# Global Regulations of Food Colors

## *Each region has its own definitions of what constitutes a color additive, with related use requirements and restrictions.*

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It is said, *we eat with our eyes*. Since antiquity, humans have used the color of a food to discern its quality. Color provides a way to judge ripeness, perceive flavor and assess quality of food.

Ancient civilizations introduced color into their foods. The ancient Egyptians colored their food yellow with saffron, and the ancient Mayans used annatto to color their food orange-red. Wealthy Romans ate bread that had been whitened by adding alum to the flour. Color could be used to enhance the physical appearance of the product. However, if it made the food appear to be of better quality than it was, that was considered a deceitful practice. This is the broad definition of *adulteration*. In Paris in 1396, an edict was issued that forbade the coloring of butter. This was one of the early laws against intentional adulteration of food.

Through the centuries, advances in preservation of food by refrigeration, canning and processing, all of which extended the shelf life of food, also tended to alter the normal color of the food. Large-scale processing and year-round demand for a variety of foods caused a desire to establish a uniform appearance of foods. However, overuse of food colors was soon recognized as a threat to public health. Of concern was that some of the substances were known to be poisonous and were often incorporated to hide poor quality, add bulk to foods and to pass off imitation foods as real.

On February 1, 1899, the executive committee of the National Confectioners' Association published an official circular which was "to throw light upon the vexed question of what colors may be safely used in confectionery" as "there may at times be a doubt in the mind of the honest confectioner as to which colors, flavors, or ingredients he may safely use and which he may reject." This list contained 21 colors said to be harmful, and 33 colors said to be harmless.

In 1906, the Food and Drug Act was passed by Congress. This act banned the addition of "poisonous" colors to confectionery products, and prohibited the addition of colorants to foods for the purpose of concealing inferiority. As a result of the 1906 act, and further study by Wiley and Hesse, seven colors (Amaranth, Ponceau 3R, Orange I, Erythrosine, Naphthol Yellow S, Light Green SF Yellowish and Indigo Disulfo Acid Sodium Salt) were voluntarily certified. ➤

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***Because absolute safety of any substance can never be proven, FDA must determine if the additive is safe under the proposed conditions of use, based on the best scientific knowledge available.***

In 1938, the Food and Drug Act was overhauled, and certification of colors became mandatory. The responsibility for certification fell to the newly formed Food and Drug Administration. In 1959, the Food, Drug and Cosmetic Act was passed. The Color Additive Amendment was added in 1960. The laws included a provision, known as the *Delaney Clause,* which established that no food or color additive could be deemed safe—or given FDA approval—if found to cause cancer in humans or animals.

The act also divided the colors into two categories—*certified* and *exempt from certification*—and further divided the certified colors into permanently and provisionally listed colors. The 1960 act required manufacturers to sponsor new toxicity testing. Based on these data points and various safety factors, FDA determines a safe exposure level for the food and color additive.

FDA compares the safe exposure level to the amount likely to be consumed in food, taking into consideration the composition and properties of the substance and the proposed conditions for use. Because absolute safety of any substance can never be proven, FDA must determine if the additive is safe under the proposed conditions of use, based on the best scientific knowledge available. With color additives, FDA also must determine their suitability for use. The Office of Food Additive Safety, formerly the Office of Premarket Approval, evaluates this information. Because this is a rigorous and exhaustive process for additive evaluation, and because of the Delaney Clause, FDA additives are considered as having "No Risk" or "Minimal Risk" with consumption.

Beginning in 1956, the Food and Agriculture Organization (FAO) of the United Nations and the World Health Organization (WHO) began collecting and evaluating scientific data on food additives and making recommendations of safe levels of use. The Codex Alimentarius Commission was created in 1963 by FAO and WHO to develop food standards, guidelines and related texts such as codes of practice under the Joint FAO/WHO Food Standards Programme.

