Food Additives and its application

Introduction:

Food additives have been used for thousands of years, salt was probably used to preserve meat and fish. The role of food additives has become more prominent in recent years, due in part to the increased production of prepared, processed, and convenience foods. Food additives are chemicals that keep food fresh or enhance its colour, flavour or texture.

This episode deals with

1. Types of additives and Antioxidants
2. Colouring Foodstuffs ,Flavour enhancers and Types of flavouring substances
3. Sweeteners and Preservatives
4. Anti-caking agents, Anti – foaming agents and Glazing agents:
5. Emulsifiers ,Stabilisers and Thickeners

Food Additive: any substance a food producer intentionally adds to a food for a specific purpose. Producers use around 3,000 additives to preserve and improve foods

1. Food additives are substances added to products to perform specific technological functions. These functions include preserving, i.e. increasing shelf-life or inhibiting the growth of pathogens, or adding colouring and flavouring to food for interest and variety. Added to food to preserve flavor or enhance its taste and appearance. Some additives have been used for centuries; for example, preserving food by pickling (with vinegar), salting, as with bacon, preserving sweets or using sulfur dioxide as with wines.

2. There are over 300 permitted additives that can be used in the UK. Flavourings are not included in this figure, as there are over 3,000 flavouring components in UK use, in many different combinations. International organisations provide advice on the safety of flavourings.

Types of additives

Additives may be:

• **Natural** – found naturally, such as extracts from beetroot juice (E 162), used as a colouring agent;

• **Manmade versions** – synthetic identical copies of substances found naturally, such as benzoic acid (E210), used as a preservative;

• **Artificial** – produced synthetically and not found naturally, such as nisin (E234), used as a preservative in some dairy products and in semolina and tapioca

Some artificial colours have almost disappeared from foods as companies realised that many consumers prefer food products to contain natural colours. At present there is not the variety of natural additives required to perform all the functions of additives necessary. Manmade additives may prove more efficient at preserving, and some natural colours fade in some products.

Preservatives

Prevent the growth of micro-organisms which could cause food spoilage and lead to food poisoning; extend the shelf-life of products, so that they can be distributed and sold to the consumer with a longer shelf-life.

For example, bacon, ham, corned beef and other 'cured' meats are often treated with nitrite and nitrate (E249 to E252) during the curing process.

Antioxidants: Antioxidants reduce the oxidative deterioration that leads to rancidity, loss of flavour, colour and nutritive value of foodstuffs. Fats, oils, flavouring substances, vitamins and colours can all oxidise spontaneously with oxygen when exposed to air.

1. Prevent food containing fat or oil from going rancid due to oxidation, i.e. developing an unpleasant odour or flavour;

2. Prevent the browning of cut fruit, vegetables and fruit juices (and so increase shelf life and appearance).

For example, vitamin C, also known as ascorbic acid, or E 300, is one of the most widely used antioxidants.

Colours:

Colours are used to enhance the appearance and visual properties of foods. The use of colours controversial, because some of the most brightly coloured products are those aimed at children.

Colouring Foodstuffs:

The term 'colouring foodstuffs' has been adopted for colourings that are derived from recognised foods and processed in such a way that the essential characteristics of the food from which they have been derived are maintained.

1. Restore colour lost during processing or storage, e.g. marrowfat peas;

2. Ensure that each batch produced is identical in appearance or does not appear 'off';

3. Reinforces colour already in foods, e.g. enhance the yellowness of a custard;

4. Give colour to foods which otherwise would be colourless (e.g. soft drinks) and so make them more attractive.

Certain combinations of the following artificial food colours:

sunset yellow (E110),

quinoline yellow (E104),

carmoisine (E122),

tartrazine (E102), have been linked to a negative effect on children's behaviour. These colours are used in soft drinks, sweets and ice cream. The Food Standards Agency suggests if signs of hyperactivity or Attention Hyperactivity Disorder are seen in a child, these additives should be avoided.

1. Flavour enhancers: Flavour enhancers bring out the flavour in foods without imparting a flavour of their own, e.g. monosodium glutamate (E 612) is added to processed foods. For example some soups, sauces and sausages. Flavourings, on the other hand, are added to a wide range of foods, usually in small amounts to give a particular taste. These do not have E numbers because they are controlled by different food laws. Ingredients lists will say if flavourings have been used, but individual flavourings might not be named. This is a group of additives that has attracted adverse attention, in particular monosodium glutamate (MSG:E621), which is widely blamed for an intolerance reaction known as "Chinese Restaurant Syndrome".

