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INTRODUCTION TO FOOD FRAUDS AND THEIR IDENTIFICATION

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ABSTRACT

This paper deals with definition, classification, and ways of detection of common food frauds worldwide presenting generally known examples of frauds in order to promote knowledge of people particularly specialists and authorities about detection of fraudulent foodstuffs and prevention of their manufacture. The objective of this article is to identify common frauds in food industry, recognize the importance of package labeling and emphasize on global fight against food adulteration to get healthy foods.

Keywords: Food fraud, Adulterated foods, additives, healthy.

INTRODUCTION

Food fraud goes back Middle Ages however; it has been extended due to urbanization and declined morals [22, 43, 50]. Combating frauds is important because of consumers' health, lower value of purchased product than the paid money as well as distrust of consumers and development of social abnormal behavior [15, 19, 21, 23, 25, 26, 46]. Thus acts including prohibition of fraud act (PFA, 1954, India), Federal food, drug and cosmetics act (1938, 21 U.S.C, 321 et seq), Federal meat inspection act (1906, 21 U.S.C 601 et seq) and Poultry products

inspection act (1957, 21 U.S.C 451 et seq) were enacted which prohibit marketing adulterated foods tuffs for human consumption [12, 49, 52, 53]. International nutrition law commission of United Nations with FAO and WHO as well as FFC codex is the reference for preparation of quality standards of different food classess [34, 39]. Global food safety initiative (GFSI) is a coalition for knowledge sharing and uniform development of food safety management in industry. US pharmacopeia convention

(USPC) presents the strategy for food frauds reduction [34].

2. Definition of adulterated foods

According to FDA, fraud is defined as the act of concealing contamination or product damages, unauthorized fortification for quality enhancement and apparent value of products, dilution and reduced valuable components, substitution with cheaper substances, and mislabeling [28]. Global food and drug organization defines economically motivated adulteration (EMA) as replacement with or intentional addition of a substance in product without awareness on its potential harmful effect in order to enhance apparent value or reduce the cost of manufacture. It also protect foods from intentional frauds with terroristic and savagery intents [8, 25, 34]. It considers that use of any matter in foods is subject to testing and safety especially with regard to its carcinogenesis [52]. According to PFA (1954, India), production sale and distribution of foods cooked in an incorrect way or contaminated with poisonings and harmful microorganism or fraud foods made with unnecessary ingredients or by intentional addition of unpermitted or excessive ingredients is prohibited and standards were determined for nature and quality of foodstuffs, aseptic packaging with non-toxic and safe materials [5, 12, 32, 49],

since plastic bottles bear carcinogenic compounds Bisphenol A and Dioxin causing metabolic diseases [32, 49]. Contamination transfer from contaminated devices or raw foods such as salads to sensitive foods like meat results in cross contamination. WHO announced, in its annual report that about 2.2 percent of 2.2 million children below 2 years old die from diarrhea caused by consuming contaminated water and food [40]. In contrast to 100% frauds such as manufacture of lime juice from straw, sometimes people suffering from food allergies need to be protected through continues control of the formulation of dietary foods [13]. Frauds may be harmless like the addition of thickener starch to yogurt or be pathogenic and fatal such as incorporation of carcinogenic red pigment Sudan [13, 19, 31, 34, 46]. Potentially hazardous foodstuffs require temperature control due to fast growing toxic or infectious microorganisms [10, 40].

3. Nature of frauds

- 3.1. Selling a food instead of another e.g. supplying broad bean and green bean powder instead of pistachio powder [2, 13, 26].
- 3.2. Supplying products of poor quality with well – known trade names and mixing low – quality cheap ingredients with similar components [13, 26].

- 3.3. Non-compliance with the standard or formulation included in the requirements such as lower fat percentage for sterilized and homogenized milk as compared to the stated amount [2, 13, 26].
- 3.4. Selling and supplying spoiled, contaminated and expired – date product in place of perfect one [2, 13, 21, 26].
- 3.5. Using colorings, essences, and other unpermitted additives or excessive use of permitted preservatives [2, 13, 26].
- 3.6. Decreasing or increasing an ingredient such as milk fat reduction or water – added milk [3, 19, 26, 31].

