

Worst Offender Additives in Food Items and Their Hazards

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Abstract

Every living organism needs food to live. Foods have many nutrients such as carbohydrates, fats, proteins, vitamins, or minerals. These nutrients present in food are ingested and assimilated by an organism to produce energy, stimulate growth and maintain life. These days we don't just want our food to taste good but it also has to look good. As a result, food producers use any of laboratory- made additives to make it appear fresher, more attractive and last longer on the shelf. Processing and packaging also has increased the use of food additives in the food industry. Some of these additives have associated health risks. The Food Safety and Standards Authority of India (FSSAI), Quality Assurance Division, (A Statutory Authority established under the Food Safety and Standard Act, 2006) provides the clear idea about the permissible limit of the additives added in food items. International Numbering System [INS] gives the number to the Food Additives. INS is only for identifying the INS No. of these food additives on their synonyms as per the codex . A surveillance system which documents adverse effects to food additives as well as monitors risk on a regular basis is important for every country to have. Such data would be beneficial to regulatory authorities as well as the industry in fixing usage levels of the additive in an effort to minimize health risk.

Keywords :- Food additives; Dietary exposure; Risk analysis; artificial sweetener; Food colour; Preservative

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Introduction

Additives have become common place in our modern diet but do they really “add” any value to our food? It might be common knowledge to you that most processed foods are not ideal for our health. These foods are often laden with artificial chemicals which can cause all sorts of havoc to our body. Typically these food additives are not easy to identify, as they are hidden under a variety of names and codes and usually in very small font. Even when additives are derived from plant sources they can still be harmful. . Effects of food additives may be immediate or may be harmful in the long run if you have constant exposure. Immediate effects may include headaches, change in energy level, and alterations in mental concentration, behaviour, or immune response. Long-term effects may increase your risk of cancer, in females breast cancer, cardiovascular disease, different types of allergies and other degenerative conditions. Although it may seem difficult to change habits and find substitutes for foods you enjoy, remind yourself that you will be adding to your diet some new wholesome foods that you will come to enjoy even more. Whole foods are foods that are unprocessed and unrefined, or processed and refined as little as possible before being consumed. Examples of whole foods include unpolished grains; fruits and vegetables; unprocessed meat, poultry, and fish; and non-homogenised milk. Enjoy nature’s own bounty of fresh fruits, vegetables, grains, beans, nuts and

seeds. Find foods that resemble what they looked like when they were originally grown..

Food additives may be classified as:

a) Antimicrobial agents; which prevent spoilage of food by mould or micro-organisms. These include not only vinegar and salt, but also compounds such as calcium propionate and sorbic acid, which are used in products such as baked goods, salad dressings, cheeses, margarines, and pickled foods.

b) Antioxidants; which prevent rancidity in foods containing fats and damage to foods caused by oxygen. Examples of antioxidants include vitamin C, vitamin E, BHA (butylated hydroxyl anisole), BHT (butylated hydroxytolene), and propyl gallate.

c) Artificial colours; which are intended to make food more appealing and to provide certain foods with a colour that humans associate with a particular flavour (e.g. red for cherry, green for lime).

d) Artificial flavours and flavour enhancers are the largest class of additives; its function is to make food taste better, or to give them a specific taste. Examples are salt, sugar, and vanilla, which are used to complement the flavour of certain foods. Synthetic flavouring agents, such as benzaldehyde for cherry or almond flavour, may be used to simulate natural flavours. Flavour enhancers, such as monosodium glutamate (MSG) intensifying the flavour of other compounds in a food.

e) Bleaching agents; such as peroxides, are used to whiten, foods such as wheat flour and cheese.

f) Chelating agents; which are used to prevent discoloration, flavour changes, and rancidity that might occur during the processing of foods. Examples are citric acid, malic acid, and tartaric acid.

g) Nutrient additives; including vitamins and minerals are added to foods during enrichment or fortification. For example, milk is fortified with vitamin D, and rice is enriched with, thiamin, riboflavin, and niacin.

h) Thickening and stabilizing agents; which function to alter the texture of a food. Examples include the emulsifier lecithin, which, keeps oil and vinegar blended in salad dressings, and carrageen, which is used as a thickener in ice creams and low-calorie jellies.