The tasks of establishing levels of use for additives and developing food standards have fallen to the Joint FAO/WHO Expert Committee on Food Additives (JECFA), which was established in 1955. Most of these standards are built on the ADI (acceptable daily intake) for additives, including color additives. This ADI philosophy is to spread out the risk of cancer. This type of philosophy is a "Low Risk" philosophy. JECFA also has the responsibility for establishing monographs for the identity and purity of individual food additives. The additives are assigned INS numbers. The work of JECFA with additives feeds into the Codex General Standard for Food Additives (GSFA) food category system. This system is a hierarchical system and applies to all foodstuffs, including those in which no food additives are permitted. The system has established food category definitions. For example, confectionery is Category 05.0 and "Includes all cocoa and chocolate products (05.1), other confectionery products that may or may not contain cocoa (05.2), chewing gum (05.3), and decorations and icings (05.4), or foods produced solely with any combination of foods conforming to these sub-categories." In the GSFA, JECFA will eventually establish usage limits for all additives, based on consumption patterns, in each specific food product category. www.codexalimentarius.net/gsfaonline/foods/index.html

The General Principle of Codex Alimentarius is to guide and promote the harmonization of food laws among countries and to adopt internationally agreed-upon standards. ➤

This will lead to fewer barriers to trade and freer movement of food products among countries, which will benefit farmers and their families, and will help to reduce hunger and poverty.

The United States and Japan employ the No Risk philosophy. JECFA and the European Commission (EC) of the European Union (EU) employ the Low Risk philosophy. It is the Low Risk philosophy that we see in new and revised regulations.

As we examine in depth what constitutes a color additive in each region, it is also important to remember that entities also have purity requirements, and often restrict colors and other additives based on the finished food product that is being sold to consumers. There are more than 100 governmental regulatory bodies, international trade agreements, nongovernmental organizations and industrial trade organizations that oversee food regulations. We will examine some of these in more depth.

## U.S. REGULATION

In the United States, the act states that

> ...a material otherwise meeting the definition of color additive to be exempt from section 721 of the act, on the basis that it is used (or intended to be used) solely for a purpose or purposes other than coloring, the material must be used in a way that any color imparted is clearly unimportant insofar as the appearance, value, marketability, or consumer acceptability is concerned. (It is not enough to warrant exemption if conditions are such that the primary purpose of the material is other than to impart color.)

Plainly stated, if the purpose of an additive is to change the color of a food, then the additive is a color. As a color, it has to be approved as a color for use in food by the Food and Drug Administration.

Two main categories make up the FDA's list of permitted color additives. They are the certified color additives and the exempt-from-certification color additives. The certified color additives are primarily man-made synthetic organic colors. The manufacturer submits a sample of the batch for certification, and the FDA tests the sample to determine whether it meets the color's requirement for composition and purity. When the batch is approved, the FDA issues a certified lot number to the batch, and the manufacturer can then sell the product. The name is changed to its unique FD&C nomenclature. Only then can that lot be used to make FDA-regulated colors. Following is the list of color additives subject to certification:

- FD&C Red #3
- FD&C Red #40
- FD&C Yellow #5
- FD&C Yellow #6
- FD&C Green #3
- FD&C Blue #1
- FD&C Blue #2

The exempt color additives are largely from plant, animal or mineral sources, or are synthetic variations of naturally occurring colorants. While not subject to batch certification, they are still artificial color additives and must meet the requirements for composition and purity as listed in the Code of Federal Regulations. Some of the colors exempt from certification are limited to certain classifications of food products or certain usage levels. It is important to check 21 CFR Section 73 for these limitations. The common color additives exempt from certification are shown in Figure 1.

In the United States, color additives are required to be labeled. Certified colors must always be declared by name in the ingredient statement. It is not necessary to include the FD&C prefix or the term *No.* ➤

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in the declaration, although the term *lake* must be included where applicable (e.g., Yellow 5, Blue 1 Lake).

Exempt-from-certification colors are described in 21 CFR Part 73. Labeling options for most exempt-from-certification colors are varied, and include the following:

- *artificial color*
- *artificial color added*
- *color added*
- *colored with* _____ (fill in with the color name as described in Part 73)

FDA also allows for alternative equally informative terms, as long as it is clearly indicated that a color has been used. Exceptions to the above options are indicated by a statement in the exempt color description in Part 73 to the effect that declaration must be by name. Currently, the only exempt-from-certification colors to require declaration by name are cochineal extract and carmine.

