Food colors perform a variety of functions in foods and beverages. Yet, despite their careful regulation by federal authorities and history of safe use, claims continue to be made linking food colors to hyperactivity in children. This document serves as a guide to common questions about food colors, including what they are, how and why they are used, and how they are regulated for safe use in the United States. It also reviews recent scientific research that has examined the potential relationship between food colors and hyperactivity.

What is a food color?
A food color, or color additive, is any dye, pigment or substance that imparts color when added or applied to a food, drug, cosmetic, or the human body. There are two categories of food colors that are permitted by the U.S. Food and Drug Administration (FDA): certified color additives and colors that are exempt from certification.

Certified color additives are man-made and are widely used to provide an intense, uniform color. Certified color additives are less expensive than their alternatives, do not create an unpleasant flavor in food products, and blend easily to create a range of hues. There are currently nine certified color additives that are approved by the FDA for use in the U.S. Some examples of certified color additives are FD&C Blue Nos. 1 and 2; FD&C Red Nos. 3 and 40; and FD&C Yellow No. 5. To view a complete list of certified color additives, visit: [http://www.fda.gov/ForIndustry/ColorAdditives/ColorAdditiveInventories/ucm115641.htm](http://www.fda.gov/ForIndustry/ColorAdditives/ColorAdditiveInventories/ucm115641.htm).

The second category, colors that are exempt from certification, include pigments that are derived from natural sources, such as vegetables, minerals or animals. Despite coming from natural sources, they are still artificial color additives and must comply with regulatory requirements. These colors are typically more expensive than certified color additives and may add undesirable flavors to foods.

Why are food colors added to foods?
Colors are added to foods for several purposes. One of the primary reasons is to make up for color losses in foods which occur when food is exposed to air, light, moisture, and variations in temperature. Additionally, food colors are used to even out natural variations in color that can occur in foods. Food colors can also enhance naturally occurring colors in foods. Lastly, color additives can be used to add color to foods that would otherwise be colorless, to make them more attractive and appetizing.

What foods most commonly contain food colors?
Food colors are contained in many processed foods, including snack foods, candies, margarine, soft drinks, cheese, jams and jellies, and desserts.

How can I tell if the food I am eating contains food colors?
The first place to look for food colors is in the ingredients list on the product label, located on the product’s packaging. Food manufacturers are required to list all ingredients contained in food products. The ingredients that are used in the greatest amounts are listed first, followed by additional ingredients in descending order. Food colors that are exempt from certification, unless otherwise required by regulation, can be labeled as “artificial colors” on the ingredients list without naming each specific color. In contrast, certified color additives must be listed individually.

Who is responsible for regulating food color use in food products in the U.S.?
The FDA is responsible for regulating the use of all food colors in the U.S. to make sure that foods containing these additives are safe for human consumption. The FDA also makes sure that foods containing color additives are accurately labeled and contain only FDA-approved food colors.

How are food colors approved for use in foods?
Before a new food color is allowed to be used in food products that will be sold to the public, the manufacturer must petition the FDA for approval. The manufacturer is responsible for
providing sufficient evidence to the FDA that the food color is safe for its intended use. As the FDA evaluates a food color for approval, key details that are part of the safety evaluation include: an investigation of the composition and properties of the food color; the amount of the food color that would normally be consumed; the short-and long-term health effects of consumption; and other safety factors. After the safety evaluation, the FDA sets a level of use for the food color that is much lower than what would be expected to have any adverse effects. In other words, it includes a built-in safety margin. The FDA uses sound scientific criteria to support its ruling that there is “reasonable certainty of no harm to consumers” when the food is consumed at the approved level.

Once the food color is approved, the FDA determines whether any additional regulations are needed for the color additive, including limitations on foods in which the color additive can be used, how much of the food color can be used, and how the food color should be labeled. The FDA continues to follow food colors after they are on the market by monitoring Americans' consumption of food products containing the color additives and conducting or evaluating further safety research, if necessary. Additionally, Good Manufacturing Practices (GMP) regulations limit the amount of food ingredients, including food colors, used in foods only to the amount necessary to achieve the desired effect.1

Do food colors cause hyperactivity in children?
The issue of whether food colors cause hyperactivity in children has occasionally been called into question by a small subset of the scientific community. Scientific studies on the potential relationship between food colors and hyperactivity have been conducted over the past thirty years; however, these studies have been unable to show a “cause and effect” relationship. Additionally, many of these studies had limitations, including: small sample populations; the inability to isolate one food color and link it to a particular behavior; and reliance on anecdotal reports and recall by study participants. To date, most scientific experts agree that sufficient evidence does not exist to support a causal relationship between food color consumption and increased hyperactivity, with an overall consensus that more research is needed on the topic.