Significance of Food Additives

Additives and preservatives are used to maintain product consistency and quality, improve or maintain nutritional value, maintain palatability and wholesomeness, provide leavening, control pH, enhance flavour, or provide colour. Although preservatives are essential to maintain food safety, too much of a good thing is not healthy. Besides allergies, these foods may cause stomach pains, vomiting, breathing problems, hives and skin rashes. Some of the worst additives include benzoates, which can cause skin rashes, asthma and perhaps brain damage. Bromates can cause nausea and diarrhoea. Saccharin may lead to toxic

reactions that impact the gastrointestinal tract and heart, as well as cause tumours and bladder cancer. Red Dye 40 is suspected to cause certain birth defects and possibly cancer. Mono and di-glycerides can cause birth defects, genetic changes and cancer. Caramel is a famous flavouring and colouring agent that can cause vitamin B6 deficiencies. It can cause certain genetic defects and even cancer. Sodium chloride can lead to high blood pressure, kidney failure, stroke and heart attack. Such problems are why some doctors are now saying it is better to have a soda with sugar than a diet soda with additives. Some of the known food additives, preservatives and their hazards are as follows:

1. Butylated Hydroxy Anisole (BHA)

BHA is a mixture of the isomers 3-tert-butyl-4-hydroxyanisole and 2-tert-butyl-4-hydroxyanisole. Also known as BOA, tert-butyl-4-hydroxyanisole, (1,1-dimethylethyl)-4-methoxyphenol, tert-butyl-4-methoxyphenol, antioxyne B, and under various trade names. BHA, an antioxidant, is used to preserve some cereals, chewing gums and potato chips. It is also used in rubber and petroleum products. According to the National Institutes Of Health and the World Health Organisation's International Agency for Research on Cancer considers Butylated hydroxyanisole is "reasonably anticipated to be a human carcinogen, because on animal studies that have shown that their chemical composition can cause tumors in rats and hamsters fore stomachs (

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something which humans don't have) and fish livers.

Molecular Formula $C_{11}H_{15}O_2$
Molecular weight 179.24
FSSAI Permissible Limit 200 p.p.m
INS No. 320

2. Butylated Hydroxy Toluene (BHT)

Also known as 3,5-di-tert-butyl-4-hydroxytoluene; methyl-di-tert-butylphenol; 2,6-di-tert-butyl-para-cresol. BHT the common additive used to prevent oxidation in a wide variety of foods and cosmetics is listed by the National Toxicology Program (NTP) in 2005 as "reasonably anticipated to be a human carcinogen" on the basis of experimental findings in animals. It is also used in jet fuels, rubber, petroleum products, transformer oil and embalming fluid. BHT should not be allowed to enter the environment, can cause liver damage, and is harmful to aquatic organisms.

Molecular Formula $C_{11}H_{15}O$
Molecular weight 163.11
FSSAI Permissible Limit 50 p.p.m
INS No. 321

3. Propyl Gallate

Propyl gallate, or propyl 3, 4, 5-trihydroxybenzoate is an ester formed by the condensation of gallic acid and propanol. Since 1948, this antioxidant has been added to foods containing oils and fats to prevent oxidation. It is used in mayonnaise, vegetable oil, foods, cosmetics, hair products, adhesives, and lubricants, used in conjunction with BHA and BHT. Some scientist believe

that propyl gallate is an "endocrine disrupter". Endocrine disrupter can lead to developmental, reproduction and/or neurological problems, according to the National Institute of Health, including fertility issue.

Molecular Formula $C_{10}H_{12}O_5$
Molecular weight 212.5
FSSAI Permissible Limit 90 mg/kg.
INS No. 310

4. Mono Sodium Glutamate

Monosodium glutamate (MSG, also known as sodium glutamate) is the sodium salt of glutamic acid, one of the most abundant naturally occurring non-essential amino acids. Monosodium glutamate is found naturally in tomatoes, cheese and other foods. MSG enhances the savoury or meaty umami flavour of foods. It is popular in Asian cooking, also known as "Chinese restaurant syndrome". Some reports indicate MSG causes headache, Flushing, Sweating, Facial pressure or tightness, burning in the face, neck and other areas, fluttering heartbeats, Chest pain, Nausea etc.