In general, less than 5% of frauds represents the addition of unpermitted additives 95% whole or partly substitution of expensive ingredients with cheaper ones and less than of some valuable components without inclusion in labeling and changing in its price, removing flavor components and fat and selling it as natural paprika [47, 50].

4. Examples of foods frauds

4.1. Drinking water: Drinking water should not be supplied from contaminated sources or even their vicinity.

4.2. Tea: Tea bags made with plastics such as nylon, thermoplastic, PVC or propylene, leach unknown hazardous compounds into tea in boiling water. Paper tea bags contain epichlorohydrin which is hydrolyzed to 3-MCPP being a carcinogenic causing

infertility and suppressing immune system [33]. Unfortunately, in addition to toxic synthetic color copper carbonate added to green tea [1, 52], faked tea bags may contain sand sawdust, starch, china clay, poor – quality tea leaves of other plants even lawn grass and unpermitted colors. Faked tea is best recognized by putting it in cold water as natural high – quality tea does not develop any color and flavor in cold water [13, 19, 22, 26, 31, 33, 34, 49].

4.3. Cocoa: Natural cocoa powder is free from pungent taste, insects, dust, and fungal infection. Faked cocoa powder is adulterated with colorings and grains flour. Other frauds include the addition of other oils and fats mineral oils and additives [49].

4.4. Coffee: Fraudulent coffee is adulterated with malt, chicory, colors, caramel, coffee powder, roasted bran powder, roasted date seeds powder, roasted tamarind powder, pigeon beans and peas, parchment and other roasted cereals powder including barley, corn, etc. [25, 33, 34, 49]. Faked coffee is also made with salt and figs in addition to above – mentioned ingredients [34]. Coffee milk may contain cheaper milk, milk powder, urea, detergent, sodium bicarbonate, sugar, salt and skimmed milk powder. When coffee is gradually added to water, it floats while chicory powder submerges and caramel is detected. Aqueous solution of 1% sodium

carbonate sprinkled on coffee powder made of persimmon and date stone and / or tamarind powder on blotting white paper leaves a red spot [1]. Soil flavor of coffee is caused by mouldy beans hazelnut flavor by unripe beans and sourness by spoiled coffee bean [29].

4.5. Honey: Natural honey is rich in antioxidants where a part of it may be adulterated. 100% faked honey is made with fruits syrup such as date berries or glucose -, starch – contained ingredients which develop aroma and flavor different than of natural honey. Fraudulent honey made of sugar, sugarcane, and sweet fruits such as melon, watermelon, pumpkin, and date rather than from bees contains the same compounds as natural honey [13, 19, 33]. Sometimes disallowed additives and antibiotics, as well as heavy metals are found in honey mislabeled by a country as manufactured by another to avoid paying customs [25, 34]. The fraudulent make honey with sugar syrup, corn syrup fructose, glucose high – fructose corn syrup (HFCS), saccharose syrup, invert sugar, sugar beet, honey – colored syrup and from bees feeding sugar syrup [25, 33, 49]. Feeding bees with sugar syrup, juices and artificial honey is also considered a fraud [13, 19]. Honey made with some plants such as henbane thimble flower, oleander, hemlock and Chama, is toxic for humans

[13]. If honey is dissolved in water, it will show less purity and acceptability and higher moisture content [13]. Darker honey contains more minerals. Granulation or crystallization not only is not an indicator of fraud, but it indicates that honey has been naturally made. The more glucose content is relevant to the faster granulation phenomenon directly [29]. Natural honey is polarized westwards and has a fructose to glucose ratio of more than 90% [41]. All honey has harmless yeasts for human. Honey with >17% moisture and crystallized honey shows increased fermentation percentage. Honey is not fermented below 11C and at 38C however high temperature reduces the honey quality [13]. Cotton impregnated with pure honey inflames while honey made with water, sugar and / or molasses does not inflame, if does it sounds or crackling [1].