What does the past and current scientific research say about food colors and hyperactivity?
Research on the relationship between food colors and hyperactivity in children dates back to the 1970s, when Dr. Benjamin Feingold suggested that salicylates, artificial flavors, and artificial food colors were causes of hyperactivity. This became known as the “Feingold Hypothesis.” To both prevent and treat hyperactivity, Dr. Feingold recommended a diet free of these substances.2 Dr. Feingold’s research on the association between food colors and hyperactivity was, however, limited by issues with the methodology he used — the studies lacked control groups, preventing him from drawing a conclusive causal link between food colors and hyperactivity.

Since the 1970s, numerous double-blind studies conducted on the Feingold Hypothesis have found no benefit from the elimination of the food ingredients mentioned above in the prevention or treatment of hyperactivity beyond the normal placebo effect. In addition, in 1982 a Consensus Development Panel of the National Institutes of Health (NIH) concluded that there was no scientific evidence to support the claim that food colors cause hyperactivity. The Panel did find, however, that for some children with attention deficit hyperactivity disorder (ADHD) and a confirmed food allergy, reducing or removing food colors from their diets produced some improvement in behavior. The Panel also concluded that eliminating entire categories of foods from children’s diets should not be used as a universal treatment for childhood hyperactivity, since there is no scientific evidence to show which children would benefit from this, and it could lead to unnecessary removal of nutrients from the diet.3

More recently, several reviews of the research also failed to establish a link between food colors and hyperactivity. One review conducted in 2007 by Cormier and Elder stated, “There is little empirical evidence supporting the effectiveness of dietary restriction in treating child psychiatric disorders, in particular autism and attention deficit hyperactivity disorder (ADHD).”4 Another review by Cruz and Bahna (2006) found “limited support” for “the possible role of foods or additives in causing behavioral disorders in children, particularly ADHD.”5

The most recent study exploring the relationship between food colors and hyperactivity was commissioned by the UK Food Standards Agency (FSA) and was published in 2007 by researchers at the University of Southampton in the United Kingdom. This study sparked renewed attention to the possible relationship between food color consumption and hyperactivity in children (McCann, et al., 2007). The researchers found that two groups of children ages 3 and 8-9 years had increased hyperactivity when they consumed two different mixtures of artificial colors plus a preservative.6

However, a European Food Safety Authority (EFSA) panel of experts evaluated the study and determined that the “effects observed were not consistent for the two age groups and for the two mixtures used in the study.” The Panel also concluded that this study could not be used as a basis for altering the Acceptable Daily Intake (ADI) levels established in Europe for the implicated food colors.7

Will removing food colors from all children’s diets solve the problem of hyperactivity?
There are several factors that contribute to hyperactivity in children, including genetics and lifestyle habits. A 1997 review published in the Journal of the American Academy of Child & Adolescent Psychiatry found “there is minimal evidence of efficacy and extreme difficulty inducing children and
adolescents to comply with restricted diets.” Therefore, dietary modifications should only be used under extreme circumstances. In addition, it is important to note that there can be a social implication to altering a child’s diet to eliminate certain foods, in that they can’t enjoy the same foods as their friends, which could make them feel left out in social settings, such as birthday parties and school lunches. Moreover, some foods containing color additives can provide important nutrients (ex. cheese), and parents should be cautious about eliminating foods from their children’s diets without first consulting their pediatrician and/or a registered dietitian. Parents can also encourage their children to consume a diet emphasizing nutrient-dense foods and beverages, including fruits and vegetables, whole grains, sources of lean protein, and fat-free or low-fat dairy products. A healthful eating pattern that includes nutrient-dense foods and beverages will automatically reduce their consumption of artificial food colors, minimizing concerns.

**Is more research on the relationship between food colors and hyperactivity in children warranted?**

Since a clear causal relationship between food colors and hyperactivity has not been documented in the scientific literature to date, and existing research has been conflicting, experts believe there is a need for more well designed and controlled scientific research on this subject to put the debate to rest.

In conclusion, the majority of experts agree that food colors do not contribute to hyperactivity in children. However, those who wish to avoid products containing food colors either due to preference or because of a suspected food sensitivity can do so by simply reading the label and avoiding those products. Likewise, consumers who are not affected can still consume foods containing food colors without feeling concerned about their approval for food use, safety, or role in child hyperactivity. Practicing moderation will ensure consumers can continue to enjoy foods containing food colors along with a nutrient-rich diet.

**References:**


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**International Food Information Council Foundation**

1100 Connecticut Avenue, NW

Suite 430

Washington, DC 20036

[www.foodinsight.org](http://www.foodinsight.org)

Updated: 3/2011