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Fahim A. Shaltout *

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Review Article

How much does Food coloring agents are Dangerous for the Consumers?

Fahim A. Shaltout

Food Control, Faculty of Veterinary Medicine Benha University, Egypt.

***Corresponding Author:** Fahim A. Shaltout, Food Control, Faculty of Veterinary Medicine, Benha University, Egypt.

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Abstract

Color is an important factor in evaluating the quality of meat products. Adding the food color fixatives to meat products, which can optimize their appearance and improve their quality. In traditional meat products, nitrite is usually added as a coloring fixative, which will seriously threaten human health. Nowadays, food coloring substitutes are the popular development direction of coloring fixatives for meat products.

Types of food coloring agents, Natural: as Orange yellow beta carotene from green plants, red color from red beet juice and red oleoresin from paprika. Synthetic as Carmines, and Carmoisine.

Key Words: color; food; traditional meat products; Carmines; nitrite; beta carotene

Introduction

The decision to purchase a particular food item is strongly influenced by its appearance. One such quality is food colour, which may be interpreted as an indicator of flavour, freshness, maturity or wholesomeness, and its intensity may also affect taste perception. Therefore, food manufacturers often employ additives to improve the colour of their products and make them more attractive to consumers. Even though colour may be one of the most important considerations in a purchasing decision, it should be emphasised that food must primarily be safe for consumption. Any unauthorised use of food additives may seriously affect human health. The use of pigments and other food additives by food manufacturers within the borders of the European Union is regulated by Regulation 1333/2008 of the European Parliament and Council (EC) of the 16 December 2008 regarding food additives. The legislator has authorised 41 additives, classified as pigments, based on their role in the final product (1,2,3,4,5,6 and 7). In addition, to more precisely define the conditions permitting the use of additives, foods have been divided into specific categories. The present study concerns products within the following categories as defined in Regulation No. 853/2004 (EC): Meat preparations and Meat products. The latter is divided into non-heat-treated processed meat and "Heat-treated processed meat". Depending on the food category and substance type, pigment use can be determined by the level of quantum satis or the maximum numerical value set by the legislator (8,9,10,11,12,13 and 14). Legislation on the use of additives varies between different parts of the world. In the US, general rules for using food colours are regulated by § 70 Title 21 of the Code of Federal Regulations .As a result, nine food additives acting as pigments have jointly been certified and approved for use in the food industry by the Food and Drug Administration (FDA), seven of which are intended for general use . The aim of the present study is to identify the most common dyes present in processed meat, examine the relationships between their presence and the food characteristics, and evaluate their correctness of use; these aims are achieved by an analysis of information of product labels. Based on the available literature, it also assesses the risks and benefits to human health of using such dyes. Knowledge of the presence of dyes in meat products and meat preparations may also affect the dietary and purchasing decisions among consumers predisposed to allergic reactions (15,16,17,18,19,20 and 21).

Discussion:

Organic/Natural Food Coloring With the growing health concerns, the demand for natural food coloring is rapidly increasing in various domestic and commercial markets. Organic food coloring, also known as natural food coloring are colorants or color additives derived from natural sources, such as plants, trees, vegetables, beetroots, animals, and minerals.

Natural food coloring is economically friendly, safe, and healthier than synthetic food coloring. However, these food colorings are expensive due to limited sources and applications and often fade away after a certain period. Natural food colorings are most commonly used for domestic purposes due to their limited uses (29,30,31,32,33,34 and 35).

Advantages of Organic Food Coloring

Organic Food Coloring provides several health benefits, including Natural food coloring has antioxidant, anti-cancer, and anti-inflammatory properties that are great for health. Enhance the nutritional value of foods and

beverages. Safe and healthier for human consumption. Doesn't cause any side effects or allergic reactions. Natural food coloring is economically friendly (36,37,38,39,40,41 and 42).

