Food Additives and Processing Aids

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Food additives are substances added to foods for many purposes including preserving flavor or improving taste, texture, and appearance. The term food additive applies broadly to chemicals, both natural and synthetic, that are added to food, either intentionally or indirectly, to facilitate processing, extend shelf life, improve or maintain nutritional value, or enhance the food’s organoleptic qualities. Some products would not be possible to produce without additives. However, some of the food additives also have serious problems with respect to their halal status. For the food industry to serve the halal market properly, it is very important that they determine the halal status (suitability) of these additives. Unfortunately, some of the common additives are derived from sources that are not halal, for example, pigs and other haram animals and animals that were not slaughtered as halal. Even if the food additive is listed in the ingredients statement, the source of the additive is usually not mentioned. Furthermore, food additives do not need to appear on the ingredients label statement when used as carriers, processing aids, and anticaking agents. Because of how they are processed, some foods may become contaminated with unintentional food additives that are not halal such as non-halal food grade equipment lubricants. To make sure all aspects of the food’s production is halal, food companies need to be able to assure halal consumers that all food additives they use are halal. This requires that a food company work closely with their halal certifier and that the halal certifier is knowledgeable about and checks the halal status of all materials that are used in or come in contact with a food product (Zweig, 2013).

Food additives have been around for centuries to make foods more desirable, appear more attractive to eat, stay fresh longer, healthier, and even prevent disease. There are many types of food additives available with different uses. Food additives must be tested both for efficacy and safety. There are approximately 3000 food additives that have been formally studied and classified into different groups under the category of food additives that are being used by the food industry and are maintained in the U.S. by the Food and Drug Administration (FDA) in its food additive database (Kansas State Research and Extension, 2010). The main groupings of food additives include acids, acidity regulators, anticaking agents, antifoaming agents,
antioxidants, bulking agents, food colorings, color retention agents, emulsifiers, flavors, flavor enhancers, flour treatment agents, glazing agents, humectants, tracer gases, preservatives, sequestrants, stabilizers, sweeteners, surface active agents, and thickeners. There are some other categories, but the above groupings include the majority of the food additives that are commonly used.

The food additives that affect nutritional quality are primarily vitamins and minerals. In some foods, these may be added to enrich the food or replace nutrients that may have been lost during processing. In other foods, vitamins and minerals may be added for fortification to supplement nutrients that may often be lacking in human diets (Branen and Haggerty, 2002; Zweig, 2013). For example, vitamins and minerals are added to many foods including flour, cereal, margarine, and milk. This helps to make up for vitamins or minerals that may be low or lacking in an individual’s diet. However, the fortification of foods in the U.S. is regulated and not all foods can be fortified.

Preservatives or antimicrobial substances are used to prevent bacterial and fungal growth in foods. These additives can delay spoilage or extend the shelf life of the finished product (Branen and Haggerty, 2002). Antioxidants are additives that can also extend the shelf life of foods by delaying rancidity or lipid oxidation. For example, antioxidants help baked goods preserve their flavor by preventing the fats and oils from becoming rancid. They also keep fresh fruits from turning brown when exposed to the air.

Additives that maintain product quality may also ensure food product safety for the consumer. For example, acids may be added to prevent the growth of microorganisms that cause spoilage and may also prevent the growth of microorganisms that can cause foodborne illness. Food additives may be used as a processing or preparation aid, that is, to help during processing while not changing the character of the finished product. Thus, in the U.S. and other countries, they may not require identification within the ingredient statement.

Leavening agents that release acids when they are heated react with baking soda to help biscuits, cakes, and other baked goods rise. Some food additives are used to enhance the flavor or color of foods to make them more appealing to the consumer. Flavoring chemicals may be used to magnify the original taste or aroma of food ingredients or to restore flavors lost during processing. Natural and artificial coloring substances are added to increase the visual appeal of foods, to distinguish flavors of foods, to increase the intensity of naturally occurring color or to restore color lost during processing (Branen and Haggerty, 2002).

However, most food flavorings are classified in a category called generally recognized as safe (GRAS) in the U.S. The standard for such a classification is that there is sufficient data in the public domain to establish the safety and efficacy by a panel of experts. Thus, over 4000 flavor compounds are recognized as GRAS through the GRAS panels of the Flavor and Extract Manufacturers Association and the list of accepted compounds is published regularly in Food Technology magazine rather than in the Code of Federal Regulations. The process of getting materials classified as GRAS has been changing, and the FDA website (www.cfsan.fda.gov) will have the latest information on the GRAS process in the U.S.

Food additives may be natural, nature identical, or synthetic. Natural additives are substances found naturally in a foodstuff and are extracted from that food so that it
can be used in another food. For example, beet root juice with its bright purple color can be used to color other foods such as sweets. However, if the beet root juice is further processed to isolate the color compounds, then this material becomes an artificial color when used with any product other than beets. Nature identical additives are man-made copies of substances that occur naturally. For example, benzoic acid is a substance that is found in nature, for example, cranberries, but is made synthetically at a much lower cost. It is widely used as a preservative. Artificial additives are substances made synthetically that are not found in nature. An example is azodicarbonamide, a flour improver, which is used to help bread dough hold together.

THE FOOD ADDITIVE MARKET

According to new market data from Leatherhead Food Research (2014), there is a growing demand for functional foods and beverages that help consumers improve their diet, health, and well-being. This is driving the growth in the USD 24.5 billion global food additives market in 2010 (Leatherhead Food Research, 2014). According to the Institute of Food Technologist (IFT), the global food additives market exceeded USD 33 billion in 2015 (www.IFT.org).

