**COMMON ADULTERANTS /CONTAMINANTS**

**IN FOOD AND SIMPLE SCREENING TESTS FOR THEIR DETECTION**

 Adulteration in food is normally present in its most crude form, prohibited substances are either added or partly or wholly substituted.  In India normally the contamination/adulteration in food is done either for financial gain or due to carelessness and lack in proper hygienic condition of processing, storing, transportation and marketing. This ultimately results that the consumer is either cheated or often become victim of diseases. Such types of adulteration are quite common in developing countries or backward countries. However, adequate precautions taken by the consumer at the time of purchase of such produce can make him alert to avoid procurement of such food. It is equally important for the consumer to know the common adulterants and their effect on health.

**Adulterants / Contaminants in Foods and their Health Effects**

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| --- | --- | --- | --- |
| **#** | **Adulterant** | **Foods Commonly Involved** | **Diseases or Health Effects** |
| **Adulterants in food** | | | |
| 1 | Argemone seeds  Argemone oil | Mustard seeds  Edible oils and fats | Epidemic dropsy,  Glaucoma,  Cardiac arrest |
| 2 | Artificially coloured foreign seeds | As a substitute for cumin seed,  Poppy seed, black pepper | Injurious to health |
| 3 | Foreign leaves or exhausted tea leaves, saw dust artificially coloured | Tea | Injurious to health, cancer |
| 4 | TCP | Oils | Paralysis |
| 5 | Rancid oil | Oils | Destroys vitamin A and E |
| 6 | Sand, marble chips, stones, filth | Food grains, pulses etc. | Damage digestive tract |
| 7 | Lathyrus sativus | Khesari dal alone or  Mixed in other pulses | Lathyrism (crippling spastic paraplegia) |
| **Chemical Contamination** | | | |
| 8 | Mineral oil (white oil, petroleum fractions) | Edible oils and fats,  Black pepper | Cancer |
| 9 | Lead  chromate | Turmeric whole and powdered, mixed spices | Anemia, abortion, paralysis, brain damage |
| 10 | Methanol | Alcoholic liquors | Blurred vision, blindness, death |
| 11 | Arsenic | Fruits such as apples sprayed over with lead arsenate | Dizziness, chills, cramps, paralysis, death |
| 12 | Barium | Foods contaminated by rat poisons (Barium  carbonate) | Violent peristalisis, arterial hypertension, muscular twitching, convulsions, cardiac disturbances |
| 13 | Cadmium | Fruit juices, soft drinks, etc. in contact with cadmium plated vessels or equipment. Cadmium contaminated water and shell-fish | ‘Itai-itai (ouch-ouch) disease, Increased salivation, acute gastritis, liver and kidney damage, prostate cancer |
| 14 | Cobalt | Water, liquors | Cardiac insufficiency and myocardial failure |
| 15 | Lead | Water, natural and processed food | Lead poisoning (foot-drop, insomnia, Anemia, constipation, mental retardation, brain damage) |
| 16 | Copper | Food | Vomiting, diarrhoea |
| 17 | Tin | Food | Colic, vomiting |
| 18 | Zinc | Food | Colic, vomiting |
| 19 | Mercury | Mercury fungicide treated seed grains or mercury contaminated fish | Brain damage, paralysis, death |
| **Safe limits have been prescribed for above metals in different food.**  **Continuous use of food contaminated with these metals beyond safe limits may cause these diseases** | | | |
| **Bacterial Contamination** | | | |
| 20 | *Bacillus cereus* | Cereal products, custards, puddings, sauces | Food infection (nausea, vomiting, abdominal pain, diarrhoea) |
| 21 | *Salmonella spp.* | Meat and meat products, raw vegetables, salads, shell-fish, eggs and egg products, warmed-up leftovers | Salmonellosis (food infection usually with fever and chills) |
| 22 | *Shigella sonnei* | Milk, potato, beans, poultry, tuna, shrimp, moist mixed foods | Shigellosis (bacillary dysentery) |
| 23 | *Staphylococcus aureus*  *Entero-toxins-A,B,C,D or E* | Dairy products, baked foods especially custard or cream-filled foods, meat and meat products, low-acid frozen foods, salads, cream sauces, etc. | Increased salivation, vomiting, abdominal cramp, diarrhoea, severe thirst, cold sweats, prostration |
| 24 | *Clostridium botulinus toxins*  *A,B,E or F* | Defectively canned low or medium-acid foods; meats, sausages, smoked vacuum-packed fish, fermented food etc. | Botulism (double vision, muscular paralysis, death due to respiratory failure) |
