

A Review on Food Additives, their Health Effects and Natural Alternatives

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Abstract: *Food additives are substances added to food during processing to enhance flavor, color, texture, and shelf life. While some food additives are considered safe, others have raised concerns about their potential health effects. It's important to read food labels and be aware of the additives in your food. Choosing whole foods and natural alternatives can help reduce your exposure to potentially harmful additives and promote a healthier diet. There are natural alternatives to many food additives.*

Keywords: Food, Food additives, Natural preservative, International Numbering System (INS)

I. INTRODUCTION

Food additives are substances that are added to food products to enhance their appearance, taste, texture, or shelf life. They can be natural or synthetic, and they are used in various quantities depending on the food product and its intended purpose. Some common examples of food additives include preservatives, which are used to prevent spoilage and extend shelf life, colorings, which are added to improve the appearance of food, flavorings, which are added to enhance the taste of food, and emulsifiers, which are used to help mix ingredients that would otherwise separate.

While food additives are generally considered safe for consumption, some individuals may be sensitive or allergic to certain additives, and there have been concerns about the potential health risks associated with some additives. As a result, many countries have established regulatory bodies to oversee the use of food additives and ensure that they are safe for human consumption.

2.1 Classification of Food Additives

There are several different types of food additives, and they can be classified in various ways. One common way to classify food additives is based on their function, which can include,

1. **Preservatives:** Used to prevent or delay spoilage and extend the shelf life of food. Examples include sodium benzoate, potassium sorbate, and nitrates.
2. **Colorants:** Used to enhance the color of food or to replace colors lost during processing. Examples include caramel color, beta-carotene, and annatto.
3. **Flavor enhancers:** Used to enhance the taste or aroma of food. Examples include monosodium glutamate (MSG), aspartame, and vanilla extract.
4. **Emulsifiers:** Used to keep ingredients from separating and to improve the texture of food. Examples include lecithin, mono- and diglycerides, and carrageenan.
5. **Sweeteners:** Used to add sweetness to food without adding calories. Examples include sugar alcohols, such as xylitol and sorbitol, as well as artificial sweeteners, such as aspartame and saccharin.
6. **Stabilizers and thickeners:** Used to give food a consistent texture and to prevent separation. Examples include pectin, agar, and guar gum.
7. **Acidity regulators:** Used to adjust the pH of food, which can affect the taste and stability. Examples include citric acid, tartaric acid, and sodium citrate.

Another way to classify food additives is based on their origin, which can include natural, synthetic, or derived from natural sources. Natural additives are derived from plant, animal, or mineral sources, while synthetic additives are produced chemically. Some additives are derived from natural sources, but are chemically modified, and are therefore they are considered as derived from natural sources.

2.2 Nomenclature of Food Additives

The nomenclature of food additives refers to the system used to name and identify food additives. The most commonly used system for naming food additives is the International Numbering System (INS), which is maintained by the Codex Alimentarius Commission, a joint organization of the United Nations Food and Agriculture Organization (FAO) and World Health Organization (WHO). The INS is used by many countries around the world to identify and regulate food additives. Under the INS system, food additives are assigned a four-digit number, which indicates the functional class and chemical composition of the additive. The first digit of the number indicates the functional class of the additive, as follows:

1. Food colors
2. Preservatives
3. Antioxidants and acidity regulators
4. Stabilizers, thickeners, and gelling agents
5. Sweeteners
6. Emulsifiers, anti-caking agents, and humectants
7. Flavor enhancers
8. Miscellaneous food additives

The second and third digits of the number indicate the specific additive within the functional class, while the fourth digit indicates the specific chemical composition of the additive. For example, the food coloring Tartrazine is assigned the INS number 102, where the "1" indicates the functional class of food colors, the "0" and "2" indicate the specific coloring agent within that class, and the "2" indicates the chemical composition of the coloring agent. It is important to note that not all countries use the INS system, and some countries may have their own systems for naming and identifying food additives. It is important to note that the safety of food additives can depend on several factors, including the amount consumed and the individual's sensitivity or allergy to the additive. As such, regulatory bodies closely monitor the use of food additives to ensure their safety for human consumption.

2.3 Food Additives and Human Safety

The safety of food additives is a topic of ongoing research and discussion, as there are concerns about the potential health effects of consuming these substances. While many food additives are generally recognized as safe (GRAS) by regulatory bodies such as the U.S. Food and Drug Administration (FDA), the European Food Safety Authority (EFSA) and fssai, there are some additives that have been linked to health concerns in certain populations.

