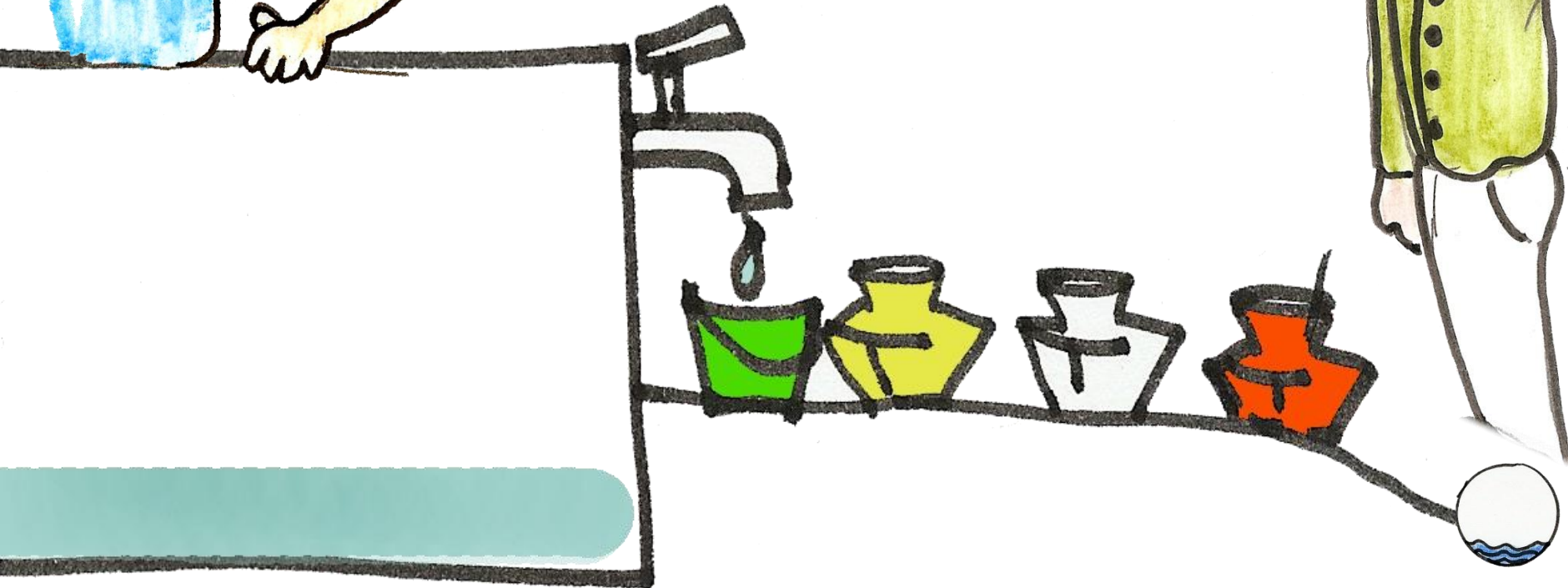
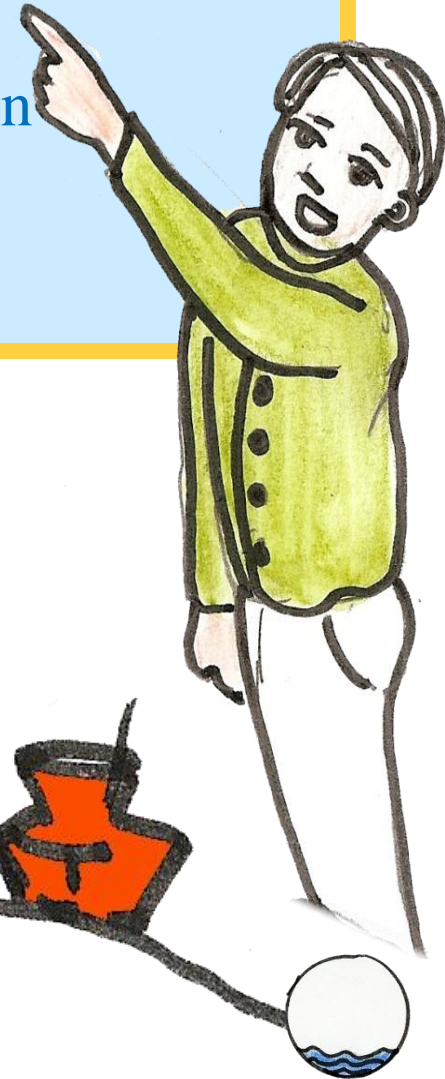


