The History and Physiological Effects of Synthetic Additives and Dyes in USDA Approved Food Products

Britney Anderson, University of Wisconsin-Superior
Dr. Kim Lebard-Rankila, Mentor

The general population in America consumes questionable food additives every day. Synthetic additives and dyes are not regulated as strongly in the United States as in other countries, and medical concerns such as hyperactivity, chronic bloating, and cancerous effects have links to these synthetic additives and dyes. No one is immune to side effects from food that is eaten and digested. Pesticides on food before packaging, additives during packaging, and even the leaking of products into our food from the packaging itself make it almost impossible to avoid foreign products in the food, and dyes in USDA-approved food have been allowed to reach harmful levels that are detrimental to the American people. Research on food additives, alternative processing procedures, and packaging that could help decrease chronic illness linked to processed food will be shared with the reader.

What once started as a hopeful procedure of supplying more foods to families at a cheaper cost has become one of America's most significant crimes. The Food and Drug Administration (FDA) continues to allow this process of applying or mixing harmful synthetic dyes and additives into the food we eat. Americans cannot escape this; if they do, it will come at a cost. Eating food that is only USDA organic is not something the lower or middle-class family can easily afford to do. They have no option but to eat the food that has been altered with the addition of synthetic additives and dyes. The timeline that will be shared in the paper will cover the 1960s to present day. America has been perfecting how to add additives to our food for over 60 years, and there appears to be no end in sight for these procedures to be altered or addressed by the USDA.

In addition to expanding the food supply and reducing costs, food additives extend the shelf-life of foods and also reduce the process of molding and rancidity setting into food. Synthetic additives and dyes in America date back to the late 19th century (Hasano, 2016). Additives and dyes were first put in food during the business boom (Hasano, 2016). Controlling the color of food makes it more visually attractive and disguises the man-made additives that have been added to the food that consumers purchased for their families at a reasonable price. Food manufacturing companies that added synthetics and dyes to the food that they processed did run into difficulties, as the additives changed the smell of the food and were nearly impossible to complete (Autumn, 2016). The chemicals were initially used to expand the food supply per batch and elongate the shelf life. The method of additives started off as harmless but progressed as time went on. In the 1870's Wells Richardson & Company and the Christopher Hansen's Laboratory Company started adding synthetic colors to their dairy products, specifically cheese and butter (Hasano, 2016). By the 1920s, food dyes became normal for many manufacturers, adding them to candy, jellies, pasta, butter, cheeses, canned foods, ice cream, sausage, and margarine (Autumn, 2016).

Then, in the 1930s, processed foods became more common than organic agricultural products. During this time, manufacturers replaced organic vegetable dyes with synthetic ones (Koehn, 2017). Synthetic dyes became a crucial ingredient for making food look appetizing (Rosemarie, 2017). Manufacturers' use of synthetic dyes not only benefited them, but the dye manufacturers profited from this change as well. This became so lucrative that the dye manufacturers made recipe booklets and production manuals on what colors to mix to reach the desired pigment (St. Louis, 2016). The "coloring formulas and instructions helped confectioners make specific" "natural" colors of "certain" foods and flavors (St. Louis, 2016). As dyes became more common in factories, farmers slowly started to use them to enhance the appearance of their products and make them appear ripe more quickly. Florida citrus growers were the first to color their produce (Sheldon, 2016). Their oranges were soaked in a "synthetic color" solution "to make the fruit look ripe" (Sheldon, 2016). The growers believed that changing the unripe green peel of the orange to bright orange would help with their profit. Selling ripe and unripe oranges simultaneously increased their profit margin (Warner, 2016). After this, other farmers started the same process of coloring and selling unripe products to manufacturers (Warner, 2016). By the time the product left the manufacturers and went on the shelf for consumers to buy, they had gone through multiple synthetic baths, and the once organic food was no longer healthy (Warner, 2016).

The FDA, whose role is to ensure food safety, has known about synthetic dyes in our food since

1908. They allow 80 different dyes to be in our food. In 2012 the 80 allowed dyes changed to 9 allowed dyes, but some still tend to pass under different names or are hidden in different ingredients (Leo, 2018). Aside from dyes, the FDA still allows roughly 2,500 additives in our food. There are many adverse effects linked to synthetic dyes, including hyperactivity, respiratory problems, itchy skin, hives, and even cancer. The FDA knows what these dyes can cause but still allows them to be in our food (Raman, 2018). Our food's most common synthetic dyes are red 40, yellow 4, and yellow 6. Food dyes have no benefits to humans or the quality of food (Leo, 2018). Their only use is to make food look more appealing.