4.6. Maple syrup: Maple syrup and other natural sweeteners like honey are adulterated with sugar and other syrups [34].

4.7. Vinegar: Fraudulent make cheap vinegar with commercial acetic acid, unpermitted colors, artificial fragrant, pepper, chamomile root, mustard and water so that its acetic acid content would be equivalent to that of natural vinegar, i.e. 5%. Sometimes natural vinegar is mixed with water and some vitriol bicarbonate

acetate is used to balance the specific weight [13, 19].

4.8. Lime juice: Faked lime juice is made of acetic acid or citric acid mixed with an extract of lukewarm and rough straw or by addition of water and citric acid to lime juice [13, 19].

4.9. Sour grapes juice: Sour grapes juice is adulterated with citric acid and water [13, 19].

4.10. Juices: Natural juices exert antimicrobial property due to contained essential oils as well as terpenes, alcohols esters, ketons, phenols and aldehydes while they would be pathogenic in the case of insufficient pasteurization or lack of correct sealing or presence of pores or cracks [17]. Natural orange juice has a shelf-life of only two days (Sampson, 2009) [32]. Since fraudulent juice can be only made with water, sugar, essences, and colors labeled containing fruit content, or with diluted juice [4, 25, 45], use of edible acids to modify pH changes caused by sugar addition as a thickener sweetener is unavoidable however their co-application is banned in some countries. Also min solids content with min. Brix value must comply with the standards and soluble solids should not be modified by similar other fruits [6, 17]. Some costly juices are diluted with water or cheaper juices such as apple and grapes juice thus, colors, essences and

thickeners especially sugar are used to conceal poor quality of faked pomegranate juice [4, 34, 46]. Pectin as a thickener in a certain method for rising Brix in fruit juices is seen Instead of expensive fruits concentrates commonly experimentally. Apple juice labeled as pure juice but containing water, HFCS, fructose, sweetener raisin, malic acid, sugar beet and grapes pineapple, pear and figs juices, as well as flavorings and artificial colors is considered fraudulent [4, 33, 34]. Adulterated orange juice is made by mixing lime juice sugar juice paprika and marigold extracts, edible acids, sulphur dioxide and / or lemonade, as well as tangerine, grapes, grapefruit, high fructose corn syrup, sugar beet, and artificial flavoring containing ethylbutyrate [4, 11, 25, 32, 33, 35]. Sugar beet is used for adulteration of frozen non – sweet orange juice concentrate [34]. Clouding agent and palm oil is used in juice, jam, etc. [25]. It should be noted that plasticizer Di (2-ethyl hexyls) phthalate (DEHP) is carcinogenic [25].

4.11. Jam: Palm oil, clouding agents and phthalate are used in faked jam and juices [25, 34].

4.12. Milk: Milk is adulterate if it is mixed with different animal's milk, water, thickeners such as starch, milk powder, sweeteners, sodium bicarbonate, chromate and bichromate, vegetable oil, whey, sugar,

detergents, hydrogen peroxide, antibiotics, preservatives, salt, skim milk powder and even if it is contaminated with toxins such as formaldehyde, urea, color, and rennet [1, 13, 19, 22, 25, 33, 34]. Since the specific weight of water is less than milk when water is added to milk it decreases the specific weight of milk thus it would be compensated by removal of fat and increasing the specific weight of milk [1, 41]. Sodium bicarbonate, formal, potassium chromate and bichromat neutralize organic acids generated by spoilage bacteria thereby concealing the milk spoilage by preventing spoiled milk from clogging in the presence of heat, development of blue color in heated milk in the presence of one drop of tincture of iodine indicates that starch or flour has been added to milk [13, 31, 26]. Insufficient heating for sterilization is determined by turbidity test and for pasteurization by phosphates test [49]. Melamine addition to milk for increasing its protein content is evaluated by measuring total nitrogen [34, 45, 46].

4.13. Yogurt: Yogurt is adulterated both through starting material and by addition of thickeners. Starch – containing yogurt goes sour faster thus the fraudulents add some sodium bicarbonate to yogurt in order to retard sourness development [26].

4.14. Dried whey: Consumption of traditional unpasteurized dried whey can

lead to fatal poisoning caused by botulism. Adulterated dried whey may contain flour as well as salt, vegetable oil, white mud [13, 26, 31].