Although industry often refers to exempt-from-certification colors as *natural colors*, use of this term is prohibited on an ingredient statement. Regardless of the source of the color, FDA regulations do not consider any added color to be natural unless the color is "natural to" the food product itself, such as coloring strawberry ice cream with strawberry juice.

**Common Exempt-from-Certification Color Additives**

Annatto extract
Astaxanthin
Beet juice
Beta carotene
Beta-apo-8′ caroteneal
Canthanxanthin
Caramel
Carmine/Cochineal
Dehydrated beets (beet powder)
Fruit juice
Grape color extract
Grape skin extract
Paprika oleoresin
Riboflavin
Saffron
Sodium copper chlorophyll
Spirulina extract
Synthetic iron oxide
Titanium dioxide
Tomato lycopene
Turmeric oleoresin
Vegetable juice

Figure 1

## EU REGULATIONS

The European Union is a group of 26 member states (countries), with five candidate countries. The EU has spent many years arriving at its current structure in its regulations. The first directive for additives agreed to was for colors in 1962. They used the E-number classification system. This was followed by other directives for preservatives, antioxidants and emulsifiers. This system still allowed the member states to specify which foods could contain the substances and the maximum levels permitted.

Harmonization of food additives was the push throughout the community, and was achieved in the Framework Directive 89/107. The framework directive covered three separate directives on color, sweeteners and all other additives. It had supporting directives containing purity criteria. However, this required adoption and implementation by member states.

Risk management responsibility for food additives lies with the Directorate General for Health and Consumer Protection (DG Sanco). Specific risk assessment for the safety of food ingredients is reviewed under the European Food Safety Authority (EFSA). EFSA has two panels. It is the panel on Food Additives and Nutrient Sources Added to Food (ANS) that deals with questions of safety in the use of food additives, nutrient sources and other substances deliberately added to food, excluding flavorings and enzymes. The ANS panel applies the Low Risk philosophy, with an added "precautionary principle" philosophy. The precautionary principle is a "better safe than sorry" outlook.

Starting in 2008, directives were replaced with a new, broader framework for additives. The new Regulation 1333/2008 entered into force on January 20, 2010. In November 2011, the detailed provisions designed to replace the requirements of the directives were published in Regulation 1129/2011, which introduced substantial amendments to Regulation 1333/2008. These entered into force on June 1, 2013. Purity criteria were updated to align with the JECFA monographs, and were published in Regulation 231/2012.

In the EU, ingredients that are added to foods to change their color are classified one of three ways: as a color additive, as a flavor or as a coloring food.

Regulation 1333/2008 has several tables of additives that can be used, additives that ➤

can be used in additives and foods in which additives may be used, and the maximum usage level limits. Each additive has an "E" number which corresponds to the INS numbers listed in Codex. By definition, colors from synthetic sources, and selectively extracted colors from natural sources, as well as inorganic pigments, are regulated together. Some additives are allowed at *quantum satis* (GMP), while others have part per million levels based on the food category. The website maintained by DG Sanco is a useful tool to investigate the regulation. https://webgate.ec.europa.eu/sanco_foods/main/?event=display

Since 2008, this regulation has been amended over 30 times. Since it is new and often changing, it can feel disjointed and lead to some confusion. For the confectionery industry, one of the amendments of impact is Commission Regulation (EU) No 380/2012 of 3 May 2012 amending Annex II as regards the conditions of use and the use levels for aluminum-containing food additives. This regulation reduced the number of permitted aluminum additives because consumption levels of aluminum are considered too high. Specifically, this limits the use of aluminum lakes. In confection products in general, the use of lakes is restricted by the color, and further by the aluminum, to 70 ppm.