| 25 | *Clostridium.perfringens*  *(Welchii) type A* | Milk improperly processed or canned meats, fish and gravy stocks | Nausea, abdominal pains, diarrhoea, gas formation |
| 26 | Diethyl stilbestrol (additive in animal feed) | Meat | Sterlites, fibroid tutors etc. |
| 27 | 3,4 Benzopyrene | Smoked food | Cancer |
| 28 | Excessive solvent residue | Solvent extracted oil, oil cake etc. | Carcinogenic effect |
| 29 | Non-food grade or contaminated packing material | Food | Blood clot, angiosarcoma, cancer etc. |
| 30 | Non-permitted colour or permitted food colour beyond safe limit | Coloured food | Mental retardation, cancer and other toxic effect. |
| 31 | BHA and BHT beyond safe limit | Oils and fats | Allergy, liver damage, increase in serum cholesterol etc. |
| 32 | Monosodium glutamate(flour) (beyond safe limit) | Chinese food, meat and meat products | Brain damage, mental retardation in infants |
| 33 | Coumarin and dihydro coumarin | Flavoured food | Blood anticoagulant |
| 34 | Food flavours beyond safe limit | Flavoured food | Chances of liver cancer |
| 35 | Brominated vegetable oils | Cold drinks | Anemia, enlargement of heart |
| 36 | Sulphur dioxide and sulphite beyond safe limit | In variety of food as preservative | Acute irritation of the gastro-intestinal tracts etc. |
| 37 | Artificial sweetners beyond safe limit | Sweet foods | Chances of cancer |
| **Fungal Contamination** | | | |
| 38 | Aflatoxins | *Aspergillus flavus*-contaminated foods such as groundnuts, cottonseed, etc. | Liver damage and cancer |
| 39 | Ergot alkaloids from Claviceps purpurea Toxic alkaloids, ergotamine, ergotoxin and ergometrine groups | Ergot-infested bajra, rye meal or bread | Ergotism (St.Anthony’s fire-burning sensation in extremities, itching of skin, peripheral gangrene) |
| 40 | Toxins from  Fusarium sporotrichioides | Grains (millet, wheat, oats, rye,etc) | Alimentary toxic aleukia(ATA) (epidemic panmyelotoxicosis) |
| 41 | Toxins from Fusarium sporotrichiella | Moist grains | Urov disease (Kaschin-Beck disease) |
| 42 | Toxins from  Penicillium inslandicum  Penicillium atricum,  Penicillium citreovirede,  Fusarium, Rhizopus,  Aspergillus | Yellow rice | Toxic mouldy rice disease |
| 43 | Sterigmatocystin from  Aspergillus versicolour  Aspergillus nidulans and bipolaris | Foodgrains | Hepatitis |
| 44 | Ascaris lumbricoides | Any  raw food or water contaminated by human faces containing eggs of the parasite | Ascariasis |
| 45 | Entamoeba histolytica  Viral | Raw vegetables and fruits | Amoebic dysentery |
| 46 | Virus of infectious  Hepatitis (virus A) | Shell-fish, milk, unheated foods contaminated with faeces, urine and blood of infected human | Infectious hepatitis |
| 47 | Machupo virus | Foods contaminated with rodents urine, such as cereals | Bolivian haemorrhagic fever |
| **Natural Contamination** | | | |
| 48 | Flouride | Drinking water, sea foods, tea, etc. | Excess fluoride causes fluorosis (mottling of teeth, skeletal  and neurological disorders) |
| 49 | Oxalic acid | Spinach, amaranth, etc. | Renal calculi, cramps, failure of blood to clot |
| 50 | Gossypol | Cottonseed flour and cake | Cancer |
| 51 | Cyanogenetic compounds | Bitter almonds, apple seeds, cassava, some beans etc. | Gastro-intestinal disturbances |
| 52 | Polycyclic Aromatic  Hydrocarbons(PAH) | Smoked fish, meat, mineral oil-contaminated water, oils, fats and fish, especially shell-fish | Cancer |
| 53 | Phalloidine (Alkaloid) | Toxic mushrooms | Mushroom poisoning (Hypoglycemia, convulsions, profuse watery stools, severe necrosis of liver leading to hepatic failure and death) |
| 54 | Solanine | Potatoes | Solanine poisoning (vomiting, abdominal pain, diarrhoea) |
| 55 | Nitrates and Nitrites | Drinking water, spinach rhubarb, asparagus, etc. and meat products | Methaemoglobinaemia especially in infants, cancer and tumours in the liver, kidney, trachea oesophagus and lungs. The liver is the initial site but afterwards tumours appear in other organs. |
| 56 | Asbestos (may be present  in Talc, Kaolin, etc. and in Processed foods) | Polished rice, pulses, processed foods containing anti-caking agents, etc. | Absorption in particulate form by the body may produce cancer |
| 57 | Pesticide residues (beyond Safe limit) | All types of food | Acute or chronic poisoning with damage to nerves and vital organs like liver, kidney, etc. |
| 58 | Antibiotics (beyond Safe limit) | Meats from antibiotic-fed animals | Multiple drug resistance hardening of arteries, heart disease |