4.15. Milk powder: The fraudulents mix milk powder with dextrin powder or starch solution [49].

4.16. Ice cream: Unpermitted colors, artificial sweets other fats, gelatinous matters and hydrogenated fats are used in faked ice-cream [49].

4.17. Cheese: Other fats applied in fraudulent cheese are detected by use of Riche – Michel, Polensk, and kreshner tests [41]. In some cheeses red lead caused by coloring is detected by annatto [1, 52].

4.18. Butter: Some fraudulents add some water or water, casein and salt to butter to increase its weight and thus reduce the fat content [13, 19, 26, 31]. In order to increase fat content and due to lower cost of oils and fats than that of butter hydrogenated vegetable oils and coconut oil with animal fat are added to milk [49, 41]. This fraud is detected by using Rich–Michel, Polensk and Kreshner tests. Kreshner test determines volatile fatty acids content of butyric acid [41]. Permitted or unpermitted colors are used for desirable yellow color development. Bichromate is used for inhibition of appearing pungent and sour flavor [13, 19]. Application of starch,

melted grease and lard, as well as thickeners is considered other fraud [1, 15].

4.19. Cream: Cream separated from milk to which vanaspati fats are added and homogenized is used in adulterated cream [49]. Other fats added to cream are detected by use of Verner–Stchmid, Riche–Michel, Polensk and kreshner tests, saponified number and iodine value and the presence of thickener starch in cream by iodine test, gums and gelatin thickener by stax test [41]. An unknown fraud in this product is use of Al-mg drug syrup to get white color.

4.20. Salt: Unrefined salt contains soluble and insoluble impurities such as lead, arsenic, mercury, calcium, magnesium and sands resulting in gastrointestinal and hepatic diseases as well as reduced iron absorption. Iodized salt should be stored in closed containers away from light and moisture [14]. Faked salt is made with white powdered stone and / or plaster. It is detected by white color appearance in water and other substances will be water–insoluble [48].

4.21. Saffron: Saffron is an expensive spice adulterated by mixing yellow stamens of safflower and other similar cheaper plants, coloring meat fibers with artificial colors, glycerine, sandalwood dust, tartrazine yellow color, barium sulphate, borax, marigold, and even colored corn silk [13, 19, 25, 26, 33, 34, 41]. Safflower

powder is red thus it is mixed with corn powder. Pure saffron develops purple or orange color on gas stove flame while fraudulent saffron generates yellow color [13, 19, 26, 31, 41]. Saffron is faked if it leaves stain when pressed between two newspapers [13, 19]. Fraudulent saffron tastes bitter. Pure saffron is rapidly dissolved in alcohol while safflower is water – soluble. Corn silk is straight whereas saffron stamen is curved [3, 41, 19]. Saffron should be stored in glass jar away from light and moisture in order to prevent vaporization of fragrant and decrease in its thrapeutical and flavor properties [31].

4.22. Turmeric: Fraudulents adulterate turmeric with flour or dried bread powder, pistachio shell powder maple flower or other grains powder starch, tar color and lead chromate [19, 26, 31, 49]. Metanil yellow used in faked turmeric is stable when exposed to hydrochloric acid while turmeric’s color changes rapidly [1].

4.23. Pepper: Fraudulent black pepper is made with compact sieved granulated mixture of clay and cayenne pepper [1]. Also juniper seeds, berries, papaya seeds, starch, black wheat flour, millet grains as well as fine sawdust, walnut and hazelnut shell powder, olive pulp, vetch mash, sour cherry stone red pepper or black mustard powder [13, 19, 31, 33, 34, 42, 49]. Olive

pulp is precipitated in a mixture of water and glycerin in equivalent ratio, whereas pepper particles float on the water [26, 31, 49]. To detect red pepper powder 5g of suspected pepper powder is mixed with 10 cc 90 alcohol and then it is filtered and evaporated after 30 min. In the case of red color development, the mixture is free from red pepper [26, 49].

4.24. Mixed spices: Chili and mixed spices powder is adulterated with starch colored brown with tar, bran poser and saw dust [2].