3:Sweeteners and Preservatives:

Sweeteners=Sweeteners perform an obvious function. They come in two basic types – "bulk" and "intense", and are permitted in foods that are either energy-reduced or have no added sugar. They are also sold direct to consumers as "table-top" sweeteners – well-known to dieters and diabetics. Sweeteners include:

•**Intense sweeteners,** e.g. saccharin, have a sweetness many times that of sugar and therefore are used in small amounts, e.g. in diet foods, soft drinks, sweetening tablets.

• **Bulk sweeteners**, e.g. sorbitol, have a similar sweetness to sugar and are used at similar levels.

TYPES OF FLAVOURING SUBSTANCES

- Natural flavoring substances- Vanilla extract is obtained from vanilla pods
- Nature-identical flavoring substances
- Artificial flavoring substances

Preservatives:

Preservatives are probably the single most important class of additives, as they play an important role in the safety of the food supply. Preservatives are used in processed meats for food safety, shelf life and food technology reasons.

Sodium nitrite or potassium nitrite in meat:=Sodium nitrite or potassium nitrite play a key role in the safety of processed meats.

Nitrites, or in cured meats sodium or potassium nitrates which are gradually converted to nitrites. They provide excellent protection against botulism in processed meats. At the same time their use results in the characteristic colour and flavour of cured meats.

Other preservatives inhibit the growth of microorganisms. The sulphites, sources of sulphur dioxide, also inhibit the growth of microorganisms while retaining the bloom (fresh colour and appearance) of red meat. Some preservatives can have adverse affects on health. The levels of nitrates and nitrites in meat are restricted because they can be converted in the stomach or during high temperature frying to chemicals understood to cause cancer. Sulphur dioxide causes breathing difficulties in some people. Other preservatives can have adverse affects if consumption limits are exceeded. Preservatives can also be regulated to prevent use which is incompatible with other manufacturing processes.

The Value of Food Additives

1. Preservatives extend the shelf life of many foods

Ex. mold inhibitor calcium propionate and BHT are used in bread to prevent mold (keeping the fat fresh)

2. Supporters of food additives say additives prevent disease caused by malnutrition

Goiter = an enlargement of the thyroid gland caused by a lack of iodine

This was then added to table salt in 1924.

Anti-caking agents: Anti-caking agents ensure free movement or flow of particles, e.g. in dried milk or table salt.

Anti – foaming agents: Anti-foaming agents prevent or disperse frothing, e.g. in the production of fruit juices.

Glazing agents: Glazing agents provide a protective coating or sheen on the surface of foods, e.g. confectionary (for appearance and shelf-life).

Emulsifiers, stabilisers, gelling agents and thickeners

The purpose of emulsifiers and stabilisers is to facilitate the mixing together of ingredients that normally would not mix, namely fat and water. This mixing of the aqueous and lipid phases is then maintained by stabilisers

Emulsifiers help mix ingredients together that would normally separate, e.g. Lecithins (E322). Stabilisers prevent ingredients from separating again, e.g. locust bean gum (E410).

Emulsifers and stabilisers give food a consistent texture, e.g. they can be found in low-fat spreads. Gelling agents are used to change the consistency of a food, e.g. pectin (E440), which is used to make jam.

Uses:

1. They make food appealing

2. help maintain quality and freshness.

3. Extended shelf life

4. improved dough handling.

5. used for gluten reduction in bakery products.

6. stabilize the emulsion in low-fat spreads providing the right stability and mouth feel and reduce spattering in frying margarine give baked and snack products the necessary functionality without the trans fats

• Color is the first notable characteristic of a food.

• Food coloring, or color additive, is any dye, pigment or substance that imparts color when it is added to food or drink, in the form of liquids, powders, gels and pastes

• Color is a way to identify a food and a way to judge the quality of a food. Color predetermines our expectations of flavor and taste.

• offset color loss due to exposure to light, air, temperature extremes, and moisture and storage conditions

• in order to correct natural variations in color;

• to improve colors that occur naturally and to provide color to colorless foods

• Direct food additives

They are the food additives added to a food for a specific purpose in that food, such as:

1. To provide nutrition

2. To maintain product quality and freshness

3. To aid in the processing and preparation of foods

4. To make foods appealing

• Indirect food additives

They are the food additives that become part of the food in traces due to its packaging, storage or other handling. They are not used or placed in the food on purpose

1. Government guidelines mostly necessitate that all food ingredients, including direct additives should be listed on the package label by their common names in order of weight.

2. Each food additive used is assigned a unique number, called the "E numbers", which are basically used in Europe for all approved additives.