Regulation EC 1333/2008 EU contained a list of food colors (Article 24) for which the labeling of foods shall include additional information. These colors (Sunset Yellow, Quinoline Yellow, Carmoisine, Allura Red, Tartrazine and Ponceau 4R) are required to state the following: *name of E number of color(s): may have an adverse effect on the activity and attention in children*. The phrase coined for these colors is the *Southampton Six*, which refers to the university that completed the study. With this required labeling, the uses of the Southampton Six colors in the EU have been virtually eliminated.

Some additives have a flavor aspect as well as a color aspect. Flavorings, as defined in EC Regulation 1334/2009, are products which are added to food in order to impart or modify odor and/or taste. Flavorings with a secondary coloring effect are exempted from the food additive definition. Some items, such as spice oleoresins (paprika oleoresin and turmeric oleoresin), are classified as flavors.

On November 29, 2013, the Standing Committee on Food Chain and Animal Health issued Guidance Notes on the Classification of Food Extracts With Coloring Properties, Version 1. These guidance notes should be read in conjunction with the appropriate legislation, especially Regulation (EC) No 1333/2008 on food additives. These guidance notes do not represent the official position of the commission and they do not intend to produce legally binding effects.

The guidance notes contain a decision tree. The decision tree helps in determining if the ingredient is a color additive, a flavor or a food, or a coloring food. It is important to note that foods normally consumed as such in the EU, for example, cherry juice added to yogurt, would be regarded as a food. As a food, they would be labelled as such, even when added principally for coloring purposes. In addition, products extracted from foods by other processes than drying or concentration to be used in food for their coloring properties should not automatically be regarded as coloring food and should be examined and classified in accordance with the decision tree.

Extraction can range from simple water extraction, to degrees of selective extraction, up to isolation of the pure pigments. It is essential to identify when the prod- ➤

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Whether an extraction is selective or not depends on the ratio of the pigments relative to the nutritive or aromatic constituents. [Regulation (EC) No 1333/2008] In order to determine when selective extraction occurs, the guidance provides an enrichment factor calculation. The ratio of the pigments, the nutritive constituents and the aromatic constituents relative to the source material are all considered. Based on the calculation, a threshold value is determined. For coloring food, the value is less than 6. For selective extraction, the value is greater than 6. The decision tree is shown in Figure 2.

One factor being gathered for this guidance is the reference values for the source materials. The source material reference values might have significant impact on the enrichment factor calculations. For practical reasons it is recommended to use reference values based on the literature relevant to the edible part from which the coloring food is extracted. A table with the generally applicable reference values will be established as Annex III to this guidance.

In the EU, color additives must be declared by the category name (color) and E number of the specific color, e.g., *Color (E 171)*. If it is a flavor with a coloring property, it shall be designated either by the term *flavoring* or by a more specific name or description of the flavoring, such as *turmeric oleoresin*. Coloring food shall be designated by its specific name, e.g., *elderberry concentrate/extract*. The term *coloring food* is not a legal category name nor a specific name for the relevant ingredient.

In December 2013, the EU published a guidance document describing the food categories. This guidance document roughly aligns the food categories with the Codex GFSA food category system. While we have discussed what constitutes a color, and the purity of colors, the DG Sanco maintains the database on food additives, as a tool to inform about the food additives approved for use in food in the EU and their conditions of use. https://webgate.ec.europa.eu/sanco_foods/main/?event=display. While solely for informational purposes, it can help in the search for the connection between food categories and the additives allowed.

