

Excerpts taken from Healthline

## NUTRITION

Evidence Based

# Food Dyes: Harmless or Harmful?

Food dyes can appear in a range of foods, from candies to salad dressing. Common dyes include Red 40, Yellow 5, and Yellow 6. Some studies suggest food dyes may cause cancer, but research in this area is limited.

Artificial food dyes are responsible for the bright colors of candy, sports drinks and baked goods.

They're even used in certain brands of pickles, smoked salmon and salad dressing, as well as medications.

In fact, artificial food dye consumption has increased by 500% in the last 50 years, and children are the biggest consumers ([1](#)Trusted Source, [2](#)Trusted Source, [3](#)Trusted Source).

Claims have been made that artificial dyes cause serious side effects, such as hyperactivity in children, as well as cancer and allergies.

The topic is highly controversial and there are many conflicting opinions about the safety of artificial food dyes. This article separates the fact from fiction.

# What Are Food Dyes?

Food dyes are chemical substances that were developed to enhance the appearance of food by giving it artificial color.

People have added colorings to food for centuries, but the first artificial food colorings were created in 1856 from coal tar.

Nowadays, food dyes are made from petroleum.

Over the years, hundreds of artificial food dyes have been developed, but a majority of them have since been found to be toxic. There are only a handful of artificial dyes that are still used in food.

Food manufacturers often prefer artificial food dyes over natural food colorings, such as beta carotene and beet extract, because they produce a more vibrant color.

However, there is quite a bit of controversy regarding the safety of artificial food dyes. All of the artificial dyes that are currently used in food have gone through testing for toxicity in animal studies.

Regulatory agencies, like the US Food and Drug Administration (FDA) and the European Food Safety Authority (EFSA), have concluded that the dyes do not pose significant health risks.

Not everyone agrees with that conclusion. Interestingly, some food dyes are deemed safe in one country, but banned from human consumption in another, making it extremely confusing to assess their safety.

## BOTTOM LINE:

Artificial food dyes are petroleum-derived substances that give color to food. The safety of these dyes is highly controversial.

# Artificial Dyes Currently Used in Food

The following food dyes are approved for use by both the EFSA and the FDA (4, 5Trusted Source):

- **Red No. 3 (Erythrosine):** A cherry-red coloring commonly used in candy, popsicles and cake-decorating gels.
- **Red No. 40 (Allura Red):** A dark red dye that is used in sports drinks, candy, condiments and cereals.
- **Yellow No. 5 (Tartrazine):** A lemon-yellow dye that is found in candy, soft drinks, chips, popcorn and cereals.
- **Yellow No. 6 (Sunset Yellow):** An orange-yellow dye that is used in candy, sauces, baked goods and preserved fruits.
- **Blue No. 1 (Brilliant Blue):** A greenish-blue dye used in ice cream, canned peas, packaged soups, popsicles and icings.
- **Blue No. 2 (Indigo Carmine):** A royal blue dye found in candy, ice cream, cereal and snacks.

The most popular food dyes are Red 40, Yellow 5 and Yellow 6. These three make up 90% of all the food dye used in the US (3Trusted Source).

A few other dyes are approved in some countries, but banned in others. Green No. 3, also known as Fast Green, is approved by the FDA but banned in Europe.

Quinoline Yellow, Carmoisine and Ponceau are examples of food colorings allowed in the EU but banned in the US.

### **BOTTOM LINE:**

There are six artificial food dyes that are approved by both the FDA and the EFSA. Red 40, Yellow 5 and Yellow 6 are the most common.

## **Food Dyes May Cause Hyperactivity in Sensitive Children**

In 1973, a pediatric allergist claimed that hyperactivity and learning problems in children were caused by artificial food colorings and preservatives in food.

At the time, there was very little science to back up his claim, but many parents adopted his philosophy.

The doctor introduced an elimination diet as a treatment for attention deficit hyperactivity disorder (ADHD). The diet eliminates all artificial food colorings, along with a few other artificial ingredients.

One of the earliest studies, published in 1978, found no changes in children's behavior when they were given a dose of artificial food dyes (6Trusted Source).

Since then, several studies have found a small but significant association between artificial food dyes and hyperactivity in children ([1](#)Trusted Source).

One clinical study found that removing artificial food dyes from the diet, along with a preservative called sodium benzoate, significantly reduced hyperactive symptoms ([7](#)Trusted Source).

A small study found that 73% of children with ADHD showed a decrease in symptoms when artificial food dyes and preservatives were eliminated ([8](#)Trusted Source).

Another study found that food dyes, along with sodium benzoate, increased hyperactivity in both 3-year-olds and a group of 8- and 9-year-olds ([9](#)Trusted Source).

However, because these study participants received a mixture of ingredients, it is difficult to determine what caused the hyperactivity.

Tartrazine, also known as Yellow 5, has been associated with behavioral changes including irritability, restlessness, depression and difficulty with sleeping ([10](#)Trusted Source).