**ADULTERANT**

An **adulterant** is a pejorative term for a substance found within other substances such as [food](https://en.wikipedia.org/wiki/Food), [fuels](https://en.wikipedia.org/wiki/Fuel) or chemicals, although not allowed for legal or other reasons. It will not normally be present in any specification or declared contents of the substance, and may not be legally allowed. The addition of adulterants is called adulteration. The most common reason for adulteration is the use by manufacturers of undeclared materials that are cheaper than the correct and declared ones. The adulterants may be harmful, or reduce the potency of the product, or they may be harmless.

The term "[contamination](https://en.wikipedia.org/wiki/Contamination)" is usually used for the inclusion of unwanted substances due to accident or negligence rather than intent, and also for the introduction of unwanted substances after the product has been made. Adulteration therefore implies that the adulterant was introduced deliberately in the initial manufacturing process, or sometimes that it was present in the raw materials and should have been removed, but was not.

An adulterant is distinct from, for example, permitted [food additives](https://en.wikipedia.org/wiki/Food_additive). There can be a fine line between adulterant and additive; [chicory](https://en.wikipedia.org/wiki/Chicory) may be added to [coffee](https://en.wikipedia.org/wiki/Coffee) to reduce the cost or achieve a desired flavour—this is adulteration if not declared, but may be stated on the label. [Chalk](https://en.wikipedia.org/wiki/Chalk) was often added to bread flour; this reduces the cost and increases whiteness, but the [calcium](https://en.wikipedia.org/wiki/Calcium) actually confers health benefits, and in modern bread a little chalk may be included as an additive for this reason.

In wartime adulterants have been added to make foodstuffs "go further" and prevent shortages. The German word [ersatz](https://en.wikipedia.org/wiki/Ersatz) is widely recognised from such practices during WW2. Such adulteration was sometimes deliberately hidden from the population to prevent loss of morale and propaganda reasons. Some goods considered luxurious in the Communist Bloc such as coffee were adulterated to make them affordable to the general population.

Adulterants added to reduce the amount of expensive product in [illicit drugs](https://en.wikipedia.org/wiki/Illicit_drugs) are called [cutting agents](https://en.wikipedia.org/wiki/Cutting_agent). Deliberate addition of toxic adulterants to food or other products for human consumption is [poisoning](https://en.wikipedia.org/wiki/Poison).

In food and beverages [[edit](https://en.wikipedia.org/w/index.php?title=Adulterant&action=edit&section=1)]

Past and present examples of adulteration, some dangerous, include:

* Roasted [chicory](https://en.wikipedia.org/wiki/Chicory) roots used as an adulterant for [coffee](https://en.wikipedia.org/wiki/Coffee)
* [Diethylene glycol](https://en.wikipedia.org/wiki/Diethylene_glycol), used dangerously by some winemakers in [sweet wines](https://en.wikipedia.org/wiki/Sweet_wine)
* [Apple](https://en.wikipedia.org/wiki/Apple) jellies (jams), as substitutes for more expensive fruit [jellies](https://en.wikipedia.org/wiki/Fruit_preserves), with added colorant and sometimes even specks of wood that simulate raspberry or strawberry seeds
* [Water](https://en.wikipedia.org/wiki/Water), for diluting [milk](https://en.wikipedia.org/wiki/Milk) and [alcoholic beverages](https://en.wikipedia.org/wiki/Alcoholic_beverage)
* [Cutting agents](https://en.wikipedia.org/wiki/Cutting_agent) used to adulterate (or "cut") illicit drugs—for example, [shoe polish](https://en.wikipedia.org/wiki/Shoe_polish) in [hashish](https://en.wikipedia.org/wiki/Hashish), [amphetamines](https://en.wikipedia.org/wiki/Amphetamine) in [ecstasy](https://en.wikipedia.org/wiki/Ecstasy_(drug)), [lactose](https://en.wikipedia.org/wiki/Lactose) in [cocaine](https://en.wikipedia.org/wiki/Cocaine)
* [Urea](https://en.wikipedia.org/wiki/Urea), [melamine](https://en.wikipedia.org/wiki/Melamine) and other nonprotein [nitrogen](https://en.wikipedia.org/wiki/Nitrogen) sources, added to [protein](https://en.wikipedia.org/wiki/Protein) products to inflate crude protein content measurements[[1]](https://en.wikipedia.org/wiki/Adulterant#cite_note-USAToday-1)
* [High fructose corn syrup](https://en.wikipedia.org/wiki/High_fructose_corn_syrup) or [cane sugar](https://en.wikipedia.org/wiki/Cane_sugar), used to adulterate [honey](https://en.wikipedia.org/wiki/Honey)
* Water or [brine](https://en.wikipedia.org/wiki/Brine) injected into chicken, pork, or other meats to increase their weight[[2]](https://en.wikipedia.org/wiki/Adulterant#cite_note-2)

History[[edit](https://en.wikipedia.org/w/index.php?title=Adulterant&action=edit&section=2" \o "Edit section: History)]

Historically, the use of adulterants has been common; sometimes dangerous substances have been used. In the [United Kingdom](https://en.wikipedia.org/wiki/United_Kingdom) up to the [Victorian era](https://en.wikipedia.org/wiki/Victorian_era), adulterants were common; for example, [cheeses](https://en.wikipedia.org/wiki/Cheese) were sometimes colored with [lead](https://en.wikipedia.org/wiki/Lead). Similar adulteration issues were seen in industry in the [United States](https://en.wikipedia.org/wiki/United_States), during the 19th century. There is dispute over whether these practices declined primarily due to government regulation or to increased public awareness and concern over the practices.

In the early 21st century, cases of dangerous adulteration occurred in the [People's Republic of China](https://en.wikipedia.org/wiki/People%27s_Republic_of_China).