4.25. Asafetida: It is adulterated with resins and plant gums [49].

4.26. Coriander seeds: Fraudulent coriander seeds powder is made by coloring other seeds bran powder and sawdust [49].

4.27. Sumac: Faked sumac is made with sour grapes pulp, barberry and blackberry juice [19].

4.28. Cinnamon: Fraudulents use cassia with a thick bark instead of cinnamon with thin bark and also willow tree bark powder sawdust and even soil are used [1, 19].

4.29. Mustard: Adulterated mustard is made with turmeric powder mixed with grains starch to develop yellow color [13]. Also arjemone seeds is used [49]. Mustard seed has a soft surface whereas the surface of arjemone is coarse and darker. Faked mustard powder or paste is made with wheat flour, cayenne pepper and a lot of

bay salt. Some fraudulents also use pea flour and / or radish seeds [1].

4.30. Sauces: Faked sauces are mainly produced with faked starting materials such as fraudulent spices colored with carcinogenic color Sudan [34].

4.31. Pickles: Pickles made by copper green – colored utensils are toxic [1].

4.32. Flour: Flour bleaching materials can be carcinogenic. Oxidation of stale flour during long storage, lack of complete separation of weed seeds from wheat, use of animals and poultry feed concentrate powder, uses of damaged poor – quality, germinated wheat or infected by worms, pests, and field – storage fungi including, *Eurygaster integriceps*, ergot, bunt (smut) and rust reduce the quality of flour and its products [16, 36]. Some weed seeds produce toxin. Black cumin (*Nigella sativa*) seeds produce toxin Agrostemin and thornapple *Stramonium* (*Datura stramonium*) seeds produce toxins Atropine, Scopolamine and Hyocyanine [16]. Tapioca flour is used in adulterated wheat flour and cheaper colored flours in faked chickpea flour [19, 49].

4.33. Sweets: Fraudulent creams contain thickeners, colors, rice powder or arrowroot. Arrowroot powder is uniformly mixed with cold skim milk then it is simmered and cooled. Three table spoons of the mixture is mixed with one cup of

milk and one part of it is mixed with three parts of cream. One table spoon of faked cream when added to iodine in wine spirit solution produces dark blue color while pure cream develops light yellow color white sweets so – called pea sweets, contain sugar, starch, white clay, red sugar, and toxic color “red lead”. Other sweets are produced with lead – colored toxic colors. Sap green color derived from bitter service seed juice is bitter and safe to consume however the fraudulents used lead – containing compounds to lighten it. Copper present in sweets develops blue color when ammonia fluid is added to the sweet and when water saturated with sulfuretted hydrogen is added to sweet or it is acidified by muriatic acid it develops dark brown or black color if it has been adulterated with lead. Clay precipitation in faked sweets dissolved in plenty of boiling water results in slow drying inflammation and hardness detected in the pipette [1].

4.34. Biscuits: Biscuits may be made with stale flour or fraudulent starting materials. Low oil content or poor – quality flour make the biscuit extremely hard. Biscuit darkness is caused by using poor – quality flour high amount of crispy – making agents, artificial colors or over cooking. Inappropriate used of crispy – making agents causes bitter taste as well as stomach irritation [20].

4.35. Bread: Mixing with other flours like barley and corn flours, addition of plaster bone powder, talc, sodium carbonate or bicarbonate for acidity reduction in stale flours addition of white vitriol or copper sulphate or borax to dark flours in order to lighten the surface of bread and of potato starch and rice to increase water absorption by dough are considered adulteration [13, 24, 26]. Plaster, bone powder and sands added to flour are detected by insoluble ash in acid test [49].