ARTIFICIAL SWEETENERS

1. Add sweet taste

2. Add bulk and give texture

3. Act as preservatives

HEALTH CONCERNS

4. Saccharin can cause bladder cancer

5. Aspartame is associated with brain tumors and people with phenylketonuria can not tolerate it

6. Because of presence of chlorine, sucralose is thought to be carcinogenic.

Thickeners

Thickening agents are substances which, when added to the mixture, increase its Viscosity without substantially modifying its other properties.

Disadvantages

A number of additives can cause allergic reactions. The two most widely artificial colorings -- Red 40 and Yellow 5 -- are also the most likely additives to cause allergy-like reactions and hypersensitivity. They can also cause hyperactivity in some children. Red 40 and Yellow 5 are widely used in everything from pet food and sausages to soda, candy and pastries. Other food additives that are known to cause allergic reactions in some people include the artificial coloring carmine, tragacanth gum and sodium benzoate.

Disadvantages to having additives in our food:

Food additives sometimes destroy vitamins in food *

Food additives may be used to make bad quality food look good *

Many people are allergic to particular food additives

Overview of the relevant standards

Table 1 also lists other applicable standards

• Nutritional supplements include

• vitamins

• minerals

• herbs

• meal supplements

• sports nutrition products

• natural food supplements other related products used to boost the nutritional content of the diet

Leavening Agents

Sodium bicarbonate , Ammonium bicarbonate , Yeast , eggs , Gyceroyl monostrate

Preservatives :

Anti-oxidants

Tocopherols (Vitamin E) ,Ascorbic acid and sodium ascorbate (Vitamin C) ,Erythorbic acid (like vitamin C, but not a vitamin) ,BHA (Butylated Hydroxyanisole) ,BHT (Butylated ydroxytoluene) Sodium citrate ,Lecithin ,Propyl gallate

Anti-microbials

Sodium benzoate ,Benzoic acid ,Potassium sorbate ,Sorbic acid ,Natamycin ,Triclosan ,Triclocarban ,Hexachlorophene ,Acetic acid (vinegar) ,Salt ,Sugar ,Calcium propionate ,Sodium propionate ,Lactic acid ,Sodium nitrite ,Sodium nitrate ,Propylene glycol ,Butylene glycol ,Honey

Sweeteners

Colors :Annatto ,Beta carotene ,Carmine ,Saffron ,Turmeric ,,llura Red ,Tartrazine ,Indigo ,Sodium caseinate ,Calcium caseinate ,Ferrous Gluconate

Flavours

Acids

Acetic acid (vinegar) ,Citric acid ,Lactic acid ,Stearic acid ,Phosphoric acid ,Fumaric acid

Tartaric acid

Esters

Methyl Vanillin ,Ethyl Vanillin ,Denatonium benzoate

Chocolate

Vanilla ,Monosodium glutamate (MSG) ,Hydrolyzed vegetable protein

Ethanol ,SD alcohol ,Stearyl alcohol ,Cetyl alcohol ,Glycerine (glycerol) ,Menthol

Fruits

Figs, Dates,Prunes , Cherries , Nuts , Coconuts , PeaNuts

Moisture Controller

Glycerine (glycerol) ,Sorbitol ,Sodium PCA ,Propylene glycol ,Butylene glycol ,Panthenol

STABILIZER

Corn syrup (mostly glucose) ,Sodium caseinate ,Calcium caseinate ,Polyethylene glycol (PEG)

Polypropylene glycol (PPG) ,Lecithin ,Hydroxymethylcellulose ,Sodium Carboxymethylcellulose

Xylenesulfonates ,Agar ,Gelatin ,Pectin ,Alginate & proplylene glycol alginate,

Starch ,Modified Starch ,Carrageenan ,uar bean gum ,locust bean gum ,Gum Acacia ,Gum Arabic ,Brominated vegetable oil ,Xanthan Gum ,Gum Tragacanth ,Ghatti ,Karaya ,Furcelleran

COLOURS

Colours make foods look more attractive,they are added to help identify flavours, to make food look brighter and to regain colour that may have been lost during processing.

CODE NUMBER ADDITIVE NAME DETAILS FOOD

100 Curcumin Orange-yellow colour that is extracted from

the roots of the turmeric plant.

Curry, fats and oils, processed cheese.

101 Riboflavin Riboflavin (vitamin B2) can be obtained by

fermenting yeast or synthesised artificially. In foods, it is used as an orange-yellow colour.Sauces, processed cheese and foods with

added vitamins such as bread.

160a Beta-carotene Orange-yellow colour found in plants such as

carrots, tomatoes and oranges.