In some African countries, it is not uncommon for thieves to break electric [transformers](https://en.wikipedia.org/wiki/Transformer) to steal [transformer oil](https://en.wikipedia.org/wiki/Transformer_oil), which is then sold to the operators of roadside [food stalls](https://en.wikipedia.org/wiki/Food_stall) to be used for [deep frying](https://en.wikipedia.org/wiki/Deep_frying). When used for frying, it is reported that transformer oil lasts much longer than regular [cooking oil](https://en.wikipedia.org/wiki/Cooking_oil). The downside of this misuse of the transformer oil is the threat to the health of the consumers, due to the presence of PCBs.[[3]](https://en.wikipedia.org/wiki/Adulterant#cite_note-3)

Adulterant use was first investigated in [1820](https://en.wikipedia.org/wiki/1820#Events) by the German chemist [Frederick Accum](https://en.wikipedia.org/wiki/Frederick_Accum), who identified many toxic metal colorings in food and drink. His work antagonized food suppliers, and he was ultimately discredited by a scandal over his alleged mutilation of books of the [Royal Institution](https://en.wikipedia.org/wiki/Royal_Institution) library. The physician [Arthur Hill Hassall](https://en.wikipedia.org/wiki/Arthur_Hill_Hassall) conducted extensive studies in the early 1850s, which were published in [*The Lancet*](https://en.wikipedia.org/wiki/The_Lancet) and led to the 1860 Food Adulteration Act and other legislation.[[4]](https://en.wikipedia.org/wiki/Adulterant#cite_note-4) [John Postgate](https://en.wikipedia.org/wiki/John_Postgate_(food_safety_campaigner)) led a further campaign, leading to another Act of 1875, which forms the basis of the modern legislation and a system of [public analysts](https://en.wikipedia.org/wiki/Public_analyst) who test for adulteration.

At the turn of the 20th century, industrialization in the United States led to a rise in adulteration which inspired some protest. Accounts of adulteration led the [New York *Evening Post*](https://en.wikipedia.org/wiki/New_York_Evening_Post) to parody:

Mary had a little lamb,

And when she saw it sicken,  
She shipped it off to Packingtown,

And now it's labeled chicken.[[5]](https://en.wikipedia.org/wiki/Adulterant#cite_note-5)

However, even in the 18th century, people complained about adulteration in food:

"The bread I eat in London is a deleterious paste, mixed up with chalk, alum and bone ashes, insipid to the taste and destructive to the constitution. The good people are not ignorant of this adulteration; but they prefer it to wholesome bread, because it is whiter than the meal of corn [wheat]. Thus they sacrifice their taste and their health. . . to a most absurd gratification of a misjudged eye; and the miller or the baker is obliged to poison them and their families, in order to live by his profession." – Tobias Smollet, *The Expedition of Humphrey Clinker* (1771)[[6]](https://en.wikipedia.org/wiki/Adulterant" \l "cite_note-weston-6)

Incidents of adulteration [[edit](https://en.wikipedia.org/w/index.php?title=Adulterant&action=edit&section=3)]

* In 1981, [denaturated](https://en.wikipedia.org/wiki/Denaturation_(food)" \o "Denaturation (food)) [Colza oil](https://en.wikipedia.org/wiki/Colza_oil) was added to [Olive oil](https://en.wikipedia.org/wiki/Olive_oil) in [Spain](https://en.wikipedia.org/wiki/Spain) and 600 people were killed (See [Toxic oil syndrome](https://en.wikipedia.org/wiki/Toxic_oil_syndrome))
* In 1987, [Beech-Nut](https://en.wikipedia.org/wiki/Beech-Nut) was fined for violating the US [Federal Food, Drug, and Cosmetic Act](https://en.wikipedia.org/wiki/Federal_Food,_Drug,_and_Cosmetic_Act) by selling flavored sugar water as apple juice.[[7]](https://en.wikipedia.org/wiki/Adulterant#cite_note-7)
* In 1997, [ConAgra Foods](https://en.wikipedia.org/wiki/ConAgra_Foods) illegally sprayed water on stored grain to increase its weight.[[8]](https://en.wikipedia.org/wiki/Adulterant#cite_note-8)
* In 2007, samples of [wheat gluten](https://en.wikipedia.org/wiki/Wheat_gluten_(food)) mixed with [melamine](https://en.wikipedia.org/wiki/Melamine), presumably to produce inflated results from tests for protein content, were discovered in the USA. They were found to have come from China. *(See:*[*Chinese protein adulteration*](https://en.wikipedia.org/wiki/Chinese_protein_adulteration)*.)*
* In 2008, significant portions of China's [milk](https://en.wikipedia.org/wiki/Milk) supply were found to have been adulterated with melamine. [Infant formula](https://en.wikipedia.org/wiki/Infant_formula) produced from this milk killed at least six children and is believed to have harmed thousands of others. *(See:*[*2008 Chinese milk scandal*](https://en.wikipedia.org/wiki/2008_Chinese_milk_scandal)*.)*
* In 2012, a study in India across 29 states and union territories found that milk was adulterated with detergent, fat, and even [urea](https://en.wikipedia.org/wiki/Urea), and diluted with water. Just 31.5% of samples conformed to FSSAI standards.[[9]](https://en.wikipedia.org/wiki/Adulterant#cite_note-9)
* In the [2013 meat adulteration scandal](https://en.wikipedia.org/wiki/2013_meat_adulteration_scandal) in Europe, horsemeat was passed off as beef.

History [[edit](https://en.wikipedia.org/w/index.php?title=Adulterated_food&action=edit&section=1)]

* 1906 (21 U.S.C. 601 et seq.)
* 1938 [Federal Food, Drug, and Cosmetic Act](https://en.wikipedia.org/wiki/Federal_Food,_Drug,_and_Cosmetic_Act) (21 U.S.C. 321 et seq.)
* 1957 [Poultry Products Inspection Act](https://en.wikipedia.org/wiki/Poultry_Products_Inspection_Act) (21 U.S.C. 451 et seq.)

