

What's Really On Your Food

A Plain-Language Guide to Common Herbicides, Pesticides & Fungicides — What They Are, Why They're Used, and What the Science Actually Says

This guide is meant to inform, not alarm. Every chemical here is backed by a specific source — the U.S. Environmental Protection Agency (EPA), the International Agency for Research on Cancer (IARC), peer-reviewed studies, or other regulatory bodies. Where scientists and regulators disagree, that disagreement is stated plainly, because pretending there's a single simple answer wouldn't be honest. The goal is simple: know what these chemicals are, where they show up, and what's actually been documented about their effects — so you can make your own informed choices about the food you buy.

A note on reading this: 'linked to' or 'associated with' means studies have found a connection, not necessarily proof of direct cause in every case. Toxicology is rarely black-and-white, and regulatory bodies in different countries sometimes reach different conclusions from the same data.

HERBICIDES

Herbicides are chemicals used to kill unwanted plants — weeds competing with crops. They're generally sprayed directly on fields before or during the growing season.

Glyphosate

Sold under brand names like Roundup. The most widely used herbicide in the world.

Used on:

Corn, soybeans, wheat, and many other row crops — especially "Roundup Ready" genetically modified crops bred to tolerate it.

What's documented:

The EPA's 2017 assessment concluded glyphosate is "not likely to be carcinogenic to humans." The International Agency for Research on Cancer (IARC), part of the World Health Organization, classified it in 2015 as Group 2A — "probably carcinogenic to humans." Multiple lawsuits and some epidemiological studies have pointed to an association with non-Hodgkin's lymphoma. It's banned or restricted in several countries, while still widely used and legal in the U.S.

This is the clearest example of regulatory disagreement in this guide — two major health bodies looked at similar data and reached different conclusions, largely due to differences in how they weighted animal studies versus real-world exposure data.

Atrazine

One of the most commonly used herbicides in the U.S.

Used on:

Corn, sorghum, and sugarcane. It's also the most frequently detected pesticide contaminant in U.S. ground and surface water.

What's documented:

Atrazine is recognized as an endocrine disruptor — it interferes with hormone signaling. Laboratory studies (notably by researcher Tyrone Hayes at UC Berkeley) found that atrazine caused hormonal and reproductive abnormalities in frogs at concentrations well below the EPA's drinking water limit. The EPA has stated the data on human developmental effects remain inconclusive, and not all follow-up studies have replicated the frog findings. Atrazine is banned in the European Union but remains legal and widely used in the U.S.

2,4-D

One of the oldest and most widely used herbicides, dating back to the 1940s.

Used on:

Lawns, wheat, corn, and pasture land. Also a component of Agent Orange, though it's the other component (2,4,5-T) that caused Agent Orange's worst harms.

What's documented:

The EPA classifies 2,4-D as "Group D" — not classifiable as to human carcinogenicity — citing insufficient data. IARC has classified the broader class of chlorophenoxy herbicides (which includes 2,4-D) as Group 2B, "possibly carcinogenic to humans." Some studies have found associations with non-Hodgkin's lymphoma, though the evidence is described by regulators as inconsistent. 2,4-D use has been increasing since its approval as part of a newer herbicide blend (Enlist Duo).

Paraquat

A fast-acting herbicide considered one of the more acutely toxic chemicals still in agricultural use.

Used on:

Clearing fields before planting corn, soybeans, and cotton.

What's documented:

The EPA itself states "one sip can kill" — there is no antidote for paraquat poisoning. Beyond acute poisoning risk, multiple peer-reviewed epidemiological studies (including research on farmworkers in Taiwan and British Columbia) have found a strongly elevated risk of Parkinson's disease among people with occupational paraquat exposure. It's banned in more than 70 countries, including the UK, China, and the EU — but remains legal for restricted agricultural use in the U.S.