Disadvantages of Organic Food Coloring

Although natural/organic food coloring provides so many benefits, there are some drawbacks associated with it. Natural food colorants have poor stability and often fade away easily compared to synthetic food coloring. Challenge food manufacturers who must ensure consistent color in their products. Organic food coloring doesn't provide a variety of color ranges compared to synthetic coloring. These natural food colorings are expensive which makes them not suitable for mass nmproduction (43,44,45,46,47,48 and 49).

Understanding Synthetic Food Coloring

Synthetic food coloring are colorants or coloring agents derived from coal-tar or petroleum-based chemicals, which do not occur naturally. The general rule of thumb is to avoid any food that is dyed since these dyes tend to be used in low nutritional value foods (candy, soft drinks, gelatin desserts, etc.). Synthetic food colorings are widely used to improve the appearance of food products making them more attractive to consumers. Synthetic food colorings are certified and permitted for use in a variety of applications, including food, drugs, and cosmetics (50,51,52,53,54,55 and 56).

Advantages of Synthetic Food Coloring

Synthetic food coloring provides several advantages, including the capability to produce a wide range of colors with different hues and shades, lower cost, and improved shelf life of a product. Here are the top advantages of synthetic food coloring, derived from coal tar derivatives that contain an azo group. Cost-effective and readily available compared to natural food coloring. Offer greater resistance to light and pH and don't fade away. Provides high color stability and durability with a longer shelf life. Highly appealing to consumers as they impart more vibrant, bright colors to users (64,65,66,67,68,69 and 70).

Disadvantages of Synthetic Food Coloring

Although synthetic food coloring has so many advantages, there are some coms associated with synthetic food coloring, including, derived from coal tar and petroleum-based chemicals, which are non-renewable sources of energy. Not environmentally friendly. Offers high pH, high temperature, strong acids, and heavy metal catalysts. Synthetic food dyes are not as healthy as natural dyes (71,72,73,74,75,76 and 77).

Natural Coloring in Meat Products

Using natural coloring in meat products has revolutionized the way processed foods like sausages and deli meats are presented. These colorants not only improve appearance but also provide a safer alternative to synthetic dyes, which often raise health concerns. paprika is among the most commonly used natural colorants, as they help achieve an attractive and consistent red hue in products such as hams and sausages (78,79,80,81,82,83 and 84). Paprika, extracted from red peppers, paprika imparts a reddish-orange hue that mimics the natural color of meat. It is a versatile choice for products that do not contain animal protein, such as meat substitutes, or as a seasoning. Thanks to its stability in heat and light, paprika maintains its color during food processing. The bioavailability of capsanthin and capsorubin from paprika extract is very low, and does not raise genotoxic or carcinogenic concern (85,86,87,88,89,90 and 91). Moreover, based on the lack of genotoxic potential, and on the no-observed-adverse-effect level for histopathological changes, an acceptable daily intake of 24 mg/kgbw for paprika extract has been indicated (92,93,94,95,96,97 and 98). red beet juice,Therefore, red beet could be a good natural colorant in emulsified pork sausage but it needs additional processing, such as betalain concentration and extraction as a juice, to be used as an antioxidant in meat products (99,100,101,102,103,104 and 105).Orange yellow beta carotene from green plants, In natural pigments, carotenoids are the most widely available and studied lipophilic pigments which provide yellow, orange, and red colors to plants. These are mostly present in plants, algae, fruits, and vegetables as well as in photosynthetic bacteria. These play role in the photosynthesis process by absorbing light and transferring it to chlorophyll. These pigments have non-covalent bonding with proteins. More than 70 carotenoids have been identified and are specific to each product (106,107,108,109,110,111 and 112).

Synthetic Coloring in Meat Products

Synthetic colors are often applied in raw meat applications. However, pH, myoglobin content, and packaging systems may all influence the color application in raw meats. With experienced innovative and problem-solving skills, ROHA Food Scientists provide professional industrial recommendations and customized solutions to our customers. Idacol range has a wide range of synthetic colors to all the meat requirements (113,114,115,116,117,118 and 119).