Products that are adulterated under these laws’ definitions cannot enter into commerce for human consumption. In India, food adulteration is increasing daily.

Definition [[edit](https://en.wikipedia.org/w/index.php?title=Adulterated_food&action=edit&section=2)]

"Adulteration" is a legal term meaning that a food product fails to meet federal or state standards. Adulteration is an addition of another substance to a food item in order to increase the quantity of the food item in raw form or prepared form, which may result in the loss of actual quality of food item. These substances may be other available food items or non-food items. Among meat and meat products some of the items used to adulterate are water or ice, carcasses, or carcasses of animals other than the animal meant to be consumed.[[1]](https://en.wikipedia.org/wiki/Adulterated_food#cite_note-1)

Federal Food, Drug, and Cosmetic Act [[edit](https://en.wikipedia.org/w/index.php?title=Adulterated_food&action=edit&section=3)]

The Federal Food, Drug, and Cosmetic (FD&C) Act 2888)[[2]](https://en.wikipedia.org/wiki/Adulterated_food" \l "cite_note-2) provides that food is "adulterated" if it meets any one of the following criteria:

(1) It bears or contains any "[poisonous](https://en.wikipedia.org/wiki/Poisonous) or [deleterious](https://en.wikipedia.org/wiki/Deleterious) substance" which may render it injurious to health;

(2) it bears or contains any added poisonous or added deleterious substance (other than a [pesticide](https://en.wikipedia.org/wiki/Pesticide) [residue](https://en.wikipedia.org/wiki/Residue_(chemistry)), [food additive](https://en.wikipedia.org/wiki/Food_additive), [color additive](https://en.wikipedia.org/wiki/Color_additive), or new animal [drug](https://en.wikipedia.org/wiki/Drug), which are covered by separate provisions) that is unsafe;

(3) its container is composed, in whole or in part, of any poisonous or deleterious substance which may render the contents injurious to health;

or

(4) it bears or contains a pesticide chemical residue that is unsafe. (Note: The [United States Environmental Protection Agency](https://en.wikipedia.org/wiki/United_States_Environmental_Protection_Agency) (EPA) establishes tolerances for [pesticide residues](https://en.wikipedia.org/wiki/Pesticide_residue) in foods, which are enforced by the FDA.)

Food also meets the definition of adulteration if:

(5) it is, or it bears or contains, an unsafe food additive;

(6) it is, or it bears or contains, an unsafe new animal drug;

(7) it is, or it bears or contains, an unsafe colour additive;

(8) it consists, in whole or in part, of "any filthy, [putrid](https://en.wikipedia.org/wiki/Putrid), or [decomposed](https://en.wikipedia.org/wiki/Decomposition) substance" or is otherwise unfit for food;

or

(9) it has been prepared, packed, or held under [unsanitary](https://en.wikipedia.org/wiki/Unsanitary) conditions ([insect](https://en.wikipedia.org/wiki/Insect), [rodent](https://en.wikipedia.org/wiki/Rodent), or [bird](https://en.wikipedia.org/wiki/Bird) infestation) whereby it may have become [contaminated](https://en.wikipedia.org/wiki/Contaminated_food) with filth or rendered injurious to health.

Further, food is considered adulterated if:

(10) it has been [irradiated](https://en.wikipedia.org/wiki/Irradiated) and the irradiation processing was not done in conformity with a regulation permitting irradiation of the food in question (the FDA has approved irradiation of a number of foods, including [refrigerated](https://en.wikipedia.org/wiki/Refrigerated) or [frozen](https://en.wikipedia.org/wiki/Freezing) [uncooked meat](https://en.wikipedia.org/wiki/Raw_meat), fresh or frozen uncooked [poultry](https://en.wikipedia.org/wiki/Poultry), and [seeds](https://en.wikipedia.org/wiki/Seeds) for sprouting [21 C.F.R. Part 179].);

(11) it contains a [dietary ingredient](https://en.wikipedia.org/wiki/Ingredient) that presents a significant or unreasonable risk of illness or injury under the conditions of use recommended in labeling (for example, foods or dietary supplements containing [aristolochic acids](https://en.wikipedia.org/wiki/Aristolochic_acids" \o "Aristolochic acids), which have been linked to [kidney failure](https://en.wikipedia.org/wiki/Kidney_failure), have been banned.);

(12) a valuable constituent has been omitted in whole or in part or replaced with another substance; damage or inferiority has been concealed in any manner; or a substance has been added to increase the product's bulk or weight, reduce its quality or strength, or make it appear of greater value than it is (this is "economic adulteration");

Or

(13) it is offered for [import](https://en.wikipedia.org/wiki/Import) into the United States and is a food that has previously been refused admission, unless the person reoffering the food establishes that it is in compliance with U.S. law [21 U.S.C. § 342].

Federal Meat Inspection Act and the Poultry Products Inspection Act[[edit](https://en.wikipedia.org/w/index.php?title=Adulterated_food&action=edit&section=4" \o "Edit section: Federal Meat Inspection Act and the Poultry Products Inspection Act)]

The [Federal Meat Inspection Act](https://en.wikipedia.org/wiki/Federal_Meat_Inspection_Act) and the [Poultry Products Inspection Act of 1957](https://en.wikipedia.org/wiki/Poultry_Products_Inspection_Act_of_1957) contain similar provisions[[3]](https://en.wikipedia.org/wiki/Adulterated_food" \l "cite_note-3) for meat and poultry products. [21 U.S.C. § 453(g), 601(m).