**EU Decision Tree—Coloring Food vs Additive Food Color**

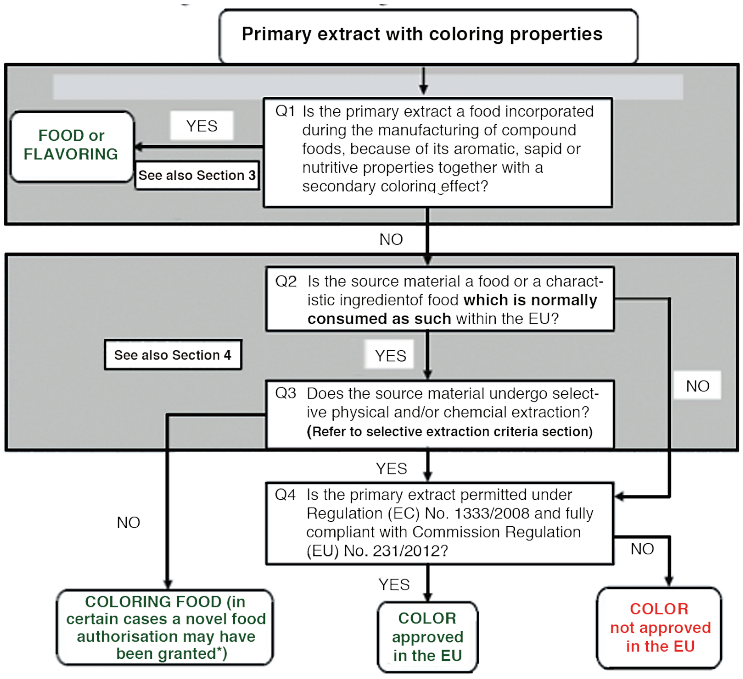


Figure 2

## OTHER COUNTRIES

Here is a review of some of the other regions and how they compare in the areas of purity requirements, nomenclature, usage levels, certification and registration, and labeling. In application of the regulations, it is important to keep in mind the definition of the food product in the region and regulation. ➤

## Canada

Canada has a long history of food regulation. The enabling legislation is the Food and Drug Act. Currently, the use of additives is under the direction of Health Canada. Food colors are listed in Division 6- B.06.01. "'Synthetic color' means any organic color, other than caramel, that is produced by chemical synthesis and has no counterpart in nature."

Table 3 on the Health Canada website (http://www.hc-sc.gc.ca/fn-an/securit/addit/list/3-colour-color-eng.php) is a List of Permitted Coloring Agents (Lists of Permitted Food Additives) and is subdivided into three parts. Part 1 is colors that are from natural sources, are synthetic equivalents or are inorganic pigments, and are generally permitted to GMP. Parts 1.1-1.7 and 1A are colors that have limits in certain food products. Part 2 is caramel and Part 3 is the synthetic dyes. The Canadian regulations allow for the same certified colors as the United States, with the additional allowance for amaranth. Certification of color additives is required in Canada. The usage limits in foods in general is 300 ppm total, with not more than 100 ppm being Brilliant Blue (FD&C Blue 1) or Fast Green FCF (FD&C Green 3). Health Canada maintains their regulations on their website.

Like most regions around the world, Canada states that it is the intent of the ingredient that makes it a color. Just because it has another function other than color, it is still a color, and needs to be declared as such. Currently, the permitted labeling of color in Canada is *Colour* in both English and French. Additional information on the name of the color additive can be given. Alternative dual labeling for U.S. and Canadian requirements can also be used, e.g., *Colour: Allura Red (red 40)*.

In addition to the HC website, Canada has a labeling hotline to which you can submit questions via email: labelwindow@inspection.gc.ca. The labeling page is found at http://www.inspection.gc.ca/food/labelling/eng/1299879892810/1299879939872.

## Mexico

Mexico has Norma Official Mexicana (Official Mexican Standard), abbreviated as NOM. This is a series of official, compulsory standards and regulations for diverse activities in Mexico. For food, if no NOM exists, then Codex, EU or U.S. regulations can be applied. Currently, there is no NOM for confectionery products.

## China

In China, color regulations are under GB2760-2011 - National Food Safety Standard - Standard for uses of food additives. The latest version was implemented June 20, 2011. Colors are registered and the toxicology data has to be submitted for new colors. Each color is petitioned for its use and usage level on an individual basis. Colors have their own purity specifications along the lines of Codex. However, there are some unusual importation regulations when you blend colors with other additives. GB 26687-2011 The National Standards for Food Safety, General Rules Regarding Compound Food Additives limits the combined level of lead to less than 2 ppm, and the combined level of arsenic to less than 2 ppm, despite the limit on the individual additive.

