Fact or Fiction?



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Chemicals in Foods and Beverages

I wonder how many people would buy coleslaw from the delicatessen if the label actually listed the following "active ingredients:"

- ethanoic acid
- d-glucopyranosy-^{1,2}-d-fructofuranose
- p-hydroxybenzyl and indoylmethyl glucosinolates
- S-propenyl and other S-alkyl cysteine sulfoxides
- b-carotene (and other carotenoids) phosphatidylcholine¹

Here's another question—What is the concoction below?

Amyl acetate, amyl butyrate, amyl valerate, anethool, anisyl formate, benzyl acetate, isobutyrate, benzyl acid, butyric acid, cinnamyl isobutyrate, cinnamyl valerate, cognac essential oil, diacetyl, dipropyl ketone, ethyl butyrate, ethyl cinnamate, ethyl heptanoate, ethyl propionate, ethyl valerate, heliotropin, hydroxyphrenyl-2-butanone, alpha-ionone, isobutyl anthranilate, isobutyl butyrate, lemon essential oil, maltol, 4-methyacetophenone, methyl anthranilate, methyl benzoate, methyl cinnamate, methyl heptine carbonate, methyl naphthyl ketone, methyl salicylate, mint essential oil, neroli essential oil, neryl isobutyrate, orris butter, phenethyl alcohol, rose, rum ether, gamma undecalactone, vanillin, and solvent.

Answer: Strawberry flavor!²

In fact, these are just some of the more than 1,000 chemicals in strawberry.³

The number and variety of chemcials in our nearest supermarket defies imagination. Here are some more examples.

- A cup of coffee is estimated to contain more than 2,000 natural chemical compounds.⁴ And while on the subject of coffee, just one cup has fifty times the mutagenic activity of the smoke absorbed from smoking a single cigarette.⁵
- Chemists have identified some 6,000 compounds in soft drinks, but the majority of flavor blends derive from only eight hundred or so compounds.⁶
- Wine contains more than 2,000 compounds that are derived from the grapes themselves and from changes the grapes undergo during fermentation.⁷ While on the subject of wine, the next time you imbibe your favorite Cabernet Sauvignon think of what Robert J. McGorrin of Oregon State University reports: "At high concentrations, 4-mercapto-4-methyl-2-pentanone ('catketone') has an off-odor associated with cat urine, but in the context of Cabernet Sauvignon wine, it provides the typical flavor impressions of the Sauvignon grape."⁸
- About 2,000 pigments exist in the plants we eat. They include some 450 carotenoids and 150 anthocyanidins, the stuff that makes carrots and pumpkins orange and plums purple.⁹
- Chocolate contains over 800 chemicals.¹⁰
- No less than 600 different chemical compounds can be found in a bottle of champagne, each lending its own unique quality.¹¹
- No one has ever defined exactly how many organic compounds make up vanilla's flavor and fragrance profile, though it is estimated that there are somewhere between 200 and 500 distinct compounds that create its complex essence.¹²
- Like many natural products, tea contains hundreds of compounds. The most characteristic of these are often referred to as flavonoids or polyphenols.¹³

• At least 150 distinctly naturally occurring chemicals have been identified in potatoes.⁴

Is this bad for us as consumers? Most probably not. The main rule in toxicology is that "the dose makes the poison." At some level, every chemical (even water) becomes toxic, but there are safe levels below that. Yet, most of the chemicals in foods haven't been tested for carcinogenicity. For example, of the 2,000 chemicals in coffee, only 26 have been tested for carcinogenicity and 19 were positive in at least one test.14 Of some 1,348 food chemicals (natural and synthetic) tested by Bruce Ames and colleagues in high-dose, animal cancer tests, 52 percent are rodent carcinogens. Remember though, that in these tests, rodents are given a near-toxic dose of the test substance over their lifetime to maximize the chance of detecting any carcinogenicity. As Ames notes, "Evidence is accumulating that cell division caused by the high dose itself, rather than the chemical per se, contributes to cancer in these tests."15

Potentially Bad Actors

This doesn't mean that our friendly supermarket doesn't have some potentially harmful stuff on the shelves. Thomas Moore reports, "One of the most deadly poisons routinely available to the public can be found in any large supermarket among household goods. It is closely related to a chemical called warfarin, and is used as rat poison. However, warfarin is a lifesaving drug. It is available in prescription form as DuPont's Coumadin. Each year it is used 3 million times in office medical practice-more frequently than Valium or Tagamet. In high-risk patients, it can prevent strokes by stopping dangerous blood clots from forming in the heart and in the legs."16

Getting back to the 'dose makes the poison' comment, there is a lethal dose of some chemicals in a number of common foods. Caffeine is only 10 times less toxic than plutonium.¹⁷

A lethal dose of caffeine is contained in 100 cups of coffee. Other toxic agents and lethal doses include: solanine in 100–400 pounds of potatoes, oxalic acid in 10–20 pounds of spinach, hydrogen cyanide in 3.7 pounds of lima beans, malonaldehyde in 3.8 tons of turkey, acetyl salicylic acid in 100 aspirin tablets, and 17 liters of water consumed in a very short time. There is a lethal dose of ethanol in a fifth of scotch, bourbon, gin, vodka, or other hard liquor.¹⁸

Although we ingest many 'lethal' doses of a wide variety of compounds they have no ill effect on us because we spread the dose out over a lifetime. Also, normal diets don't create risk, because our duct chemistry quickly flushes these compounds through them.¹⁹

Pesticides

Are synthetic pesticides dangerous? No, says Bruce Ames of the University of California at Berkeley. He adds, "Every plant has 40 or 50 pesticides it makes to kill off predators and fungi. They couldn't survive if they weren't filled with toxic chemicals. They don't have teeth and claws, and they can't run away. So throughout evolution they've been making newer and nastier pesticides. They're better chemists than Dow and Monsanto." When you eat cabbage, you ingest 49 different natural pesticides and metabolites. Oregano has 100,000 times as much natural pesticide present as there is synthetic pesticide residue.20

Summary

The vast proportion of chemicals to which humans are exposed are naturally occurring, yet public perceptions tend to identify chemicals as being only synthetic and only synthetic chemicals as being toxic. However, every natural chemical is also toxic at some dose. It is probable that almost every fruit and vegetable in the supermarket contains natural pesticides that are rodent carcinogens, and no diet can be free of chemicals identified as carcinogens in high-dose rodent tests.²¹

Yet our bodies handle all chemicals in the same way, regardless of their origin. However, the popular notion remains that the greatest health threat is posed by the synthetic chemicals in our food. And this fallacy is often encouraged by newspaper headlines and television reports warning of the danger posed by some additive or pesticides in our food.²² Remember this the next time you hear the food scare of the month and put it in perspective with the myriad of natural chemicals in the foods with eat.

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