

Food Coloring, The Visual Deception

Humans are very visual creatures by nature. Our visual senses can detect an entire rainbow of colors, while many creatures in the animal kingdom are literally colorblind. You can gather a lot of information about something by its color. You can estimate its age, its freshness, texture, taste, and many other details that are useful for survival.

We use our visual sense, along with our other senses when we go grocery shopping in the produce section. We look for which apples have browning and dimples, or which bananas have the right coloring, or which avocados are the darkest and which lemons are the brightest.

Food retailers have known that proper appearance makes an enormous difference in how people choose which food to buy. That is why companies spend millions of dollars each year in hiring specialists to design packaging that will entice buyers to choose their products over their competitors. Anyone who has ever been food shopping in a store has had the experience of trying to select a type of food. You pick up three different jars of spaghetti sauce and try to pick the best one. You obviously can't taste the sauce, but how do you figure out which one tastes the best without using your tongue.

There is a term in the food packaging industry called "sense transference". This is when someone looks at a label and deduces flavors and characteristics of the food just from the appearance of the label. A

brighter red on spaghetti sauce means it's either sweeter or more watery, a darker red means thicker or more bitter. Making sure that both your label and your food have the right color are critical for any food distributor, otherwise they could be completely out of business just because their product didn't "look right".

This is why the food coloring industry is one of the largest volume chemical producers in the world. The demand for high-quality, low-cost, wide-variety food coloring is massive. Food coloring applications are not just limited to ingested foods like sauces and candy, but also in cosmetics and pharmaceuticals.

The FDA divides food-coloring substances into two categories: natural and artificial. The list of natural coloring agents is extensive. The artificial colors, however, are limited to seven. There are two exceptions, but their use is authorized only for very specific foods and food parts. One is for hot dogs and wiener casings, and the other is for orange peels. The seven permitted artificial colors are:

1. FD&C Blue No. 1 - Brilliant Blue
2. FD&C Blue No. 2 - Indigotine
3. FD&C Green No. 3 - Fast Green
4. FD&C Red No. 40 - Allura Red AC
5. FD&C Red No. 3 - Erythrosine
6. FD&C Yellow No. 5 - Tartrazine
7. FD&C Yellow No. 6 - Sunset Yellow

With these colors, you can combine them and produce any other color.

Of those seven, the four most commonly used are Blue 1, Red 40, and Yellow 5 and 6. Of these four, three (Red 40, Yellow 5/6) are azo dyes. Azo dyes belong to a class of chemicals that are commonly aromatic hydrocarbons that are derived from petroleum. When you consider that the FDA has approved these substances as safe for consumption, it is important to determine for ourselves whether these substances are safe or not.

In 2006, a study conducted at the Department of Child Health at the University of Southampton in England tested the effects of various food-coloring agents, including the three azo dyes, on children ages 3 and 8/9. In a double blind, placebo-controlled study, the researchers concluded that these substances increased the incidences of hyperactivity and lowered IQ. In fact, they lowered IQ the same degree as leaded gasoline. As of 2009, the responsible divisions of the British government have agreed to prohibit the use of certain azo dyes for use in foods.

The study has sparked massive controversy in the food industry, which claims that the study is biased (parental reports were used in some cases), inconclusive since a mixture was provided to the children instead of single substances so it is impossible to blame specific substances when the mixture alone could be toxic, etc.

The three azo food-coloring dyes permitted in the USA are Red 40, which is used for making foods red or orange, and Yellow dye numbers 5 and 6. Two questions: how would you rate the current average student performance level in the United States? What color are Doritos and Cheetos? Need I say more? That was three questions, but I'm sure you get the point.

Besides contributing to hyperactivity in children, azo can also cause immunological symptoms like allergic reactions. Yellow 5, also known as tartrazine, even in very low doses has been linked to hives and asthma attacks in children, according to a 1994 study by the University of Melbourne conducted on roughly 800 children. The study also showed the Yellow 5 can cause:

- Anxiety
- Migraines
- Clinical depression
- Blurred vision
- Itching
- General weakness
- Hot flashes
- Feeling of suffocation
- Purple skin patches
- Sleep disturbance

This is from ingesting azo dyes. There is even evidence that simply contact with these substances can be toxic. There is an anecdotal case of researchers at the University of Regensburg in Germany of a man who developed basal cell carcinoma underneath the nail of his thumb. While basal cell carcinoma is one of the most common cancers in the world, the occurrence of it underneath a nail is exceptionally

rare, virtually unheard of. In trying to determine why the cancer developed in such a specific location, they discovered that he was a fisherman who used a specific kind of bait. This bait had been stained with an azo pigment and had accumulated under his thumbnail. When certain azo pigments are exposed to light, they can break apart and turn into carcinogenic substances and in this case, most likely, caused cancer in his thumb.