It is surprising then to discover that since the 1970s, medical journals have reported on how these additives affect kids and adults by enhancing previous conditions, such as ADHD, and creating new symptoms, such as chronic bloating (Suan, 2018). The FDA has denied this until 2011, when out of nowhere, they announced that these claims were valid (Suan, 2018). In order to recognize colors in the ingredients list, the consumer needs to look at how it is worded. It is helpful if a color label is written down as "artificial coloring." The term 'artificial color' comes from coloring derived from nature (Leo, 2018). If the color within the food is labeled as Yellow 5 or Blue 6, for example, it is coloring made in a lab (Leo, 2018). If one thinks that they can eat fruits and vegetables to avoid additives and dyes, they would be incorrect, as previously demonstrated in the timeline. The term orange-up is used when discussing coloring techniques that farmers use on fruits and vegetables to beautify the produce (Suan, 2018).

This problem is unique to the United States, as many dyes used in the United States are banned in European countries (Loke, 2018). The dyes used in the United States are known as azo dyes. Marketers like to call these dyes coal-tar derivatives, which is another way of saying that their colors come from industrial waste (Loke, 2018). Azo dyes are commonly written as Sunset Yellow, Allura Red, Tartrazine, Carnosine, and Ponceau 4 R (Loke, 2018). These dyes are found in common store foods, including noodles, ice cream, jellies, and frozen meat (Leo, 2018). In 2018, an experiment was conducted using 1681 common grocery store foods. Out of the 1681 food, 194 or 11.54% of the foods contained at least one of the five azo dyes (Suan, 2018) The dyes are synthetic and affect the inflammatory system, and they fall into the category of chemoattractant, which can alter the movement and recruit neutrophils, monocytes, and leukocytes to sites of inflammation, amplifying the response (Loke, 2018). Many of these dyes have been linked to inflammatory diseases.

In the United States, there are no regulations on azo dyes. These dyes make up over 70% of the coloring we find in food, drinks, and baking dyes (Cobbold, 2020). United States residents constantly consume these dyes, but it is likely they do not know from where the dyes come. Azo and aniline dyes come from coal tar (Cobbold, 2020).Aside from food and drinks, coal tar can be found in perfumes, drugs, fertilizers, and other chemical substances (Cobbold, 2020). "Coal tar is a waste product of the gas industry." We have been consuming waste products since the early 19th century and will continue until the FDA deems azo and aniline dyes unsafe to eat or restricts manufacturers from using the coloring (Cobbold, 2020). In the 1860s, when the use of azo dyes increased, the international supply chain started changing the name of the dyes being produced, such as butter-yellow, to hide their industrial origins (Cobbold, 2020). Rather than solving the problem and banning azo dyes once side effects arose among individuals, only specific colors were banned (Cobbold, 2020). However, the banning process was not easy. Regulators had to turn to chemists, who looked at the chemical makeup of the dye to determine how harmful it was.

Many of the dyes and synthetic additives we use today were never meant to be used in food (Shore, 2019). There was no agreement between chemists and food manufacturers regarding public health (Shore, 2019). This is why today, the regulation varies depending on the country. Each country can make its own restrictions regarding dyes. Many places in Europe have more strict regulations than the United States. Food security is a significant economic competition around the world (Shore, 2019). Many countries make their money from selling food products to other countries (Maxwell, 2019). Although there have been drops in profit, especially when purchasing from the United States due to high chemical use in food, the exportation of food is still one of the largest profit makers bringing in over $139.5 billion a year (Maxwell, 2019).

European countries have taken steps to produce food for consumers with minimal or no additives. In 2010, the European Union (EU) put a stop to the use of potentially dangerous additives and dyes (Mo, 2019). The EU had legally requested that manufacturers use natural alternatives instead of artificial ones (Mo, 2019). Once the request was in place, many manufacturers complied and changed to natural alternatives. However, few companies still use artificial dyes and colors. To compensate for using synthetic dyes and additives, companies must put a large warning label on their products explaining

what is in them and the possible side effects (Mo, 2019). On the other hand, the United States have very few regulations. Companies are not required to write a warning label about what is in the product or if it can be harmful (Mo, 2019). Many companies change the names of certain additives or use their scientific names. As a result, consumers often do not know what the ingredient is without researching it (Mo, 2019).

