1–Tier 1. *The EPA has not issued any Tier 2 test orders. ✗
LIST 2	The second group of 109 chemicals identified for testing. *The EPA has not issued any Tier 1 test orders. ✗	*The EPA has not identified nor issued any Tier 2 test orders. ✗

Source: OIG summary of EPA tier testing information. (EPA OIG table)

In 2009, EPA identified an initial list of pesticide active ingredients and inert materials to test for endocrine disruptor potential. That "List 1" was selected on the basis of exposure potential only. EPA very explicitly stated that presence on that list should NOT be construed as a suggestion of known or likely endocrine disruptor activity. In 2015, Tier 1 screening was completed for "List 1" to see which materials would need to progress to Tier 2 testing. The meaning of Tier 1 and Tier 2 are defined by EPA below.

Tier 1 screening data are used to identify substances that have the potential to interact with the endocrine system. Chemicals that go through Tier 1 screening and are found to exhibit the potential to interact with the estrogen, androgen, or thyroid hormone systems will proceed to Tier 2 for testing. The Tier 1 screening consists of a large number of evaluations of different possible effects on humans and different animal groups (i.e. mammals, birds, fish). Thus a Tier 1 screening for each individual chemical is itself a substantial study.



Source: OIG summary of the EPA's EDSP information. (EPA OIG image)

Tier 2 testing data identify adverse endocrine-related effects caused by the substance, and establish a quantitative relationship between the dose and that adverse effect. The results of Tier 2 testing will be combined with other hazard information and exposure assessment on a given chemical resulting in the risk assessment. Risk assessments are used to inform risk mitigation measures, as necessary, and regulatory decisions concerning chemicals. The need for Tier 2 testing can be based on Human health concerns, Wildlife concerns, or both.

The table on the next page shows status of the List 1 materials after Tier 1 screening. The majority of List 1 materials were found to NOT need Tier 2 testing. Evidence from the assay results, as well as other scientifically relevant data, showed that potential for endocrine bioactivity by those materials was lacking. So with respect to this process, they are done. But regular assessment testing for those materials, such as for regularly scheduled re-registration reviews, will continue. Those materials are noted in the table as “No Tier 2 testing needed.”

EPA is recommending Tier 2 testing for 18 of the List 1 chemicals to help the agency better understand the potential of these chemicals to cause adverse effects through interaction with the endocrine system. Materials for which Tier 2 testing was deemed necessary are noted for whether the need was for a Human health concern, a Wildlife concern, or both. If there was a Human health concern, the type of Tier 2 test called for is shown. Need for a Tier 2 test can arise from any one of multiple possible effect vs. animal group combinations. For example, carbaryl was cleared for all endocrine effects on humans, other mammals, and birds, and for all but one effect on fish. Carbaryl will receive Tier 2 testing for that potential effect on fish.

EPA Endocrine Disruptor Screening Program. List 1 screenings completed.		
	= Pesticide to have Tier 2 **Human health** test.	
	= Pesticide to have Tier 2 wildlife test.	
Insecticides and miticides in red, Fungicides in blue, Herbicides in green.		
Pesticide active ingredient ***** = registered for one or more tree fruit crops	**Brand name examples** (not a complete list)	**Status after Tier 1 Screening**
2,4-D*	Weedar 64	No Tier 2 test required.
Abamectin*	Agri-Flex, Agri-Mek	No Tier 2 test required.
Acephate	Acephate	No Tier 2 test required.
Atrazine	Atrazine	No Tier 2 test required.
Benfluralin	Benfluralin	No Tier 2 test required.
Bifenthrin*	Brigade, Sniper	No Tier 2 test required.
Captan*	Captan, Captec	No Tier 2 test required.
Carbaryl*	Sevin	**Wildlife**
Carbofuran	Furadan	No Tier 2 test required.
Chlorothalonil*	Bravo, Equus	**Wildlife**
Chlorpyrifos	Lorsban. All food uses discontinued.	No Tier 2 test required.
Cyfluthrin*	Baythroid, Tombstone	No Tier 2 test required.
Cypermethrin*	**Mustang Maxx** (?) (zeta-cypermethrin has 4 of the 8 isomers in cypermethrin).	**Human health & Wildlife. Assess androgen-related effects in adult males.**
DCPA	**Dacthal**	**Human health & Wildlife. Comparative thyroid assay.**
Diazinon*	Diazinon	No Tier 2 test required.
Dichlobenil*	Casoron	**Wildlife**
Dimethoate*	**Dimate**	**Human health & Wildlife. Comparative thyroid assay.**
EPTC	Eptam	No Tier 2 test required.
Esfenvalerate*	Asana	No Tier 2 test required.
Ethoprop	Mocap	No Tier 2 test required.
Fenbutatin oxide*	Vendex	No Tier 2 test required.
Flutolanil	Moncut	**Wildlife**
Folpet	Folpan	**Wildlife**
Gardona (cis-isomer) / Tetrachlorvinphos	Ravon	No Tier 2 test required.
Glyphosate*	Roundup, Rattler, Touchdown	No Tier 2 test required.
Imidacloprid*	Admire, Leverage, Sherpa	No Tier 2 test required.
Iprodione*	Rovral	**Wildlife**
Linuron	**Lorox**	**Tier 2 Human health & Wildlife. Comparative thyroid assay.**
Malathion*	Malathion	No Tier 2 test required.
Metalaxyl	Metalaxyl	**Wildlife**