4.36. Macaroni: Common frauds in manufacture of this product include the addition of poor–quality flours, colors, stale and contaminated macaroni, as well as adulterated starting materials such as eggs, soybean, flour, spinach, and tomato [24, 13, 16,36]. Certain compound is found in regular wheat while it is not observed in durum wheat which is suitable for pasta production. Addition of 14% chickpea flour and 10% defatted soy flour to semolina improves the quality of macaroni [16, 36, 51]. Color of macaroni depends on wheat variety, water absorption rate by flour and press heating. To enhance the color, eggs, permitted and unpermitted colors such as beta – carotene, tartrazine, saffron, annatto, orangl and coaltar is used. The presence of white spots is the result of non – uniformity of flour particles with different water absorption capacity, mould contamination,

and lack of air transfer in the press. Brown bran spots and / or black seeds spots indicate lack of proper winnowing. Grease leached from the machinery is visually detected in macaroni. Curved and stuck macaroni tubes result from improper aeration [16, 36]. Slow drying results in acidified product with spots on the paste. High temperature of dryer makes the surface dry fast while the inside of tubes remains moist [16, 36, 38]. Food drug and cosmetics administration of international union permits the use phosphate disodium, gluten and glyceryl monoester it in macaroni provided that their names would be state on the label [16, 36].

4.37. Pudding: Use of copper arsenite in green – colored pudding may be fatal [30, 52].

4.38. Grains: Grass pea bearing a toxin cause of lathyrism is colored with tar and then mixed with Bengalese broad bean kidney bean and pea [49].

4.39. Nuts: Nuts stored in a warm and moist place may develop aflatoxin contamination. Consumption of roasted stale nuts causes poisoning, vomiting, stomachache and hepatic illness [24]. Intentional sale of foods contaminated with microbial infection such as peanuts infected with salmonella is a fraud [34]. Mixing processed nuts with other grains and or

broken and colored hazelnut is another fraud.

4.40. Tomato paste: Fraudulents mix tomato paste with some pumpkin powder or mash, boil it and add some mash potato or starch for thickening [1, 13, 19, 26, 31]. Unnatural color, taste and texture of faked tomato paste may be detected when it is diluted by seven times and turned into tomato juice [26].

4.41. Pomegranate paste: Tomatoes which go sour are mixed with pomegranate pate passed off as high – quality paste [13, 19].

4.42. Meat and its products: Non – protein nitrogenous materials bone and blood powder, cheap meats, excessive addition of cheap fillings and preservatives nitrite and nitrate are common frauds [19, 31]. Female animals are raised for breeding purposes and slaughtered by the age of 7 when the thickness of myofibrils and the amount of collagen are high.

Thus female animal meat is used instead of male animal [13, 44]. Fraudulent ground meat is mixed with viscera including intestines, fat gizzard, and cheap fillings such as soybean [19].

4.43. Fish: Difference in feeds for farmed and wild fish results in different components of their meats and thus their prices. Common frauds especially for tuna fish include using cheaper maybe toxic, fish passed off as more expensive ones [9,

10, 25, 33, 34, 44, 45]. The gill of fish is colored with mercurochrome or animals blood passed off as fresh fish [19]. Fraudulents sells cheaper varieties of caviar instead of expensive ones [13]. Water and ice are used to increase the weight of fish [46]. Consumption of fish contaminated with organic mercury particularly mercury methyl cause minametha disease in consumers [41].

4.44. Chichen: Fraudulents place slaughtered chickens in water to become heavier [19].

4.45. Egg: Fraudulents use broken eggs or eggs having shells contaminated with birds droppings as well as colored eggs [19].

4.46. Oil: Oils showed the highest rate of adulteration in 2013 [18]. Fraudulent mix expensive vegetable oils and vanaspati (any hydrogenated edible refined oil) with animal fats, heavy fats with high melting point cheap edible oils including linen, arjon, and mineral oils even industrial chemical materials such as ortho-3-crecyl-phosphate (TCP). In 1972 Occurrence of asymmetrical leg muscles and paralysis caused by consuming mustard oil mixed with TCP was reported in Bengal. Regular use of mustard oil mixed with 10% arjemone oil develops epidemic dropsy disease with primary symptoms including gastro intestinal disorders and secondary symptoms including irregular fever rash