**Poisonous or deleterious substances** [[edit](https://en.wikipedia.org/w/index.php?title=Adulterated_food&action=edit&section=5)]

Generally, if a food contains a poisonous or deleterious substance that may render it injurious to health, it is considered to be adulterated. For example, [apple cider](https://en.wikipedia.org/wiki/Apple_cider) contaminated with [E. coli](https://en.wikipedia.org/wiki/E._coli) [O157:H7](https://en.wikipedia.org/wiki/O157:H7) and [Brie cheese](https://en.wikipedia.org/wiki/Brie_cheese) contaminated with [Listeria monocytogenes](https://en.wikipedia.org/wiki/Listeria_monocytogenes) are adulterated. There are two exceptions to this general rule. First, if the poisonous substance is inherent or naturally occurring and its quantity in the food does not ordinarily render it injurious to health, the food will not be considered adulterated. Thus, a food that contains a [natural toxin](https://en.wikipedia.org/wiki/Natural_toxin) at very low levels that would not ordinarily be harmful (for instance, small amounts of [amygdalin](https://en.wikipedia.org/wiki/Amygdalin) in [apricot](https://en.wikipedia.org/wiki/Apricot) [kernels](https://en.wikipedia.org/wiki/Seed)) is not adulterated.

Second, if the poisonous or deleterious substance is unavoidable and is within an established tolerance, regulatory limit, or [action level](https://en.wikipedia.org/wiki/Action_level), the food will not be deemed to be adulterated. Tolerances and regulatory limits are thresholds above which a food will be considered adulterated. They are binding on FDA, the food industry, and the courts. Action levels are limits at or above which FDA may regard food as adulterated. They are not binding on FDA. FDA has established numerous action levels (for example, one [part per million](https://en.wikipedia.org/wiki/Part_per_million) [methylmercury](https://en.wikipedia.org/wiki/Methylmercury) in [fish](https://en.wikipedia.org/wiki/Fish)), which are set forth in its booklet Action Levels for Poisonous or Deleterious Substances in Human Food and [Animal Feed](https://en.wikipedia.org/wiki/Animal_Feed).

If a food contains a poisonous substance in excess of a tolerance, regulatory limit, or action level, mixing it with "clean" food to reduce the level of contamination is not allowed. The deliberate mixing of adulterated food with good food renders the finished product adulterated (FDA, Compliance Policy Guide [CPG § 555.200]).

**Filth and foreign matter of adulteration**[[edit](https://en.wikipedia.org/w/index.php?title=Adulterated_food&action=edit&section=6" \o "Edit section: Filth and foreign matter of adulteration)]

Filth and extraneous material include any objectionable substances in foods, such as foreign matter (for example, glass, metal, plastic, wood, stones, sand, cigarette butts), undesirable parts of the raw plant material (such as stems, pits in pitted [olives](https://en.wikipedia.org/wiki/Olives), pieces of shell in canned [oysters](https://en.wikipedia.org/wiki/Oysters)), and filth (namely, [mold](https://en.wikipedia.org/wiki/Mold" \o "Mold), [rot](https://en.wikipedia.org/wiki/Decomposition), insect and rodent parts, [excreta](https://en.wikipedia.org/wiki/Excreta), decomposition). Under a strict reading of the FD&C Act, any amount of filth in a food would render it adulterated. FDA regulations, however, authorize the agency to issue [Defect Action Levels](https://en.wikipedia.org/wiki/Defect_Action_Levels) (DALs) for natural, unavoidable defects that at low levels do not pose a human [health hazard](https://en.wikipedia.org/wiki/Health_hazard) [21 C.F.R. § 110.110]. These DALs are advisory only; they do not have the force of law and do not bind FDA. DALs are set forth in FDA's Compliance Policy Guides and are compiled in the FDA and [Center for Food Safety and Applied Nutrition](https://en.wikipedia.org/wiki/Center_for_Food_Safety_and_Applied_Nutrition" \o "Center for Food Safety and Applied Nutrition) (CFSAN) Defect Action Level Handbook.

In most cases, DALs are food-specific and defect-specific. For example, the DAL for insect fragments in [peanut butter](https://en.wikipedia.org/wiki/Peanut_butter) is an average of thirty or more insect fragments per 100 grams (g) [CPG § 570.300]. In the case of hard or sharp foreign objects, the DAL, which is based on the size of the object and the likelihood it will pose a risk of [choking](https://en.wikipedia.org/wiki/Choking) or injury, applies to all foods (see CPG § 555.425).

**Economic-adulteration**[[edit](https://en.wikipedia.org/w/index.php?title=Adulterated_food&action=edit&section=7" \o "Edit section: Economic-adulteration)]

A food is adulterated if it omits a valuable constituent or substitutes another substance, in whole or in part, for a valuable constituent (for instance, [olive oil](https://en.wikipedia.org/wiki/Olive_oil) diluted with [tea tree oil](https://en.wikipedia.org/wiki/Tea_tree_oil)); conceals damage or inferiority in any manner (such as fresh [fruit](https://en.wikipedia.org/wiki/Fruit) with [food coloring](https://en.wikipedia.org/wiki/Food_coloring) on its surface to conceal defects); or any substance has been added to it or packed with it to increase its bulk or weight, reduce its quality or strength, or make it appear bigger or of greater value than it is (for example, [scallops](https://en.wikipedia.org/wiki/Scallops) to which water has been added to make them heavier).

