

# 99.99% Of The Pesticides We Eat Are Made By Plants



By Josh Bloom — June 7, 2018



Cabbage Contains Dozens Of Pesticides Made By The Plant Itself. Two are carcinogens. So? Image: Oocities [1]

When Bruce Ames talks about toxicity, it's time to listen **(1)**. Ames is the inventor of the hugely important Ames test for mutagenicity, which measures the damage done to DNA by a given chemical. The Ames test is an essential hurdle in the world of drug discovery research. While a positive Ames test is not *de facto* proof that a chemical will be carcinogenic in humans, it's a giant red flag in drug development. Many promising drugs have met their maker simply because of a positive Ames test.

## GOOD LUCK AVOIDING PESTICIDES

Since pesticides and herbicides are routinely in the news, lately because of the "Glyphosate Wars," **(2)** I thought it might be interesting to examine a [review article](#) [2] that Ames and colleagues wrote nearly three decades ago in *Proceedings of the National Academy of Sciences (PNAS)*. If you are dwelling under the illusion that you can prance into Whole Foods and overpay for a bunch organic stuff without pesticides, this article will disabuse you of that fallacy. If you don't want to consume pesticides, then you better stop eating, because you are consuming them with each bite. Plenty of them. According to Ames:

- 99.99% (by weight) of the pesticides consumed by the American public are **made by the plants themselves** as a defense mechanism.
- Synthetic and natural pesticides are equally likely to be carcinogenic.

(You are unlikely to see this information posted in a Whole Foods.)

Ames writes (emphasis mine):

*"Toxicological examination of synthetic chemicals such as pesticides and industrial pollutants, **without similar examination of the chemicals in the natural world** to use for comparison, has generated an **imbalance in both data and perception about potential hazards to humans.**"*

No kidding. At the American Council, we have been screaming this for many years, only to be called "shills for industry" anytime we dare to call a chemical safe. Not only are we *not* shills **(3)** but we have been right about one key point all along. The divide between "natural" and "artificial" chemicals is meaningless - something many Americans do not know. The origin of a chemical is irrelevant. Your body cannot tell what is natural or synthetic - only the properties of the chemical matter.

It is hard to blame consumers; the organic food industry and Internet quacks have done a masterful job in creating a narrative that maintains that we are all being poisoned by tiny quantities of thousands of man-made chemicals, and the way to avoid this is to buy so-called "natural" products because they don't contain chemicals. But the narrative is dead wrong. Great marketing. Terrible science. Let's take a look at how Ames reached his conclusions.

## **RAT AND MOUSE MODELS OF CARCINOGENICITY - PLENTY OF LIMITATIONS**

All of the carcinogenicity data in the PNAS paper was derived from rat and mouse models of cancer, which are **notoriously unreliable** <sup>[3]</sup> in predicting human cancers, but the best we have. Ames and colleagues at UC Berkeley scoured the literature looking for studies about foods that contained known natural pesticides. The numbers are enormous. For example, in cabbage alone, 49 pesticides and their metabolites were detected. Of these, two chemicals, chlorogenic acid, and allyl isothiocyanate were found to cause tumors in rats, but not in mice **(4)**. Ames estimates that Americans consume 5,000-10,000 different natural pesticides.

## **CARCINOGENS ARE EVERYWHERE**

The review also identified studies in which plant-based pesticides had been tested (in high doses) **(5)** to see if they caused cancer in rodents. Fifty-two of these pesticides, all commonly found in a variety of foods, were evaluated in this manner; 27 were found to be carcinogens. More than half.

*"Nature's pesticides are one important subset of natural chemicals. Plants produce toxins to protect themselves against fungi, insects, and animal predators."*

*Bruce Ames, et. al.*

Plants do not exist to serve humans; they are here because they have survived and reproduced. In

order to do so, they evolved the ability to synthesize chemicals to protect them from predators. Despite the constant railing against pesticides, we would have nothing to eat if plants didn't make the ones they needed for defense.

## AND WE EAT A LOT OF THEM

Our silly obsession with avoiding tiny quantities of pesticide residues on an apple looks even sillier when we examine the relative amounts of both natural and synthetic pesticides that we consume. When the FDA analyzed food for the presence of important synthetic chemicals (likely to be found in the environment), 105 different chemical residues were detected in food **(6)**. The sum total of these 105 chemicals (combined) was estimated to be about 0.09 mg per person per day, about half being carcinogens. By contrast, we consume about 1.5 g (1,500 mg) of natural pesticides daily.

*We also conclude that at the low doses of most human exposures the comparative hazards of synthetic pesticide residues are insignificant.*

## BUT WE ARE NOT ALL DEAD

We regularly consume thousands of pesticides, most made by the plants, and a **much** smaller quantity of pesticide residues that were applied to the crops. Yet, here we are still here. The reason is obvious, and it is the same reason that the tiny quantities of ubiquitous environmental boogeymen like BPA, phthalates, and parabens are nothing to worry about - dose. Carcinogenic chemicals, whether they are plant-based or synthetic, are processed by the liver and excreted. This is the liver's job, and it does it quite well. Otherwise, there would be no need for synthetic pesticides because the cabbage would have already planted us in the ground.

## NOTES:

(1) Bruce Ames, one of the founders of the American Council has not won the Nobel Prize for his invention. This leaves me bewildered.

(2) Although there is nothing funny about it, there has been plenty of funny business concerning glyphosate lately, including fraud. Speaking of fraud, see my colleague [Alex Berezow's brutal takedown](#) <sup>[4]</sup> of the corruption of IARC. Dr. Berezow has also written about plant-based pesticides [here](#) <sup>[5]</sup>.

(3) Shills? Hardly. At ACSH we keep a wall between science and fundraising to avoid even the appearance of a conflict of interest. At this time it is an unnecessary wall. I have been told that 97% of our funding comes from individual donors. I have no idea where the other 3% comes from.

(4) Today's regulatory status of allyl isothiocyanate is not consistent with Ames' findings. The chemical does not appear on California's Proposition 65 list and is in the IARC Group 3 - not classifiable as to its carcinogenicity to humans.

(4) This discrepancy is explained by the National Toxicology Program as the mice not receiving the maximum tolerated dose of the two chemicals while the rats did.

(5) I'm not kidding about high doses. About half of these tests were run at the maximum tolerated dose (MTD) - the dose at which animals start dying if it is exceeded. What, if anything, this has to do with humans consuming small amounts of the chemical is not known - another limitation of rodent carcinogenicity tests.

(6) National Research Council, Board on Agriculture (1987) Regulating Pesticides in Food (National Academy Press, Washington, DC).

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**Links**

[1] <http://www.oocities.org/habbage/cabbagelinks.html>

[2] <http://www.pnas.org/content/pnas/87/19/7777.full.pdf>

[3] <https://www.sciencedirect.com/science/article/pii/S0273230096910806>

[4] <https://www.acsh.org/news/2017/10/24/glyphosate-gate-iarcs-scientific-fraud-12014>

[5] <https://www.acsh.org/news/2017/06/13/9999-pesticides-we-eat-are-produced-plants-themselves-11415>