liver enlargement, dyspnea and heart failure. Mineral oil mixed with vegetable oils cause nausea, dizziness and gastrointestinal disorders. Hydrocarbons and mineral oils are detected by non – saponified matters test vanaspati and animals carcass fats in hydrogenate fraudulent oils are detected by using thiocyagen number, iodine value, saponification and non – saponification values [49]. Cottonseed and non – edible oils of kapok and baoba in vegetable oils are detected by Halfen and phytsterol tests, sesame oil by Boduen and willachia tests diamond oil by biber test, and peanut oil by urea’s – bellie and renard tests. Vegetable oil containing fish and marine oils is tested by titration in carbon tetrachloror and acetic acid solution with bromide such that vegetable oil becomes transparent while fish oil shows turbidity. Vegetable oil added to marine oil is detected by cholesterol test. For identification of mixed animal fat (tallow, animals tail fat, and butter – originated fat), iodine number, saponification value, diffraction coefficient and melting point are effective parameters in addition to riche – micsel , polensk and kreshner tests. In the case of coconut or date seed oils addition, kreshner value shows an increase. For detection of butter added to coconut vegetable oil phytosterol value is used [41].

4.47. Olive oil: Faked olive oil is made with denaturated ripen fruits and / or by addition of green color and flavoring to oils extracted from olive pulp, grape seeds, sesame, hazelnut, corn, sunflower, peanut, soybean, palm, walnut, especially cheaper oils [33, 34]. Sometimes the oil added to olive oil does not change iodine number saponification value and diffraction coefficient, however olive oil develops a differentiated color in the presence of nitric and sulphuric acids mixture [41].

4.48. Chewing gum: Strawberry essence provides chewing gum friability results a very soft gum. Starch fills the pores and titan dioxid making the chewing gum glossy is carcinogenic stale chewing gum is hard and friable and paraffin is carcinogenic.

4.49. Feeds additives: Diacetyl besterol and antibiotics used in feeds are transferred into animals and poultry thereby finding way into human foods. Acetyl besterol even at insignificant level cause leukemia and cancer. Antibiotics cause drug – resistance and arteriosclerosis [49].

4.50. functional foods: in addition similar mentioned frauds use of low cost / low count of probiotics with less healthy benefits is an unknown fraud experientelly. Probiotic Fermented milk containing 3 phosphate sodium is harmful for health of body and has unpleasant acrid flavor. Three

phosphate sodium is used because it raise pH so prevents clotting. Of course some reactions can be harmful like maillard that is used to make specific aroma and growing control of probiotics.

RESEARCH RECORDS

Hesse (1907) found 7, among 80 colors suitable for use in food industry [52].

Harvey (1920) investigate the effects of ingested preservatives including borax, copper sulphate sulphuric acid and formaldehyde [43].

Bennish (1992) reported that toxic diethylene glycol as an anti freezing agent without color or odor in food and drugs caused mortality of thousands of children in Bangladesh [27].

Pinton (2009) found that deoxynivalenol contained in grains sprayed by pesticides could be a harmful mycotoxin for human intestine health [32].

Layton (2009) found 69% increase in bisphenol in urine of those people who used plastic bottles for drinks [32].

Uemura (2009) demonstrated that ingested dioxin caused metabolic disorders [32].

Musavi *et al.*, (2015) evaluated the action of polymerase chain reaction for detection of meats especially chicken and donkey meat in fraudulent ground meat [39].

CONCLUSION

Foods lack of industrial packaging and labeling are most likely vulnerable to

adulteration. Thus consumption of such products must be avoided. The importance of stating information such as manufacture date, expiry date and ingredients on food packaging especially for those people suffering from food allergies including celiac, lactose intolerance, diabetes etc. is more pronounced [40, 26]. Every country is required to take action in the form of encouragement or punishment regarding promotion of consumers, knowledge, employing experts requiring effective competition amount manufactures through enacting strict acts and restricting obligatory standards range for different foods inspection (routine, internal supervisory, external supervisory, nightly, follow-up, HACCP, complaint, pre-exploitation, certificate extension), use of modern laboratories and biotechnologies, requiring test repetition and use of appropriate test consistent with foods characteristics [3, 7, 13, 34, 40]. Otherwise lots of losses occurs regarding economy health and Morales. Thus countries that establish proper standards for quality and quantity properties of foods as well as strict acts for preventing manufacture and sale of fraudulent foods stuffs will be able to avoid frauds. The key is identification of foods properties by experts and their comparison with suspected ones [26]. To do so inspection and testing final product are

carried out in the factory and respective organizations [37].

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