## Japan

Japan has established their own regulations based on their own knowledge, much in the manner of the United States. The Specifications and Standards for Foods, Food Additives, etc., under the Food Sanitation Act is published in English by the ➤

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Japan External Trade Organization (JETRO). In the act, they list the colors and other additives that are permitted. Colors can be under the following: Food additives with standards of use; Food additives with no standards of use; Existing food additives; and Substances which are generally provided as Food and which are used as food additives. In addition, Japan has the standard definitions of food categories, along with two special food categories: Food for Specified Health Uses (FOSHU) and Food with Nutrient Function Claims (FNFC). The English translation of the Specifications and Standards for Foods is located at http://www.jetro.go.jp/en/reports/regulations/pdf/foodext201112e.pdf.

### Korea

Korea follows the Japanese model. Food regulation is under the Ministry of Food and Drug Safety (MFDS), formerly the KFDA. The Food Code contains the relevant information regarding the quality and safety of foods covering specific maximum levels for contaminants, heavy metals, pesticides residues, veterinary drug residues, etc. One of the nuisances for Korea is the "stop sign" program. To protect young students from junk foods, the government decided to ban fast foods and soda within 200 meters of the selected schools. These junk food-free school areas are called Green Food Zones. Most confectionery products, because of low nutritive value, usually are labeled with the "Yellow" sign, and not allowed to be sold in this area. The MFDS website is http://www.mfds.go.kr/eng/index.do?nMenuCode=4.

### Australia

The Food Standards Australia and New Zealand (FSANZ) is a binational government agency. This agency had developed the Australia New Zealand Food Standards Code. It is established on the Codex model. Confectionery is in food type 5. Colors are listed in Schedules 3 and 4. Schedule 3 additives are generally the colors from natural sources, synthetic equivalents of natural sourced colors or are inorganic pigments. These additives are permitted to GMP limits in confectionery products. Schedule 4 additives are the synthetic color additives, and are permitted to a combined maximum level of 290 mg/kg in processed foods. The website is http://www.foodstandards.gov.au/Pages/default.aspx.

### MENA—Middle East and Northern Africa

Israel, Jordan, Lebanon, Malta and Syria follow the EU regulations in general. Often there are registration requirements and food category differences which affect the color usage.

These countries follow the GCC: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates. Recently proposed to the World Trade Organization is a change to adopt the Codex Alimentarius GFSA. A drawback with this adoption is that all additives have not fully progressed in the GFSA.

These countries in MENA follow their own regulation of some type or are not easily tracked: Algeria, Djibouti, Egypt, Iran, Iraq, Libya, Morocco, Tunisia, West Bank and Gaza, and Yemen.

### Other Regions

Many countries in South America and Africa follow the JECFA/Codex model discussed earlier. Because the general principle of Codex Alimentarius is to guide and promote the harmonization of food laws among countries and to adopt internationally agreed-upon standards, this is a good model ➤

to follow. When fully implemented, this model will lead to fewer barriers to trade and freer movement of food products among countries, which will benefit farmers and their families, and will help to reduce hunger and poverty.

## WORLDWIDE

Which colors are permitted worldwide? Even with the Southampton story, the best bets still are Red 40, Yellow 5, Yellow 6 and Blue 1, and most of the U.S.-approved color additives exempt from certification. Figure 3 lists the most common colors, with their respective INS number and a typical Pantone color designation.

## OTHER ISSUES

In general, there are a few additional regulatory acceptance issues that need to be considered. Color regulations are not easily charted. Many countries, such as the United States, EU and JECFA, have their own set of purity specifications. Certifica-

