Color is the most important factor in shaping our perceptions of foods. Image Source: Pexels user Leah Kelley

When it comes to the taste of food, we tend to believe that our sensory experience comes from, well, the taste of food. But time and time again, research confirms that we eat with our eyes first. "People's perception is typically dominated by what their eyes see," says Charles Spence, professor of experimental psychology at Oxford University.[1] Peter Barham of Bristol University agrees. "If we start by seeing a bright orange drink, we are very likely to think it will taste of oranges. Provided the taste is at least somewhat sweet and a little acid we will say it is orange—even if it is just colored, sweetened water or apple juice." Indeed, studies show that people who eat canned peas with bright green food coloring report that the peas taste fresher than peas without food coloring, even when the peas are the same in every other respect. Even professional wine tasters have been tricked into attributing characteristics of red wines to whites with red dyes.

The extraordinary role color plays in taste perception explains why colorants have been used for centuries to enhance the visual appeal of foods. Throughout most of that time, colorants were derived from natural sources, but that changed around the turn of the 20th century as synthetic dyes were developed, offering more vibrant, diverse, and economical colors. Today, many foods we eat are enhanced with artificial colorants designed to enhance appeal and whet our appetites and foods marketed to children are particularly susceptible; according to a study by the Center for Science in the Public Interest, a full 43% of foods marketed to children currently contain artificial dyes.[2]

In recent years, however, the public has become increasingly concerned about the effects of artificial food dyes, prompting many food manufacturers to begin the process of phasing out synthetic colorants. Kraft Heinz, ConAgra Foods, Nestle, and General Mills have all begun removing synthetic dyes and Mars announced last year that it will eliminate artificial colors in a large bulk of its product lines over the next five years. Of course, this doesn't mean that all coloring agents will disappear;

rather, it means that food manufacturers must find natural alternatives to enhance product appearance. In order to develop new color standards and successfully transition to natural food dyes, manufacturers must employ sophisticated spectrophotometric technologies.

Studies on the health effects of artificial dyes have returned conflicting results, but many consumers err on the side of caution. Image Source: Unsplash user Kat Bruni

The Controversy Surrounding Artificial Dyes

The controversy surrounding artificial food dyes may seem new, but it's actually been percolating for over 100 years when the Pure Food and Drugs Act was implemented in 1906. According to the law, artificial colors that were confirmed to be "injurious to health" were banned and the government began identifying "which of the existing 80 dyes used in foods were safe enough to keep legal."[3] 30 years into the investigation, 65 of those dyes had been banned and as time passed the original list of 80 would be whittled down to only seven that remain legal today.

But despite over a century of legality, those seven dyes remain controversial. Of particular concern are Yellow 5 and Red 40, which some studies suggest could contribute to hyperactivity in children with ADHD. Although the FDA doesn't deny the possibility that the remaining dyes could have negative health effects, it does not believe there is conclusive evidence that would warrant an outright ban. As Rachel Hennessey writes, "FDA scientists have theorized that bad reactions to artificial colors in certain individuals may be similar to a food allergy, in that they only affect a small

group of people and need to be avoided by those select individuals only, as opposed to the entire public."

So why not add a warning label, as is policy in Europe and the United Kingdom? The FDA does not believe we know enough about the effects of these dyes to create a meaningful warning label. Who would be targeted by such warnings? Who would benefit? Lindsey Loving, Senior Director at the International Food Info Council, says, "Adding a warning statement could confuse the general public for whom the message is not intended, and could cause alarm regarding safe food ingredients that have been consumed by the public for years."

Making the Change

Despite the absence of policy banning artificial dyes, food manufacturers have already begun changing their formulations due to public pressure. "Our consumers are the boss and we hear them," says Grant F. Reid, president and CEO of Mars, Incorporated. "If it's the right thing to do for them, it's the right thing to do for Mars."[4]

Of course, replacing artificial dyes with natural colorants doesn't happen overnight. "Eliminating all artificial colors from our human food portfolio is a massive undertaking, and one that will take time and hard work to accomplish," Reid notes.[5] While customers want artificial dyes removed, they also want their favorite foods to maintain their appearance and food manufacturers must find natural colorants that mimic the hues consumers are accustomed to. This can be challenging, as natural colorants tend to be more expensive and less stable than their synthetic counterparts. Additionally, some natural dyes impart unwanted flavors on foods, making them aesthetically useful but practically unsuitable for inclusion in recipes. As such, making the switch to natural colorants is a time-consuming and laborious process that requires significant resources.

Manufacturers of everything from snack foods to cereal to cheese are moving away from artificial dyes toward natural alternatives. Image Source: Pexels user Foodie Factor

Spectrophotometry Helps Perfect Formulations

Spectrophotometers play an invaluable role in formulating and manufacturing all types of foods already and are part of many food manufacturers' quality control processes. However, as manufacturers move away from artificial colors toward natural sources, these instruments take on renewed importance.

When you're releasing a new formulation of a beloved food, your customers want to see the colors they are used to even when they have deliberately chosen to forego artificial dyes. As such, new products must replicate existing products to meet consumer expectations and maintain their positive perceptions of your offerings. However, attempting to match colors based on sight alone is not enough due to variations in human sight and the impracticality of implementing such a system across multiple manufacturing locations. Spectrophotometers eliminate the inherent instability of human color perception and provide an objective way of analyzing food color and identifying color matches.

Using spectrophotometric data from existing products, you can create a standard to which new formulations must adhere, ensuring that natural formulations replicate existing products as closely as possible. This takes the guesswork out of recipe creation, facilitating more accurate and rapid product transitions. The color data can then be used to maintain consistency within each batch as well as across multiple manufacturing sites, guaranteeing that the same colors are produced regardless of operator or location. This is essential to ensuring that new formulations meet consumer expectations and that your move away from artificial dyes doesn't compromise your relationship with your customers.

HunterLab Quality

HunterLab has been a pioneer in spectrophotometric technologies for over 60 years. Today, we offer a comprehensive line-up of portable, benchtop, and in-line instruments designed with the needs of the food industry in mind. Our spectrophotometers are used by the world's top food manufacturers to help them develop innovative new offerings and consistently produce the highest quality products. Contact us to learn more about our renowned instruments, customizable software packages, and world class customer support services and let us help you select the perfect tools for your needs.

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