Soft drinks, margarine, butter, yoghurt.

150a Plain Caramel Dark brown to black colour. About 90% of all

colouring used is caramel. Obtained by the

heating of sugars.

Confectionery, baked foods, chocolate, vinegar.

123 Amaranth Dark purple synthetic colour. Similar in colour

to blackcurrants.

Powdered soup, jam, ice cream, instant gravy. BIRT ADDITIVES INFORMATION SHEET | V1.0 2010 2

PRESERVATIVES

Preservatives are used to improve the safety of food by controlling the growth of mould, bacteria and yeast that cause food to deteriorate.

CODE NUmBER ADDITIVE NAmE DETAILS

200 Sorbic acid:

Sorbic acid and its salts are naturally occurring substances and they are among the most important food preservatives for industries. Sorbic acid is effective over a wide range of foods, ie beverages, dairy products and baked goods and it adds no taste or flavour.

201 Sodium sorbate

202 Potassium sorbate

203 Calcium sorbate

280 Propionic acid

The propionates are examples of naturally occurring preservatives. They work best in more alkaline conditions of bakery products and may be used to delay green mould growth on bread.

281 Sodium propionate

282 Calcium propionate

283 Potassium propionate

ACIDITY REGULATIORS

Acidity regulators, are also known as pH control agents , added to maintain pH .They can be neutralizing agents or buffering agents. They are indicated by their E.number, such as E260 (acetic acid), or food acid, commonly used acidity regulators are citric, acetic and lactic acids.

CODE NUMBER ADDITIVE NAME DETAILS

260 Acetic acid, glacial 0.8 (dilute)

0.6–1.5 (vinegar)

262 Sodium acetate or sodium diacetate0.125–0.4

263 Calcium acetate 0.125–0.4

524 Sodium hydroxide Caustic soda – strong alkali used as acidity regulator in bakery products.

ANTIOXIDANTS

An antioxidant inhibits the oxidation of other molecules; it is Oxidation is a chemical reaction involving the loss of electrons or an increase in oxidation state. Oxidation reactions can produce free radicals or antioxidant are compounds in foods that neutralise chemicals called free radicals (unstable molecules), produced by oxidation in the human body.

Antioxidants help to prevent oils and fats from deteriorating and developing rancid flavours.

CODE NUMBER ADDITIVE NAME DETAILS

300* Ascorbic acid Beers, cut fruits, jams, dried potato. Helps to prevent cut and pulped foods from going brown by preventing oxidation reactions that cause the discolouration.

301* Sodium ascorbate

302* Calcium ascorbate

303* Potassium ascorbate

306* Tocopherols

concentrate, mixed

Oils, meat pies. Obtained from soya beans and maize. Reduces oxidation of fatty acids and some vitamins.

330 Citric acid Jam, tinned fruit, biscuits, alcoholic drinks, cheese, dried soup.

331 Sodium citrates

332 Potassium citrates

333* Calcium citrate

5: Emulsifiers ,Stabilisers and Thickeners

EMULSIFIERS

Emulsifiers are used to ensure that mixtures of oil and water (emulsions) stay mixed together. Emulsifiers, stabilizers, and related compounds are also used in the preparation of cosmetics, lotions, and certain pharmaceuticals, in addition to this, emulsifiers can also aerate, increase product softness, reduce staling.

Code number additive name details

322 Lecithin Natural emulsifier found in egg yolk. Used in range of baked goods including doughnuts and cakes to control flow and viscosity.

471 Mono- and di-glycerides of fatty acids.

Used as an emulsifier in fat emulsions; can be added as a dispersion in water. In yeast-raised foods it improves softness and shelf life.

- Acesulfame – K (Artificial sweetener, used in chewing gum)
- Aspartame – Artificial sweetener
- Azodicarbonamide – Bleaching agent in flour
- Guar Gum – Stabilizer for ice cream and soups
- MSG – Flavor enhancer in soups, Chinese foods
- Saccarin – Artificial sweetener
- Sodium citrate – pH controller; meat curer
- Sorbitol – Nutritive sweetener

Tartaric Acid – pH controller used in soft drinks

Conclusion:

Food additives are substances or mixture of substances that become part of a food product when they are added during the processing or making, storage, or packaging.

"Direct" food additives are often added during processing to: Add nutrients. Food additives are chemicals that keep food fresh or enhance its colour, flavour or texture. Salt, baking soda, vanilla, and yeast are all food additives and are commonly used in processed foods today. According to law, the label must identify the food product in a language the consumer can understand. It must indicate the manufacturer, the packer, or distributor, and declare the quantity of contents either in net weight or volume.