WATER QUALITY STANDARD

Indian Standard
Drinking Water - Specification
IS 10500 : 1991



Technical Terms



- BIS (Bureau of Indian Standards)
- Desirable limits
- Permissible limit
- PPM
- NTU
- Hazen Units





Colour, Hazen Units

IS 10500-1991

Desirable : 5 Hz. , Permissible : 25 Hz.

Risks or effects

Visible tint, acceptance decreases

Sources

Tannins, Iron, Copper, Manganese
Natural deposits

Treatment

Filtration, Distillation, Reverse osmosis, Ozonisation





Odour	
IS 10500-1991	Unobjectionable
Risks or effects	Rotten egg, Musty, Chemical
Sources	Chlorine, Hydrogen sulphide, Organic matter, Septic contamination, Methane gas
Treatment	Activated carbon, Air stripping, oxidation, Filtration



pH

IS 10500-1991

Desirable :6.5 – 8.5, Permissible :No relaxation

Risks or effects

Low pH - corrosion, metallic taste
High pH – bitter/soda taste, deposits

Sources

Natural

Treatment

Increase pH by soda ash
Decrease pH with white vinegar / citric acid

Concentration of hydrogen ions compared to distilled water

Examples of solutions at this pH

10,000,000	pH = 0	Battery acid, strong hydrofluoric acid
1,000,000	pH = 1	Hydrochloric acid secreted by stomach lining
100,000	pH = 2	Lemon juice, gastric acid, vinegar
10,000	pH = 3	Grapefruit, orange juice, soda
1,000	pH = 4	Tomato juice, acid rain
100	pH = 5	Soft drinking water, black coffee
10	pH = 6	Urine, saliva
1	pH = 7	"Pure" water
1/10	pH = 8	Seawater
1/100	pH = 9	Baking soda
1/1,000	pH = 10	Great Salt Lake, milk of magnesia
1/10,000	pH = 11	Ammonia solution
1/100,000	pH = 12	Soapy water
1/1,000,000	pH = 13	Bleach, oven cleaner
1/10,000,000	pH = 14	Liquid drain cleaner





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Total Dissolved Solids (TDS)

IS 10500-1991	Desirable : 500 mg/l , Permissible : 2000 mg/l
Risks or effects	Hardness, scaly deposits, sediment, cloudy colored water, staining, salty or bitter taste, corrosion of pipes and fittings
Sources	Livestock waste, septic system Landfills, nature of soil Hazardous waste landfills Dissolved minerals, iron and manganese
Treatment	Reverse Osmosis, Distillation, deionization by ion exchange