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**Colors from Around the World**

| Colorant | ANS# | pH | Pantone |
|---|---|---|---|
| FD&C Red #40 (Allura Red) | 129 | 2-8 | 1797 |
| Amaranth* | 123 | 2-8 | 7433 |
| Black Carrot | 163 | 3 | 1945 |
| Carmine | 120 | 3 | 7425 |
| Carmoisine* | 122 | 2-8 | 200 |
| Cochineal Extract/Carminic Acid | 120 | 7 | 225 |
| Beet | 162 | 4-7 | 674 |
| Elderberry Juice | 163 | 5 | 237 |
| FD&C Red #3 (Erythrosine) | 127 | 3-8 | 1915 |
| Grape Juice | 163 | 3 | 674 |
| Grape Skin Extract | 163ii | 3 | 674 |
| Lycopene (from tomato) | 160dii | 3-7 | 1795 |
| Lycopene (synthetic)* | 160di | 3-7 | 1795 |
| Monascus Color* | – | 5-8 | 7433 |
| Ponceau 4R | 124 | 2-8 | 199 |
| Purple Sweet Potato | 163 | 3 | 212 |
| Red Cabbage | 163 | 3 | 1935 |
| Red Iron Oxide* | 172ii | 2-8 | 7621 |
| Red Radish | 163 | 3 | 214 |
| Annatto-Bixin | 160bi | 2-6 | 173 |
| Annatto-Norbixin | 160bii | 3.5-8 | 173 |
| Beta-Apo-8′-Carotenal | 160e | 2-8 | 1585 |
| Beta-Carotene | 160ai-iv | 2.5-8 | 136 |
| Canthaxanthin | 161g | 2-8 | 2028 |
| Cochineal Extract | 120 | 3 | 1635 |
| Lutein* | 161b | 3-8 | 1385 |
| Paprika Oleoresin | 160c | 2-8 | 166 |
| Saffron | – | 2-8 | 152 |
| FD&C Yellow #6 (Sunset Yellow FCF) | 110 | 2-8 | 021 |
| Beta-Carotene | 160ai-iv | 2.5-8 | 1375 |
| Carrot Oil* | 160a | 2-8 | 136 |
| Quinoline Yellow* | 104 | 2-8 | 102 |

| Colorant | ANS# | pH | Pantone |
|---|---|---|---|
| Riboflavin | 101i | 2-8 | 114 |
| FD&C Yellow #5 (Tartrazine) | 102 | 2-8 | 115 |
| Turmeric/Curcumin | 100 | 2.5-6.5 | 107 |
| Yellow Iron Oxide* | 172iii | 2-8 | 129 |
| Chlorophyll* | 140i | 2-8 | 7742 |
| Copper Chlorophyll* | 141i | 2-8 | 7742 |
| FD&C Blue #1 (Brilliant Blue FCF) | 133 | 2-8 | 300 |
| Gardenia Blue* | – | 4-8 | 7690 |
| Huito* | – | 4-6 | 7694 |
| FD&C Blue #2 (Indigotine) | 132 | 2-8 | 285 |
| Red Cabbage | 163 | 7.5 | 7683 |
| Spirulina | – | 5-8 | 3005 |
| Natural Blue Vegetable Juice Color | – | 4-8 | 2935 |
| Black Carrot | 163 | 7 | 7678 |
| Blue Carmine | 120 | 7 | 7447 |
| Purple Sweet Potato | 163 | 4 | 2080 |
| Black Iron Oxide* | 172i | 2-8 | Black |
| Brilliant Black* | 151 | 2-8 | Black |
| Vegetable Carbon* | 153 | 2-8 | Black |
| Avalanche Opacity Agent | – | 2-8 | White |
| Calcium Carbonate* | 170 | 2-8 | White |
| Titanium Dioxide | 171 | 2-8 | White |
| Caramel Color I | 150a | 2-8 | 1615 |
| Caramel Color II | 150b | 2-8 | 1615 |
| Caramel Color III | 150c | 2-8 | 1615 |
| Caramel Color IV | 150d | 2-8 | 1615 |
| Aluminum* | 173 | 2-10 | Silver |
| Gold* | 175 | 2-10 | Gold |
| Mica-Based Pearlescent Pigments | 171 & 555 | 2-8 | Various |
| Silver* | 1754 | 2-10 | Silver |

**Items are not generally permitted for food use in the United States*

Figure 3

***At the current time, no color is coming from a genetically modified source. However, the carriers and emulsifiers used in colors can be from genetically modified sources, such as soy and corn.***

tion or registration may be required. Labeling requirements will vary from country to country. Regulations are often fluid and are subject to interpretation.