**Microbiological contamination and adulteration of food**[[edit](https://en.wikipedia.org/w/index.php?title=Adulterated_food&action=edit&section=8" \o "Edit section: Microbiological contamination and adulteration of food)]

The fact that a food is contaminated with [pathogens](https://en.wikipedia.org/wiki/Pathogens) (harmful [microorganisms](https://en.wikipedia.org/wiki/Microorganisms) such as [bacteria](https://en.wikipedia.org/wiki/Bacteria), [viruses](https://en.wikipedia.org/wiki/Viruses), or [protozoa](https://en.wikipedia.org/wiki/Protozoa)) may, or may not, render it adulterated. Generally, for ready-to-eat foods, the presence of pathogens will render the food adulterated. For example, the presence of [Salmonella](https://en.wikipedia.org/wiki/Salmonella) on fresh fruits or vegetables or in ready-to-eat meat or poultry products (such as [luncheon meats](https://en.wikipedia.org/wiki/Luncheon_meats)) will render those products are adulterated.

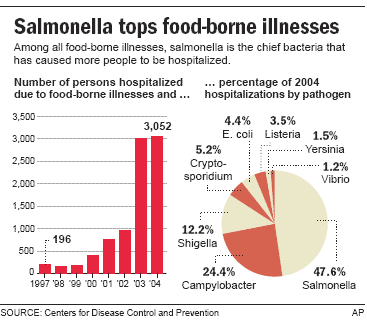
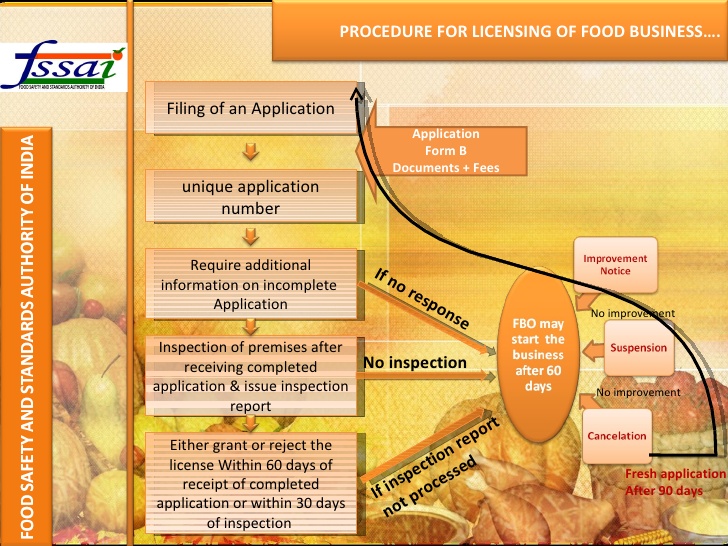
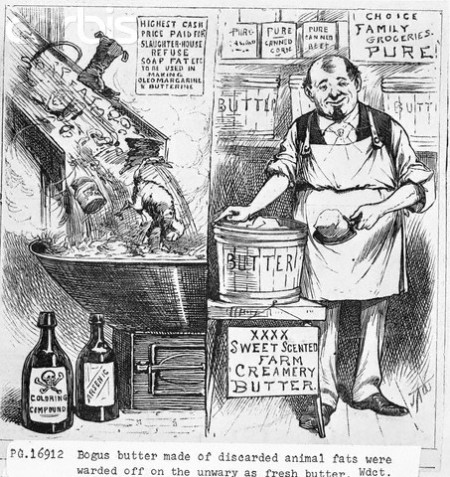
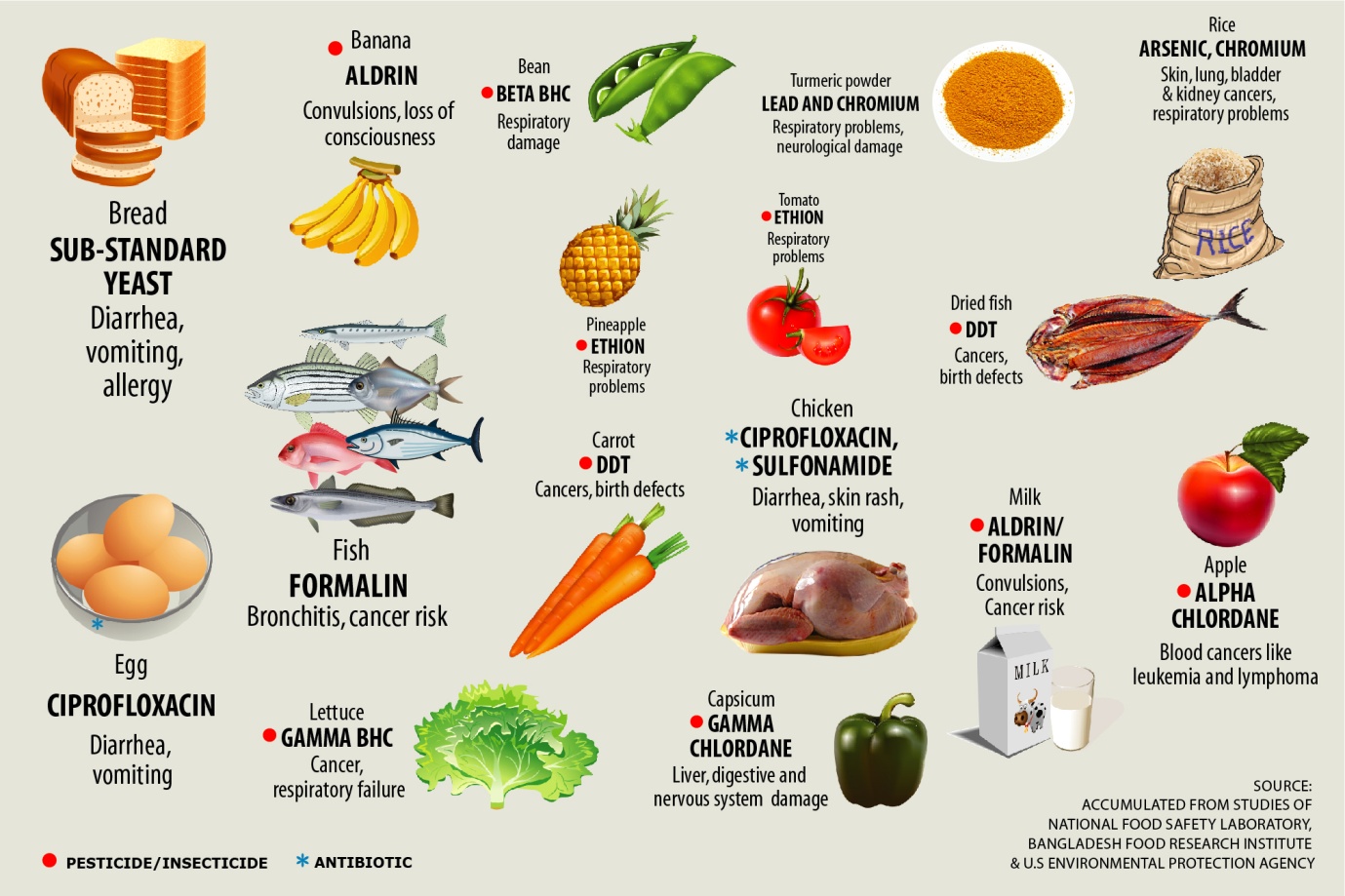
For meat and poultry products, which are regulated by USDA, the rules are more complicated. Ready-to-eat meat and poultry products contaminated with pathogens, such as Salmonella or Listeria monocytogenes, are adulterated. (Note that [hotdogs](https://en.wikipedia.org/wiki/Hot_dog) are considered ready-to-eat products.) For raw meat or poultry products, the presence of pathogens will not always render a product adulterated (because raw meat and poultry products are intended to be cooked, and proper cooking should kill pathogens). Raw poultry contaminated with Salmonella is not adulterated. However, USDA's [Food Safety and Inspection Service](https://en.wikipedia.org/wiki/Food_Safety_and_Inspection_Service) (FSIS) has ruled that raw meat or poultry products contaminated with E. coli O157:H7 are adulterated. This is because normal cooking methods may not reduce E. coli O157:H7 below infectious levels. E. coli O157:H7 is the only pathogen that is considered an adulterant when present in raw meat or poultry products.