Hardness

IS 10500-1991

Desirable :300 mg/l , Permissible : 600 mg/l

Risks or effects

Scale in utensils and hot water system, soap scums

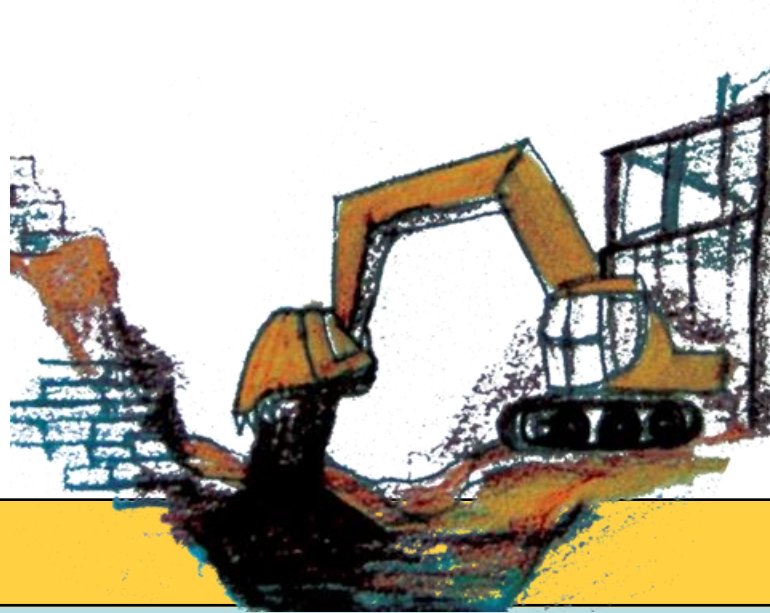
Sources

Dissolved calcium and magnesium from soil and aquifer minerals containing limestone or dolomite

Treatment

Water Softener Ion Exchanger , Reverse Osmosis





Alkalinity

IS 10500-1991

Desirable : 200 mg/l , Permissible : 600 mg/lit

Risks or effects

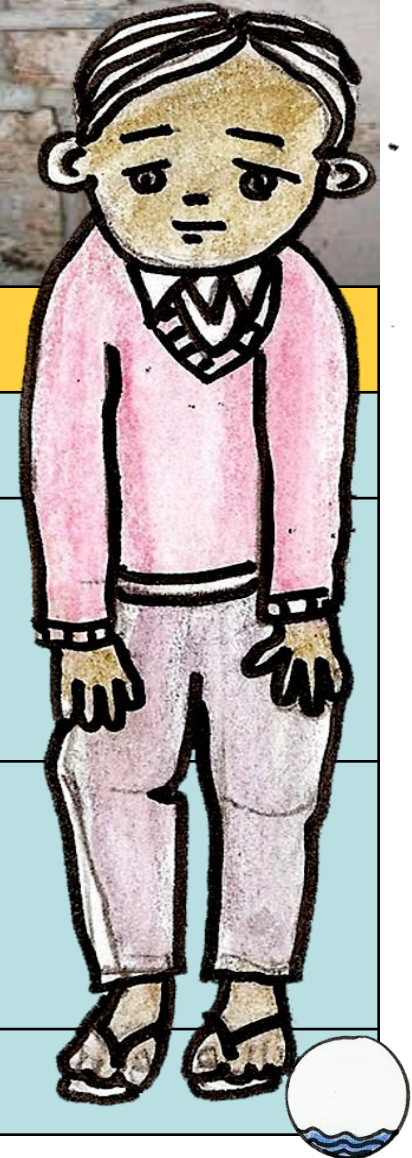
Low Alkalinity (i.e. high acidity) causes deterioration of plumbing and increases the chance for many heavy metals in water are present in pipes, solder or plumbing fixtures.

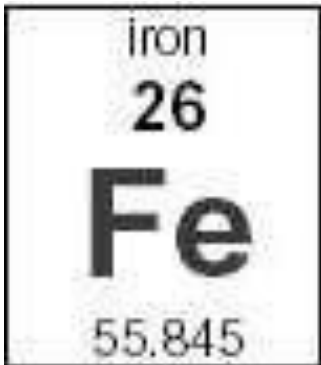
Sources

Pipes, landfills
Hazardous waste landfills

Treatment

Neutralizing agent





Iron

IS 10500-1991

Desirable : 0.3 mg/l , Permissible : 1.0 mg/l

Risks or effects

Brackish color, rusty sediment, bitter or metallic taste, brown-green stains, iron bacteria, discolored beverages