Some potential health effects of consuming food additives include:

1. **Allergic reactions:** Some individuals may be sensitive or allergic to certain food additives, such as sulfites, which are commonly used as preservatives.
2. **Hyperactivity:** Some studies have suggested that certain food additives, such as artificial colors and flavors, may contribute to hyperactivity in children.
3. **Cancer:** Some food additives, such as nitrites and nitrates, which are used as preservatives in processed meats, have been linked to an increased risk of cancer.
4. **Hormonal disruption:** Some food additives, such as bisphenol A (BPA), which is used in the lining of food cans, may have hormonal effects that could contribute to health problems.
5. **Developmental and reproductive effects:** Some food additives, such as phthalates, which are used in food packaging and processing, may have developmental and reproductive effects.

2.4 Regulatory Bodies/ Enforcement Authority to Minimize a Risk of Hazardous Additives

To mitigate potential health risks associated with food additives, regulatory bodies such as the FDA and EFSA establish safety limits for the use of these substances, and manufacturers are required to label the use of certain additives on food packaging. Consumers can also take steps to minimize their exposure to food additives by choosing fresh, whole foods and avoiding highly processed and packaged foods. It is important to note that the safety of food additives is an ongoing area of research and regulatory oversight, and new information may emerge as studies are conducted and evaluated.

In India the Food Safety and Standards Authority of India (FSSAI) is the regulatory body responsible for ensuring the safety and quality of food in India. The FSSAI has established guidelines and regulations for the use of food additives in India, which are based on international standards and best practices. Under the FSSAI regulations, food additives must be approved for use and listed on the FSSAI's Food Additives List. The FSSAI evaluates food additives for safety and efficacy, and sets limits on the amount of each additive that can be used in food products. Manufacturers must also comply with labeling requirements, which include declaring the name and functional class of any food additives used in a product. The FSSAI's Food Safety and Standards (Food Products Standards and Food Additives) Regulations, 2011 provides a comprehensive list of approved food additives, including their functional classes and maximum permissible levels[2]. The regulations also outline the procedures for applying for approval of new food additives and the criteria for evaluating their safety and efficacy.

2.5 Natural Alternative of Food Additives

There are many natural alternatives to food additives that can be used to enhance the flavor, texture, and appearance of foods. Some examples of natural alternatives to common food additives include:

1. **Vinegar and citrus juices:** These can be used as natural preservatives to help extend the shelf life of foods.
2. **Spices and herbs:** These can be used as natural flavor enhancers and can provide a wide range of flavor profiles to foods. For example
 - **Turmeric:** Turmeric is a spice that is commonly used in Indian cuisine for its vibrant color and flavor. It is also known for its antioxidant and anti-inflammatory properties.
 - **Cumin:** Cumin is a spice that is commonly used in Indian cooking for its distinctive flavor and aroma. It is also believed to aid digestion and improve immunity.
 - **Tamarind:** Tamarind is a sour fruit that is commonly used in Indian cuisine as a natural souring agent. It is also known for its antioxidant properties and ability to aid digestion.
 - **Curry leaves:** Curry leaves are a common herb used in Indian cooking for their distinctive aroma and flavor. They are also believed to have antimicrobial and anti-inflammatory properties.
 - **Asafoetida:** Asafoetida is a resinous gum that is used as a natural flavor enhancer and digestive aid in Indian cuisine.
3. **Natural sweeteners:** Natural sweeteners such as honey, maple syrup, and stevia can be used instead of artificial sweeteners to provide sweetness to foods.
4. **Fruit and vegetable purees:** These can be used as natural thickeners and can provide natural color and flavor to foods. For example, coconut milk: Coconut milk is a natural ingredient that is commonly used in Indian cooking to provide a creamy texture and enhance the flavor of dishes
5. **Natural emulsifiers:** Egg yolks, soy lecithin, and mustard can be used as natural emulsifiers to help combine oil and water-based ingredients.
6. **Plant-based gums:** Plant-based gums such as xanthan gum and guar gum can be used as natural thickeners and stabilizers in foods.

Using natural alternatives to food additives can not only enhance the taste and nutritional value of foods but also reduce the consumption of potentially harmful additives. It is important to note that natural alternatives may also have their own potential risks and limitations, and should be used in moderation and with proper food safety practices.

III. CONCLUSION

Food additives have both positive and negative effects on human health. While they are commonly used to enhance the flavor, texture, and safety of food products, some synthetic additives have been linked to health risks such as allergies,

hyperactivity, and cancer. Therefore, it is important to use food additives in moderation and with proper food safety practices. Natural alternatives to synthetic food additives are available and can provide similar functions without the potential health risks associated with synthetic additives. Natural food additives are derived from natural sources and do not contain synthetic chemicals or additives. They are commonly used in Indian cuisine and include spices such as turmeric, cumin, and ginger, as well as fruits and vegetables like tamarind and coconut milk. Consumers should consider choosing whole foods that are minimally processed and do not contain synthetic additives. Alternatively, they can look for products that use natural food additives as a safer and healthier alternative to synthetic additives. Ultimately, it is important to make informed choices about the foods we consume and to prioritize our health and well-being.

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