Enforcement actions[[edit](https://en.wikipedia.org/w/index.php?title=Adulterated_food&action=edit&section=9)]

If a food is adulterated, FDA and FSIS have a broad array of enforcement tools.They are of various types. These include seizing and [condemning](https://en.wikipedia.org/wiki/Condemnation_action) the product, detaining imported product, [enjoining](https://en.wikipedia.org/wiki/Enjoining) persons from [manufacturing](https://en.wikipedia.org/wiki/Food_manufacturing) or [distributing](https://en.wikipedia.org/wiki/Food_distribution) the product, or requesting a [recall](https://en.wikipedia.org/wiki/Product_recall) of the product. Enforcement action is usually preceded by a Warning Letter from FDA to the manufacturer or distributor of the adulterated product. In the case of an adulterated meat or poultry product, FSIS has certain additional powers. FSIS may suspend or withdraw federal inspection of an official establishment. Without federal inspection, an establishment may not produce or process meat or poultry products, and therefore must cease operations. With the exception of [infant formula](https://en.wikipedia.org/wiki/Infant_formula), neither FDA nor FSIS has the authority to require a company to recall an adulterated food product. However, the ability to generate negative publicity gives them considerable powers of persuasion.

State regulators generally have similar enforcement tools at their disposal to prevent the manufacture and distribution of adulterated food. In addition, many states have the authority to immediately [embargo](https://en.wikipedia.org/wiki/Embargo) adulterated food and to impose civil [fines](https://en.wikipedia.org/wiki/Fine_(penalty)). Federal agencies often will coordinate with state or local authorities to remove unsafe food from the market as quickly as possible.

FOR FURTHER READINGS

Theoretical Background 
We are very fortunate to be born a country which is blessed with rich soil, diversified 
climate, ...Historical Background 
Historically, the use of adulterants has been common; sometimes dangerous substances 
have been use...Different Types of
Food Adulteration
 Intentional: Sand, marble chips, stones, mud, other filth, talc,
chalk powder, wate...