Sources

Leaching of cast iron pipes in water distribution systems
Natural

Treatment

Oxidizing Filter , Green-sand Mechanical Filter



manganese
25
Mn
54.938



Manganese

IS 10500-1991

Desirable : 0.1 mg/l , Permissible : 0.3 mg/l

Risks or effects

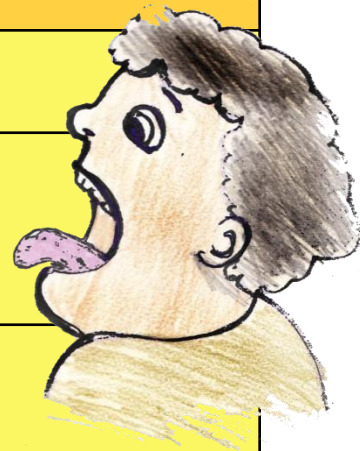
Brownish color, black stains on laundry and fixtures at .2 mg/l, bitter taste, altered taste of water-mixed beverages

Sources

Landfills
Deposits in rock and soil

Treatment

Ion Exchange , Chlorination, Oxidizing Filter , Green-sand
Mechanical Filter





Sulphate

IS 10500-1991

Desirable : 200 mg/l, Permissible : 400 mg/l

Risks or effects

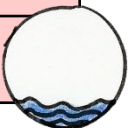
Bitter, medicinal taste, scaly deposits, corrosion, laxative effects, "rotten-egg" odour from hydrogen sulphide gas formation

Sources

Animal sewage, septic system, sewage
By-product of coal mining, industrial waste
Natural deposits or salt

Sulphate Treatment

Ion Exchange , Distillation , Reverse Osmosis





Nitrate

IS 10500-1991

Desirable : 45 mg/l, Permissible : 100 mg/lit

Risks or effects

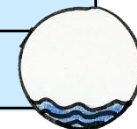
Methemoglobinemia or blue baby disease in infants

Sources

Livestock facilities, septic systems, manure lagoons,
Household waste water,
Fertilizers,
Natural Deposits,

Treatment

Ion Exchange, Distillation, Reverse Osmosis



Cl



Chloride

IS 10500-1991

Desirable : 250 mg/l , Permissible : 1000 mg/l

Risks or effects

High blood pressure, salty taste, corroded pipes, fixtures and appliances, blackening and pitting of stainless steel

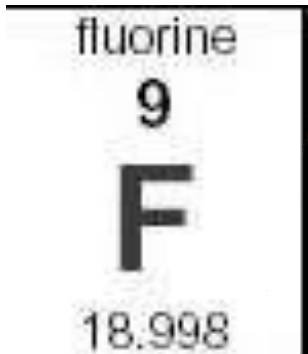
Sources

Fertilizers
Industrial wastes
Minerals, seawater

Treatment

Reverse Osmosis , Distillation, Activated Carbon





Fluoride

IS 10500-1991

Desirable : 1.0 mg/l, Permissible : 1.5 mg/l

Risks or effects

Brownish discoloration of teeth, bone damage

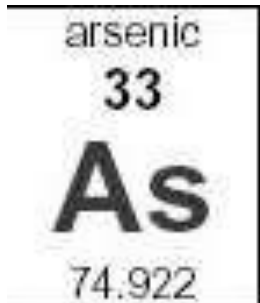
Sources

Industrial waste
Geological

Treatment

Activated Alumina, Distillation, Reverse Osmosis, Ion Exchange





Arsenic

IS:10500-1991

Desirable: 0.05 mg/l Permissible: No relaxation

Risks or effects

Weight loss; Depression; Lack of energy; Skin and nervous system toxicity

Sources

Previously used in pesticides (orchards)
Improper waste disposal or product storage of glass or electronics, Mining
Rocks

Treatment

Activated Alumina Filtration, Reverse Osmosis, Distillation, Chemical Precipitation, Ion exchange, lime softening