Carmine, derived from the Dactylopius coccus insect, is a highly versatile colorant that provides a wide range of red to pink hues, depending on the application. It comes in three primary forms, Carmine Lake, primarily used for deli meats and processed sausages, this type provides rich red tones that enhance the product's natural color (120,121,122,123,124,125 and 126). Water-soluble Carmine, This version offers shades ranging from violet to red, making it ideal for products requiring brighter colors . Liquid Carmine: Similar to the water-soluble variant, liquid carmine is suitable for sauces and marinades where easy dispersion is needed (134,135,136,137,138,139,140). Carmoisine, Carmoisine, a red to maroon shade in applications, is admired for its usage in add beverages, ice cream, sweat meant and allied. We are offering a wide gamut of carmoisine color and the compositions of C2OH12N2Na2O7S2 (141,142,143,144,145,146 and 147). Carmines and carminic acid, can be obtained from aqueous, aqueous alcoholic or alcoholic extracts of cochineal, and consist of the dried bodies of the female insect Dactylopius coccus Costa. The insects of the Coccidae family are parasites of some species of cacti. During the last century, the Canary Islands were the main production centre, but today this product can be obtained in large quantities in Peru and other countries of America. The insects are so small that about 100,000 are need to obtain 1 kg of product. However, they are very rich in the food colourant, reaching up to about 20% of their dry weight. The chemical principle of this colourant is the carminic acid, but the substance obtained by extraction with hot water (from insects) alone has no colour (148,149,150,151,152, 153 and 154). The food colourant itself is obtained through aluminum or calcium's addition to this extracted product. For some applications, especially beverages, ammonia is added instead of metal. Aluminum lakes of carminic acid (carmines) can be formed (i.e., these substances are thought to be present in the molar ratio 1:2). In commercial products, the colouring principle is associated with ammonium, calcium, potassium or sodium cations (singly or combined, with these cations eventually being in excess) (155,156,157,158,159,160 and 161). Commercial products may also contain proteinaceous material derived from the insect source, and free carminate, or a small residue of unbound aluminum cations. Carminic acid is a natural food colour, with a purple or red colour, which can be widely used, namely in preserved red fruits, fruit syrups, ice creams, meat products (such as sausages, chorizo and salami, pâtés, breakfast sausages, and as a meat preparation defined by lactic products (such as yogurt and fresh flavoured and other processed cheeses), ripened cheese, desserts, edible cheese rinds, flavoured drinks, seasoning, marmalades and jams, pastries and fine bakery, confectionery (including breath refreshing and chewing gum), breakfast cereals flavoured with fruits, fish paste and crustacean paste, precooked crustaceans, smoked fish, some alcoholic beverages, and wine-based snacks . Since 2000, the acceptable daily intake for cochineal, carminic acid and carmine (E 120) has been limited to 5 mg/kgbw . The ionisation properties of carminic acid suggest that these compounds can be absorbed into human tissues, but acute, short-term, subchronic, carcinogenicity, reproduction and developmental toxicity studies conducted in rats or mice did not show any toxicological potential. Moreover, some possibility of allergies, namely acute hypersensitivity reactions—such as angioedema, dyspnea and bronchospasm—in sensitized individuals can cause anaphylactic reactions. Considering that no threshold dose was established for allergic reactions, exposure to eliciting allergens,

such as proteinaceous compounds, must be avoided as much as possible by reducing their presence through purification steps during the manufacturing process of E120(162,163,164,165,166,167 and 168).