Consumers’ demand for healthy and natural ingredients are key factors driving food additive companies to develop a host of new additives including emulsifiers, hydrocolloids, sweeteners, vitamins and minerals, soya ingredients, probiotics, prebiotics, and plant stanol esters. The consumer’s attitude toward natural (and clean label) food and beverages is also forcing additive suppliers to develop ingredients from natural sources for the flavor and color categories as well. Because of increased material and energy cost, enzymes, acidulants, and hydrocolloids are having the highest growth rates in the food additives sector because of their ability to reduce costs, while preservatives and sweeteners are seeing the lowest growth rates as many manufacturers are moving away from using these generally artificial additives and ingredients, although the demand for natural preservatives and sweeteners is increasing. The demand for food additives also continues to increase in the emerging economies such as China and India. This has led many ingredient suppliers to establish distribution and/or production bases in these parts of the world. Chinese producers have assumed an increasingly significant presence in such key sectors of the ingredients market as acidulants and vitamins. These new sources of ingredients from the emerging economics require more effort to assure the halal integrity of these materials.

CONTROL POINTS FOR HALAL FOOD ADDITIVES AND PROCESSING AIDS

The source material from which an ingredient is obtained and the details of the processing methods will determine the acceptability of these compounds for use. Among the undeclared processing aids used in the food industry are antifoaming and release agents, extraction aids, bleaching compounds, and anti-clumping, filtering, and clarifying agents.

Processing aids may help reduce the potential contamination of foods during production as well as aid in the removal of impurities. Thus, they may play an important
role in food safety. Regulatory agencies such as the FDA and USDA have approved a number of processing aids for use during food processing. De-coloring agents, fruit and vegetable washes, and dough conditioners are approved by the FDA, while pH control compounds, chemical agents to control bacteria in chill water, and antimicrobial agents to reduce pathogens in meat and poultry are approved by the FSIS of the USDA (Chaudry et al., 2000).

Enzymes may also be considered processing aids in some food products, such as during cheese production. The source or origin of the enzyme(s) and the media used for the growth of microorganisms from which many of the enzymes are derived will determine the acceptability of these enzymes for use in the production of halal food products (Ermis, 2017; Riaz, 2000). To determine that the enzyme, even as a processing aid, meets the needs of the halal consumer requires that the halal certifying agency carefully and thoroughly investigate the detailed process of the enzyme’s production.

Even if the processing aid is no longer found in the finished product, the product may still be haram. The presence of a non-halal processing aid should result in the rejection of the finished product by the halal certification agency. In fact, contact with any non-halal additive or processing aid with halal ingredients will result in a product that should not be acceptable for use in the halal market (Anir et al., 2008).

The raw materials used for manufacturing packaging materials, their processing, and any coatings used with the packaging materials are of importance with foods for the halal market. It is important to note that the packaging used for halal foods is as important as the other ingredients that are used for halal foods. There are additives in packaging materials for improvement of its functionality and some of those are not acceptable for halal products, such as compounds from materials of animal origin. Even something as innocuous as the steel used to make the typical “tin” can or 55-gallon drums, which are widely used in the food industry, may have been coated with a protective coating that had in the past been made containing a pork ingredient. In the U.S., the American steel industry understands this concern and has eliminated these materials. But again, as the food industry globalizes, the issue needs to be addressed in other countries. Plastics may contain chemicals that are meant to or may accidentally migrate to the food contact surfaces, that is, where the packaging touches the food product, making packaging material unacceptable for halal products. Glycerol mono-stearate and glycerol mono-oleate are used as releasing agents or lubricants for metal and plastic containers and for some films to keep the food product from “sticking” to the packaging. These may be of animal origin, so the use of these compounds must be checked to be sure they are acceptable, that is, from plant sources or from halal-slaughtered animals.

For the halal market, it is necessary to have a paper trail of the auditing of ingredient production by a recognized and acceptable halal certifying agency for every ingredient. If this is not possible, then the certifying agency may consider a notarized affidavit for the ingredient from the ingredient supplier stating that the additive, processing aid, or packaging materials do not contain any component of animal origin (Hashim, 2011; Riaz, 2004) or only animal products obtained from halal animals without slaughter, for example, milk, eggs, fish, and honey. However, the
halal certifying agency should be using its global contacts to independently verify such information. Information about the packaging and transport of each ingredient starting on the farm should also be ideally obtained to assure that a product that is initially halal remains so (Noordin et al., 2014).

Going back to the steel plate discussion. The U.S. Steel Corporation asked and obtained affidavits from the suppliers of the grease coating material that the product was free from animal-derived materials. However, it turned out that on further investigation, the suppliers of the grease had a subcomponent supplier that was using the porcine (pig)-derived ingredient much to the surprise of both the grease manufacturer and U.S. Steel. So again vigilance and thorough investigation at many levels is needed (Riaz and Chaudry, 2004).

In general, food production facilities have their own computer programs to keep track of the inventory that will be used for halal certified products. This list and the actual inventory need to be spot checked by the halal supervision agency for accuracy. Assignment of a unique letter code, number code, alphanumeric code, or color code for halal ingredients, especially those found on the premises that may also be non-halal, including additives and processing aids as well as packaging materials for halal production will assist in monitoring and tracing of ingredients during production, shipping, and distribution. Ideally, a company would not be allowed to have the identical ingredient in both a halal and non-halal form within a factory. Despite all coding systems, human nature is such that if a person needs an ingredient, they may at that time not pay attention to the coding system.

A flow diagram showing the point of addition of any processing aid that is not declared on the food label or a halal-sensitive ingredient is suggested to remind the halal supervisors to check that the right material is used.

At a minimum, segregation of halal and non-halal additives, processing aids, and packaging materials in receiving, storage, preparation, and scaling areas is recommended. It is important for a food company to work closely with its halal certifying agency to be sure that all ingredients and packaging are suitable for halal products (Chaudry et al., 2000).

REFERENCES