What's more, a 2004 analysis of 15 studies concluded that artificial food dyes do increase hyperactivity in children ([11](#)Trusted Source).

Yet it appears that not all children react the same way to food dyes. Researchers at Southampton University found a genetic component that determines how food dyes affect a child ([12](#)Trusted Source).

While effects from food dyes have been observed in children with and without ADHD, some children seem much more sensitive to dyes than others ([1](#)Trusted Source).

Despite this, both the FDA and the EFSA have stated there is currently not sufficient evidence to conclude that artificial food dyes are unsafe.

Their regulatory agencies work on the premise that a substance is safe until proven harmful. However, there is certainly sufficient evidence to raise some concern.

Interestingly, in 2009 the British government began encouraging food manufacturers to find alternative substances to color food. As of 2010, in the UK a warning is required on the label of any food that contains artificial food dyes.

#### **BOTTOM LINE:**

Studies suggest there is a small but significant association between artificial food dyes and hyperactivity in children. Some children seem to be more sensitive to dyes than others.

## **Do Food Dyes Cause Cancer?**

The safety of artificial food dyes is highly controversial.

However, the studies that have evaluated the safety of food dyes are long-term animal studies.

Interestingly, studies using Blue 1, Red 40, Yellow 5 and Yellow 6 found no evidence of cancer-causing effects ([13](#)Trusted Source, [14](#), [15](#)Trusted Source, [16](#)Trusted Source, [17](#), [18](#)Trusted Source, [19](#)Trusted Source).

Nevertheless, other dyes may be more concerning.

## Concerns About Blue 2 and Red 3

An animal study on Blue 2 found a statistically significant increase in brain tumors in the high-dose group compared to the control groups, but the researchers concluded there was not enough evidence to determine whether Blue 2 caused the tumors ([20](#)Trusted Source).

Other studies on Blue 2 found no adverse effects ([21](#)Trusted Source, [22](#)Trusted Source).

Erythrosine, also known as Red 3, is the most controversial dye. Male rats given erythrosine had an increased risk of thyroid tumors ([23](#)Trusted Source, [24](#)Trusted Source).

Based on this research, the FDA issued a partial ban on erythrosine in 1990, but later removed the ban. After reviewing the research, they concluded that the thyroid tumors were not directly caused by erythrosine ([24](#)Trusted Source, [25](#), [26](#)Trusted Source, [27](#)Trusted Source).

In the US, Red 3 has mostly been replaced by Red 40, but it is still used in Maraschino cherries, candies and popsicles.

## Some Dyes May Contain Cancer-Causing Contaminants

While most food dyes did not cause any adverse effects in toxicity studies, there is some concern about possible contaminants in the dyes ([28](#)Trusted Source).

Red 40, Yellow 5 and Yellow 6 may contain contaminants that are known cancer-causing substances. Benzidine, 4-aminobiphenyl and 4-aminoazobenzene are potential carcinogens that have been found in food

dyes ([3](#)Trusted Source, [29](#)Trusted Source, [30](#)Trusted Source, [31](#)Trusted Source, [32](#)Trusted Source).

These contaminants are allowed in the dyes because they are present in low levels, which are presumed to be safe ([3](#)Trusted Source).

## More Research is Needed

Artificial food dye consumption is on the rise, especially among children. Consuming too much food dye containing contaminants could pose a health risk.

However, with the exception of Red 3, there is currently no convincing evidence that artificial food dyes cause cancer.

Nevertheless, note that most of the studies evaluating the safety of food dyes were performed decades ago.

Since then, the intake of dyes has dramatically increased and often multiple food dyes are combined in a food, along with other preservatives.

### BOTTOM LINE:

With the exception of Red 3, there is currently no conclusive evidence that artificial food dyes cause cancer. More research needs to be done based on the increasing consumption of food dyes.

## Do Food Dyes Cause Allergies?

Some artificial food dyes can cause allergic reactions ([28](#)Trusted Source, [33](#)Trusted Source, [34](#)Trusted Source, [35](#)Trusted Source).

In multiple studies, Yellow 5 — also known as tartrazine — has been shown to cause hives and asthma symptoms ([36Trusted Source](#), [37Trusted Source](#), [38Trusted Source](#), [39Trusted Source](#)).

Interestingly, people who have an allergy to aspirin seem to be more likely to also be allergic to Yellow 5 ([37Trusted Source](#), [38Trusted Source](#)).

In a study conducted in people with chronic hives or swelling, 52% had an allergic reaction to artificial food dyes ([40Trusted Source](#)).

Most allergic reactions are not life-threatening. However, if you have symptoms of an allergy, it may be beneficial to remove artificial food dyes from your diet.

Red 40, Yellow 5 and Yellow 6 are among the most commonly consumed dyes, and are the three most likely to cause an allergic response ([3Trusted Source](#)).

### **BOTTOM LINE:**

Some artificial food dyes, particularly Blue 1, Red 40, Yellow 5 and Yellow 6, may cause allergic reactions in sensitive individuals.