INSECTICIDES

Insecticides target insects that damage crops. Generally speaking, the World Health Organization notes insecticides tend to be more acutely toxic to humans than herbicides.

Chlorpyrifos

An organophosphate insecticide developed in the 1960s.

Used on:

Cotton, almonds, oranges, apples, and corn. Previously used widely in homes and gardens until that use was phased out.

What's documented:

The EPA's 2020 human health risk assessment found that food residue exposure alone was not of concern, but combined food, water, and residential exposure exceeded the agency's own safety thresholds. Multiple studies have linked chlorpyrifos exposure in children to lower IQ and increased risk of attention difficulties (including ADHD-like symptoms). At higher doses, it's a nervous system toxicant capable of causing headaches, nausea, and in severe poisoning, respiratory failure.

Metolachlor

A widely used herbicide (technically, though it's often grouped with other agricultural chemicals in consumer discussions).

Used on:

Corn, soybeans, and sorghum.

What's documented:

The EPA has classified metolachlor as a Group C "possible human carcinogen" based on animal studies. Reported effects from higher exposure levels include respiratory irritation and nausea. It's one of the more frequently detected agricultural chemicals in U.S. groundwater.

FUNGICIDES

Fungicides prevent or treat fungal disease on crops — mold, blight, mildew — which can otherwise destroy a harvest.

Chlorothalonil

Sold under names like Daconil and Bravo. One of the most widely used fungicides in the world.

Used on:

Potatoes, tomatoes, peanuts, and turf/lawns.

What's documented:

The EPA rates it a severe eye irritant and moderately toxic if inhaled, though it's considered "practically nontoxic" for oral and skin exposure at typical residue levels. A related concern: hexachlorobenzene, a contaminant sometimes found in chlorothalonil products, is classified as a B2 (probable human) carcinogen. The EU banned chlorothalonil in 2019 over concerns about groundwater contamination and its metabolites; it remains approved for use in the U.S.

Captan

A fungicide used since the 1950s.

Used on:

Apples, strawberries, grapes, and other fruit crops, as well as ornamentals.

What's documented:

The EPA's own hazard summary notes captan was found to be carcinogenic in animal studies (specifically linked to tumors in high-dose lab tests), though it's currently classified as "not likely to be carcinogenic to humans" at expected dietary exposure levels. Acute exposure can cause skin and eye irritation; ingesting large amounts has caused vomiting and diarrhea in reported cases.

WHERE TO FOCUS: THE 2025 "DIRTY DOZEN"

Each year, the Environmental Working Group (EWG) analyzes USDA pesticide residue testing data — done on produce after it's been washed or peeled — to rank fruits and vegetables by pesticide load. This isn't a government list, but it's based on government testing data, and it's a genuinely useful practical tool: if you can only buy a few things organic, this is where your money goes furthest.

2025 Dirty Dozen (highest pesticide residue)	2025 Clean Fifteen (lowest pesticide residue)
Spinach	Avocados
Strawberries	Sweet corn
Kale, collard & mustard greens	Pineapple
Grapes	Onions
Peaches	Papaya
Pears	Sweet peas (frozen)
Nectarines	Asparagus
Apples	Honeydew melon
Bell & hot peppers	Kiwi
Cherries	Cabbage
Blackberries	Watermelon
Potatoes	Mushrooms

Potatoes and blackberries are new to the Dirty Dozen in 2025. Blackberries showed pesticide residue in 93% of tested samples, and potatoes — the most consumed vegetable in the U.S. — often carry chlorpropham, a sprout inhibitor that's banned in the EU.

Bananas, avocados, and onions consistently test among the lowest in pesticide residue, largely thanks to their thick, inedible peels.

Sources: U.S. EPA, International Agency for Research on Cancer (IARC), Environmental Working Group (EWG) 2025 Shopper's Guide to Pesticides in Produce, National Pesticide Information Center, peer-reviewed studies cited by the above. This guide is for general education and does not replace medical, legal, or agricultural advice.