EPA Endocrine Disruptor Screening Program. List 1 screenings completed cont. from previous page.		
Pesticide active ingredient ***** = registered for one or more tree fruit crops	**Brand name examples** (not a complete list)	**Status after Tier 1 Screening**
Methomyl*	Lannate	No Tier 2 test required.
Metolachlor	Metalica, Visor	No Tier 2 test required.
Metribuzin	**Tendovo**	**Tier 2 Human health & Wildlife. Comparative thyroid assay.)**
MGK 264	Insecticide synergist, apparently with no ag crop registrations	No Tier 2 test required.
Myclobutanil*	Rally	**Wildlife**
Norflurazon*	Solicam	No Tier 2 test required.
Ortho-phenylphenol	Dowcide	**Wildlife**
Oxamyl*	Vydate	No Tier 2 test required.
PCNB	Turfcide	**Wildlife**
Permethrin*	Ambush, Pounce, Perm-Up	No Tier 2 test required.
Phosmet*	Imidan	No Tier 2 test required.
Piperonyl butoxide*	Synergist, primarily for use with pyrethroids.	No Tier 2 test required.
Propargite	Omite	**Wildlife**
Propiconazole	Bumper, Propimax	**Wildlife**
Propyzamide	Rustler	No Tier 2 test required.
Pyriproxyfen*	Esteem, Senstar, Terva	No Tier 2 test required.
Simazine*	Princep, Sim-Trol, + others	No Tier 2 test required.
Tebuconazole*	Orius	**Wildlife**
Triadimefon	Bayleton	No Tier 2 test required.
Trifluralin*	Snapshot, Trust	No Tier 2 test required.
Inert ingredients		
Acetone	←	No Tier 2 test required.
Butyl benzyl phthalate	←	No Tier 2 test required.
Dibutyl phthalate	←	No Tier 2 test required.
Diethyl phthalate	←	No Tier 2 test required.
Dimethyl phthalate	←	No Tier 2 test required.
Di–sec–octyl phthalate	←	No Tier 2 test required.
Isophorone	←	No Tier 2 test required.
Methyl ethyl ketone	←	No Tier 2 test required.
Toluene	←	No Tier 2 test required.

List 1: Tier 2 testing is scheduled for 2024.

EPA has identified a "List 2" of 109 chemicals and substances for a second and final second round of Tier 1 screening. That list includes pesticides, some pharmaceuticals and an array of other chemicals ranging from those used as plasticizers, in the production of pharmaceuticals, personal care products, or in industrial manufacturing. As with List 1, List 2 was selected on the basis of exposure potential only, and being on the list is not an indication that there is any known or likely endocrine disruptor activity.

The List 2:Tier 1 screening is scheduled for 2025. Tree fruit pesticides in List 2 are shown below.

List 2. Tree fruit pesticide* active ingredients set for Tier 1 screening in 2025	
Clofentozine* (Apollo)	Isoxaben* (Gallery, Trellis)
Diuron* (Direx, Karmex),	Oxyfluorofen* (Collide, Goal)
Fosetyl-Al* (Aliette),	Thiophanate-methyl* (Topsin M)
Glufosinate* (Cheetah, Rely)	Triflumizole* (Procure)
Hexythiazox* (Onager, Savey)	Ziram* (Ziram)

Closing Words

"There is a simple straightforward answer to any question. And it is usually wrong."

~ Anonymous

The newsletter is a joint author publication, but all content in this issue is from Koehler.

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