This is not the first time that azo dyes have been linked to cancer. In fact there is a growing mountain of evidence that suggests that azo compounds cause chromosomal damage and genetic mutations in animal studies.

Luckily, the demand for cleaner and more natural food is growing stronger by the day and more companies are looking for natural alternatives to artificial food-coloring, but are the “natural” alternatives much better?

A commonly used natural alternative to artificial yellow food-coloring is annatto, which is made from the pulp that surrounds the seed of a particular South American fruit tree called the “achiote”. Because it is derived from a fruit tree and has been used locally since ancient times as a dye and food flavoring, the FDA classifies it as natural and “exempt from certification”. Unfortunately, natural does not necessarily mean safe, or non-toxic. It has been discovered that a significant number of people are sensitive to annatto, possibly even more than azo dyes.

In a study conducted in 1978 by Mikkelsen et al, a group of patients who suffered from hives and angioedema were given various artificial and natural food coloring substances and observed for reactions. The amount of annatto given was equivalent to what you would find in less than an ounce of butter. Within four hours, 26% of the test group had an allergic reaction, more than any other substance tested, including Yellow 6 which only 17% reacted to.

Another common natural food color is carmine. Carmine is a natural red food coloring agent that is made from the cochineal insect that lives in cacti in various parts of the Mexican desert and South America. The dye is made from the blood of the female insect which can be either a purple/burgundy color to crimson. The blood of the insect also contains a large concentration of carminic acid, which is used to deter predators from consuming the insect. One would think that it would be necessary to remove the carminic acid to reduce any potential toxicity to humans, but carminic acid is the actual source of the color in carmine and is therefore retained in the processed coloring agent.

As with annatto, carmine, or carminic acid, can cause a number of allergic reactions including asthma. There have so far been thirty-two documented cases of individuals going into anaphylactic shock from consuming carminic acid.

The FDA and other regulatory agencies are fully aware of the serious allergic reactions that both

natural and artificial coloring can cause, but their solution is not to demand that safer alternatives be developed or to outright prohibit the use of any coloring additives but instead to require it be included on the label so that sensitive individuals can simply avoid those foods. My questions is: how will these sensitive individuals know they are sensitive to Yellow 5 or Carminic acid and not just Twinkies? What if their first encounter with carminic acid causes anaphylactic shock? It is obvious that the responsibility to protect our health rests in our own hands and not from the government.

If natural food coloring is unsafe, and artificial coloring is completely toxic, what is the solution? The solution is to avoid foods with coloring. Artificial food coloring is easier to avoid since it is in mostly candies, gums, alcohol, and obviously unhealthy processed foods that can be easily avoided. In order to limit the consumption of potentially harmful natural coloring, it is best to eat fresh foods, rather than packaged foods. If packaged foods are unavoidable, carefully read the label and make sure that it is organic without any harmful additives. Just like you read your bank statements and credit card statements to make sure the bank is cheating you out of your money, you have to read food labels to make sure you're not being cheated out of your health.

If your diet has not been stellar and you are concerned that you have consumed a large amount of food coloring and it may be the reason for your poor health, it is still a good idea to flat out avoid them as much as possible. As far as we know, food

coloring has only a limited potential to become stored in the body and stopping the intake is the most important step.

Unfortunately, there has not been enough research done on how to clean out the body of these particular toxins, but what may assist the body and the liver in removing them are the sulfur-based amino acids like N-acetyl cysteine and glycine. These amino acids should promote urinary excretion of the harmful food coloring, but there is no research that proves the effectiveness of these substances against food coloring, it is just a theory based on other research about the assisting the liver in processing certain toxins.

This is a perfect example of an instance where lifestyle choices and self-education are the primary line of defense. Being aware of the dangers and taking the time to read labels and know what goes into your body will set you up for success in maintaining quality health in the long run.



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