Colors and additives may have some allergenicity issues. Carmine has caused an allergic reaction in a small number of consumers. Some types of caramel have sulfites. Sulfites can be used in some fruit and vegetable juices. In addition, the carriers and emulsifiers used in color mixtures can be sources of allergens and insensitivities.

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There are religious sensitivities that vary by region. For example, alcohol ingredients can be problematic for kosher and halal products. Some animal ingredients can be problematic for kosher and halal, and items from animals are an issue for vegetarian products. □

## REFERENCES


Australia http://www.foodstandards.gov.au/ Pages/ default.aspx

Burrows, Adam, JD. Palette of Our Palates: A Brief History of Food Coloring and Its Regulation. *Comprehensive Reviews in Food Science and Food Safety* 8: 394-408, 2009.

Canada http://www.hc-sc.gc.ca/fn-an/securit/ addit/list/3-colour-color-eng.php

Canivet, Nicolas. Food Safety Certification. FAO Food Certification. FAO/WHO, June-July 2005. Web 21 Mar 2006. ftp://ftp.fao. org/ag/agn/food/certification_programmes.pdf

CFR - Code of Federal Regulations Title 21. N.p., n.d. http://www.accessdata.fda.gov/ scripts/cdrh/cfdocs/cfcfr/cfrsearch.cfm

DG Sanco https://webgate.ec.europa.eu/ sanco_ foods/main/?event=display

EU https://webgate.ec.europa.eu/sanco_foods/main /?event=display

EU http://ec.europa.eu/food/food/fAEF/additives/ lists_authorised_fA_en.htm

FAO/WHO Scientific Basis for Codex. Codex Alimentarius: Home. FAO/WHO, n.d. Web. 26 May 2014. http:// www.codexalimentarius.net/web/index_en.jsp

FDA http://www.fda.gov/RegulatoryInformation/Legislation/FederalFoodDrugandCosmetic ActFDCAct/default.htm

*Guidance Notes on the Classification of Food Extracts with Colouring Properties.* Standing Committee on the Food Chain and Animal Health (Nov. 11, 2013): n. pag. Print. http://ec.europa.eu/food/food/fAEF/additives/guidance_en.htm.

Japan http://www.jetro.go.jp/en/reports/regulations/pdf/foodext201112e.pdf

Jukes, David, PhD. *Food Law*. Food Law - Reading. N.p., n.d. Web. 26 May 2014. http://www.reading.ac.uk/foodlaw/

Korea http://www.mfds.go.kr/eng/index.do?n Menu Code=4

Marmion, Daniel M. *Handbook of U.S. Colorants: Foods, Drugs, Cosmetics, and Medical Devices*. New York: Wiley, 1991. Print

McAvoy, Sue Ann. Color Regulations: Challenges in the Global Regulatory Environment. Color Quality of Fresh and Processed Foods. N.p.: *American Chemical Society* 983:505-14, 2008. Print. June 13, 2008.

Milestones in Food and Drug Law History. About FDA. N.p., n.d. Web. 9 Nov. 2010. http://www.fda.gov/aboutFDA/whatwedo/History/milestones/ucm081229.htm

Pack, MM. Coloring, Food. *Encyclopedia of Food and Culture*. 2003. Encyclopedia.com. 9 Feb 2014. http://www.encyclopedia.com

Questions and Answers About Acceptable Daily Intake. *IFIC*. N.p., Aug. 1996. Web. 26 May 2014. http://ific.org/publications/qa/adiqa.cfm

Science Matters. Prime Minister's speech to the Royal Society. ePolitix, 23 May 2002.

White Junod, Suzanne, PhD. Colors and Cosmetics at The Centennial. *Food and Drug Law Institute* May/June Pp 43-50, 2006.

Wijesiri, Lionel. Read my lips. *Sunday Observer* Sunday April 10, 2005. http://www. sunday observer.lk/2005/04/10/mag03. html


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