Since the regulation requirements are so different between the United States and the EU, the same product produced in the United States is made differently if imported to Europe. "American food" companies produce healthier versions of products to sell overseas (Mo, 2019). The United States started making two different types of the same product once the EU stopped purchasing the product's original formula with the additives (Shore, 2019). The United States lost millions in profit after the EU stopped purchasing the products. The United States' profit of $305 million in 1995 dropped to only $2 million in 2001 after the decision of not allowing genetically modified organisms (GMOs) (Mo, 2019). The most common products this is seen in are Mountain Dew, Heinz, and Quaker Oats (Shore, 2019). For example, Quaker Oats strawberries and cream quick oats in the United States have 29 ingredients. The one that is sent to Europe has only six ingredients. Aside from the number of ingredients, the one that stays in the United States has ingredients that an ordinary consumer does not recognize. The one that is shipped to Europe has all-natural ingredients and natural flavorings. Many other products are being produced with different ingredients because they are banned in other countries (Mo, 2019).

Moving away from factory-made food items, crops are genetically engineered as well. Crops are made to withstand pesticides genetically. Each crop has its own genetically engineered Bacillus Thuringians (Bt), which makes the crop produce its own pesticide (Maxwell, 2019). The Bt in these plants kills insects instantly once they bite into them. According to the Environmental Protection Agency (EPA), all GMOs are considered a pesticide (Environmental Protection Agency, 2018). The GMOs put in the crops are made to withstand mass doses of herbicides. This is only helpful to farmers short term by keeping invasive weeds away from the crops and providing protection from pest damage. The highly toxic GMOs, specifically Glyphosate, sprayed on many crops, sink into the skin of fruits and vegetables and remain present even after being washed (Maxwell, 2019). Ninety percent of North America's soy, sugar, and corn are genetically engineered. This results in 85% of processed foods containing GMOs (Maxwell, 2019). The FDA knows about this, being they are the ones who regulate it, but they still do "not require any type of pre-market safety testing to ensure the genetically engineered foods" are safe for humans to eat (Maxwell, 2019). The company known as Monsanto or Bayer may sound familiar to many individuals. If the name does not sound familiar, perhaps Betty Crocker, Coca-Cola, Kellogg's, and Green Giant do. Bayer provides GMO products to those companies as well as 68 others (Shore, 2019). They recently lost three lawsuits claiming their products cause cancer, specifically Non-Hodgkins lymphoma (Maxwell, 2019). Yet, the EPA and FDA have deemed these products "safe" in the United States.

What the FDA allows in our food before and after it reaches the manufacturers is causing more harm than good (Wise, 2019). With failure to consider the environment when providing pollination and pesticide services, the United States is having widespread implications of biodiversity (Wise, 2019). According to the United Nations "Intergovernmental Science-Policy Platform on Biodiversity and Ecosystems, as many as 1 million plants and seeds are at risk of extinction if humans" and the FDA does not change their ways (Wise, 2019). The genetic modification being used in the crops we eat will be the reason we see a significant decrease in our food supply (Conover, 2019). Everything in the food chain depends on one another, even the ones that have been modified. Glyphosate, a herbicide, has made its way from crops to the water supply. Glyphosates, however, do not steep into the water supply; they have been found in human breast milk (Conover, 2019). This means that we humans living in the United States have consumed enough synthetic additives from food that we are producing them from our bodies.

For over 60 years, synthetic dyes and additives have been added to our food. What once started as a way to put more food on the shelves during the business boom turned into one of America's greatest crimes. Although there have been reports of many adverse side effects, medical journalist reports, and confirmation from the FDA on the harm these additives cause, nothing has been done. Our food has become manufactured and processed to the point where other countries have refused to purchase many items unless the additives were removed.

This problem has gone from being used in manufacturing to being used on farms before the crops are grown. The seeds that are being used have been genetically engineered. They have been so altered that they create their own pesticides and can kill insects once they bite into the grown crop. The hope for change is not in sight as of now. The more companies can profit off expanding their production

by adding synthetic additives, the longer they will continue to do so. Becoming educated on the types of additives and the effects they have is vital information to have knowledge on as the cycle continues.

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