Molecular Formula $C_5H_8NO_4Na$
Molecular weight 169.04
FSSAI Permissible Limit 5 mg/kg.
INS No. 621

5. High Fructose Corn Syrup (HFCS)

HFCS is made from genetically modified corn and processed with genetically modified enzymes, loaded with "unbound" glucose and fructose molecules. Consumers will find high-fructose corn syrups in

numerous products, including yogurts, baked goods, canned and packaged foods, candies, jams, condiments, many beverages, and other sweetened foods. Studies have shown that the reactive carbonyl molecule can cause tissue damage that leads to obesity, diabetes heart disease. Recent studies revealed that HFCS also contain mercury. High consumption raises blood level of cholesterol and tri glyceride, a causative factor of heart disease.

FSSAI Permissible Limit **450p.p.m.**

6. Aspartame

It is a non-carbohydrate sweetener, aspartyl-phenylalanine-1-methyl ester; i. e., the methyl ester of the dipeptide of the amino acids aspartic acid and phenylalanine. It is marketed under a number of trademark names, such as Equal, NutraSweet and Canderel. Used all over the world as a sugar substitute in thousands of foods and drinks, including cereals, sugar-free chewing gum, low-calorie (diet) soft drinks and table-top sweeteners. Although originally believed to be the perfect artificial sweetener, it was found that even small doses of the sweetener increased the occurrence of lymphoma and leukaemia, and occasionally caused brain tumours in rats. Recent studies reveal that it causes paediatric and adolescent migraines. Upon ingestion, the artificial sweetener, aspartame is metabolized to formaldehyde in the body and has been reportedly associated with systemic contact dermatitis in patients.

Molecular Formula $C_{14}H_{18}N_2O_5$

Molecular weight **294.12**
FSSAI Permissible Limit **2200 mg/kg.**
INS No. **951**

7. Polysorbate 80

Also known as “TWEEN 80”. It is an amber/golden-colour viscous liquid. It is made from polyethoxylated sorbitan (chemical compounds derived from the dehydration of sugar alcohol) and oleic acid, a fatty acid found in animal and vegetable fats. Used as an emulsifier, surfactant or defoamer in foods, ice creams, vitamins, medicines, soaps, detergent and vaccines. Some cosmetic grade, Polysorbate 80 may potentially contain ethylene oxide, 1,4-dioxane and mono- and diethylene glycol as impurities, although worryingly these carcinogenic contaminants have also been picked up in food additives. It was seen to accelerate the maturation of female rats and resulted in deformities of the ovary. Recently, the concern with using Polysorbate 80 in vaccines is that it may permit the entry of other toxic ingredients, such as heavy metals, into the brain, damaging the “Blood- Brain-Barrier” in infants and aged persons.

Molecular Formula $C_{64}H_{124}O_{26}$
Density **1.06 – 1.09 gm/ml**
FSSAI Permissible Limit **3000 mg/kg.**
INS No. **432**

8. Benzoic Acid And Sodium Benzoate

Sodium benzoate and benzoic acid are used as a preservative. As a food additive, It is bacteriostatic and fungi static under acidic conditions. It is most widely used in acidic foods such as salad dressings

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(vinegar), carbonated drinks (carbonic acid), jams and fruit juices (citric acid), pickles (vinegar), and condiments. It is also used as a preservative in medicines and cosmetics. In combination with ascorbic acid (vitamin C, E300), sodium benzoate and potassium benzoate may form benzene, a known carcinogen. Research published in 2007 for the UK's Food Standards Agency (FSA) suggests that certain artificial colours, when paired with sodium benzoate, may be linked to hyperactive behaviour. Sodium benzoate causes eye, skin and respiratory irritation on long time exposure.

Molecular Formula $C_7H_6O_2$
[BENZOIC ACID]

Molecular weight 122.2

FSSAI Permissible Limit 50-1500 mg/kg.

INS No. 210

Molecular Formula $C_7H_5NaO_2$
[SODIUM BENZOATE]

Molecular weight 144.1

FSSAI Permissible Limit 50-1500 mg/kg.

INS No. 211

9. Canthaxanthin

Canthaxanthin is a trans-carotenoid pigment widely distributed in nature. The compound is used as an oral sun tanning agent and as a food and drug colouring agent. The presence of canthaxanthin in feed for poultry and farmed fish can lead to a more intensely-coloured egg yolk and flesh from poultry, salmon and trout. Although the amount used are very small, tests have shown

greater quantity of canthaxanthin can be hazardous in case of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (irritant), of ingestion.