Effects of Synthetic food color on the human health

color is a vital constituent of food which imparts distinct appearance to the food product. Artificial coloring becomes a technological necessity as foods tend to lose their natural shade during processing and storage. Most of the food colors tested in the conventional toxicity experiments showed toxic effects at a very high level of intake. Most of the foods borne diseases reported are due to the consumption of non- permitted textile colors. Hyperactivity in Sensitive Children: A small study found that 73% of children with attention deficit hyperactivity disorder (ADHD) showed a decrease in symptoms when artificial food dyes and preservatives were eliminated. 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. However, because these study participants received a mixture of ingredients, it is difficult to determine what caused the hyperactivity. Tartrazine, also known as Yellow, has been associated with behavioral changes including irritability, restlessness, depression and difficulty with sleeping). The artificial food dyes do increase hyperactivity in children. Yet it appears that not all children react the same way to the food dyes. Researchers at Southampton University found a genetic component that determines how food dyes affect a child (127,128, 129, 130,131,132 and 133). There is a small but significant association between artificial food dyes and hyperactivity in children. Some children seem to be more sensitive to the dyes than others. Cancer, while most food dyes did not cause any adverse effects in toxicity studies, there is some concern about possible contaminants in the dyes. Red 40, Yellow and Yellow may contain contaminants that are known cancer-causing substances. Benzedrine, 4-aminobiphenyl and 4-aminoazobenzene are potential carcinogens that have been found in food dyes. These contaminants are allowed in the dyes because they are present in low levels, which are presumed to be safe. 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. From this research work we learnt that although the synthetic food colors maybe useful for decorating food items, beverages, pharmaceuticals and other purposes, they do cause some problems in the human body. According to it is better to use the products which are naturally obtained than using the products filled with synthetic food colors even if it is a little authorized amount. Therefore, I conclude that synthetic food colors are harmful for human health (22,23,24,25,26,27 and 28). Allergies, in multiple studies, Yellow also known as tartrazine it causes hives and asthma symptoms. Interestingly, people who have an allergy to aspirin seem to be more likely to also be allergic to Yellow. In a study conducted in people with chronic hives or swelling, 2% had an allergic reaction to artificial food dyes. 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 and Yellow are among the most commonly consumed dyes, and are the three most likely to cause an allergic response. Some artificial food dyes, particularly Blue 1, Red 40, Yellow and Yellow, may cause allergic reactions in sensitive individuals (168,169,170,171,172,173,174).

Various factors effect on the human health

The most concerning claim about artificial food dyes is that they cause cancer. However, the evidence to support this claim is weak. Based on the research currently available, it is unlikely that consuming food dyes will cause cancer. Certain food dyes because allergic reactions in some people, but if you do not have any symptoms of an allergy, there is no reason to eliminate them from your diet. The claim about food dyes that has the strongest science to back it up is the connection between food dyes and hyperactivity in children (57,58,59,60,61,62 and 63). Food dyes increase hyperactivity in children with and without ADHD, although some children seem to be more sensitive than others. If your child has hyperactive or aggressive behavior, it may be beneficial to remove artificial food dyes from their diet. The reason dyes are used in foods is to make food look more attractive. There is absolutely no nutritional benefit of food dyes. The biggest sources of food dyes are unhealthy processed foods that have other negative effects on health. Removing processed foods from your diet and focusing on healthy whole foods will improve your overall health and drastically decrease your intake of artificial food dyes in the process. Food dyes are likely not dangerous for most people, but avoiding processed foods that contain dyes can improve your overall health. Technological requirements of food colorings applied in meat products, must be heat stable, at least to endure pasteurization temperatures around 80oC. Stable during exposure light or oxygen. Stable with pH changes (175,176,177,178,179,180 and 181)

Conclusions:

Synthetic food colours have been increasingly used rather than natural food colours by food manufacturers, as they have several economically relevant traits, such as their low cost; resistance to light, oxygen, and pH changes; and high colour stability. In contrast to natural food colours, which are usually extracted from several natural sources and purified, synthetic food colours are produce by full chemical synthesis or the modification of several precursor compounds. Besides this, they can be used without further transformation, and do not degrade during food processing.

Conflicts of Interest

The author declares no conflicts of interest.

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