Molecular Formula $C_{40}H_{52}O_2$

Molecular weight 564.854 g/mol

FSSAI Permissible Limit 200 mg/kg.

INS No. 161

10. Tert-Butyl Hydroquinone (TBHQ)

TBHQ - tertiary butyl hydroquinone is an aromatic organic compound which is a type of phenol. TBHQ is used as a preservative for unsaturated vegetable oils and many edible animal fats. It is added to a wide range of foods, with the highest limit (1 gram/kg) permitted for frozen fish and fish products. Its primary advantage is extending storage life. It is also added to varnishes, lacquers, resins, and oil-field additives. It is safe to consume at the concentration allowed in foods. Studies have shown that prolonged exposure to very high doses of TBHQ, can cause nausea, vomiting, ringing in the ears, delirium, a sense of suffocation, and collapse. It may be carcinogenic, especially for stomach tumours.

Molecular Formula $C_{10}H_{12}O_2$

Molecular weight 164.08 g/mol

FSSAI Permissible Limit 200 mg/kg.

INS No. 319

11. Blue ,Yellow And Red Colorants

Colour additive, is any dye, pigment or substance that imparts colour when it is added to food or drink. They come in many forms consisting of liquids, powders, gels, and pastes. Food colouring is used in cosmetics,

pharmaceuticals, home craft projects, baked goods, beverages, candies, cereals, ice creams, processed peas, dry soup packets, food colouring bottles, popsicles, sweets, soaps, shampoos, mouthwash, and medications. Studies result in various symptoms, including gastric upset, diarrhoea, vomiting, nettle rash (urticaria), swelling of the skin (angioedema) and migraines. The colouring has also been linked to hyperactivity in young children, Cause a statistically significant incidence of tumours, and particularly brain gliomas, in male rats. Carcinogenic, cause hypersensitivity reactions and behavioural problems, It is also an irritant to the skin and eyes.

Molecular Formula

$C_{16}H_9N_4Na_3O_9S_2$ (TARTRAZINE)

Molecular weight **534.36 g/mol**

12. Salt And Sugar

Christine Gerbstadt, M.D., M.P.H., R.D., L.D.N., a spokesperson for the American Dietetic Association, Says that sugar and salt though are non-toxic, large amounts are unsafe for our health and promote bad nutrition. "Simple sugars shouldn't take up more than about 10 percent of the total calories you consume daily. Too much sugar not only leads to problems with weight control, tooth decay and blood sugar levels in diabetics; it also replaces good nutrition. "In addition to providing unnecessary calories, body needs nutrients to metabolize sugar, so it robs valuable vitamins and minerals of the body.

A dash of sodium chloride, more

commonly known as salt, can certainly bring flavour to the meal. But salt is another hidden food additive that can lead to health issues. "Small amounts of salt are needed by the body and are beneficial in preserving food," says Gerbstadt. "Excessive amounts of salt can become dangerous for our health, affecting cardiovascular function, leading to high blood pressure, heart attack, stroke, and kidney failure."

Conclusion

Food additives can be derived from plants, animals, or minerals, or they can be synthetic. They are added intentionally to food to perform certain technological purposes which consumers often take for granted. There are several thousand food additives used, all of which are designed to do a specific job in making food safer or more appealing. The use of food additives is only justified when their use has a technological need, does not mislead consumers, and serves a well-defined technological function, such as to preserve the nutritional quality of the food or enhance the stability of the food. Several Indian studies have shown that with lifestyle transition the consumption of packaged and convenience food is increasing especially among children and adolescents. With increase in consumption of packaged foods, the intake of additives has also increased which is a matter of concern especially because of the presence of small scale and unorganized sector of the food industry which does not necessarily follow good manufacturing practices. Under our current system,

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thousands of toxic chemicals have been “grandfathered” in without adequate health and safety testing. Government is handcuffed with undue burden to prove harm before any precautionary action can be taken to prevent chemical exposure. From the help of “FSSAI”, we should identify the permissible limit of the food additives and choose our food products in a pure and natural way neglecting the worst offenders added in food items.

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