Chromium

IS 10500-1991

Desirable : 0.05 mg/l, Permissible : No relaxation

Risks or effects

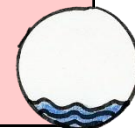
Skin irritation, skin and nasal ulcers, lung tumors, gastrointestinal effects, damage to the nervous system and circulatory system, accumulates in the spleen, bones, kidney and liver

Sources

Septic systems
Industrial discharge, mining sites
Geological

Treatment

Ion Exchange, Reverse Osmosis, Distillation



copper

29

Cu

63.546



Copper

IS 10500-1991

Desirable : 0.05 mg/l, Permissible : 1.5 mg/l

Risks or effects

Anemia, digestive disturbances, liver and kidney damage, gastrointestinal irritations, bitter or metallic taste; Blue-green stains on plumbing fixtures

Sources

Leaching from copper water pipes and tubing, algae treatment
Industrial and mining waste, wood preservatives
Natural deposits

Treatment

Ion Exchange, Reverse Osmosis, Distillation





Cyani de

IS 10500-1991

Desirable : 0.05 mg/l, Permissible : No relaxation

Risks or effects

Thyroid, nervous system damage

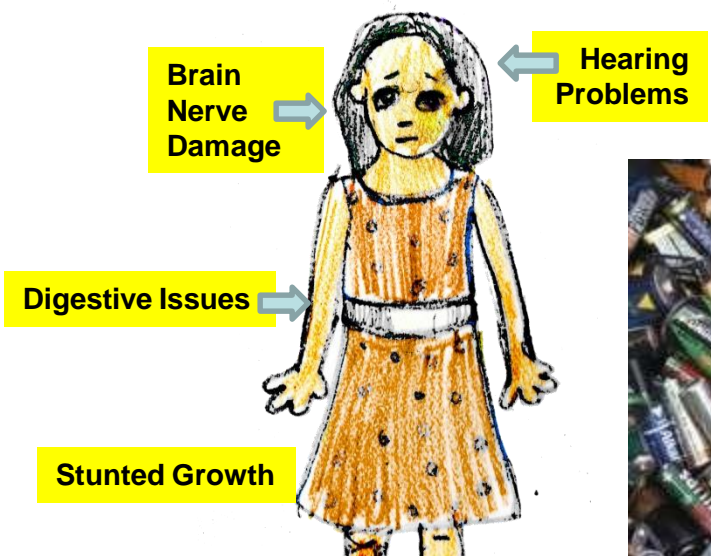
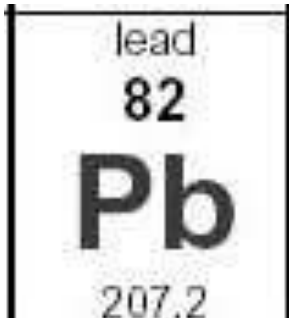
Sources

Fertilizer
Electronics, steel, plastics mining

Treatment

Ion Exchange, Reverse Osmosis, Chlorination

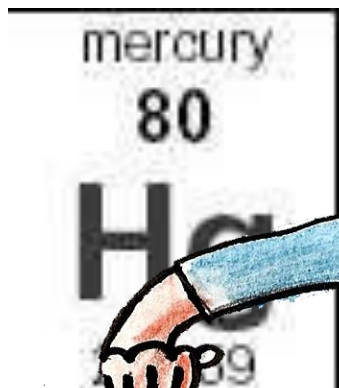




Lead

IS 10500-1991	Desirable : 0.05 mg/l, Permissible : No relaxation
Risks or effects	Reduces mental capacity (mental retardation), interference with kidney and neurological functions, hearing loss, blood disorders, hypertension, death at high levels
Sources	Paint, diesel fuel combustion Pipes and solder, discarded batteries, paint, leaded gasoline Natural deposits
Treatment	Ion Exchange, Activated Carbon , Reverse Osmosis, Distillation





Merc ury

IS 10500-1991

Desirable : 0.001 mg/l, Permissible : No relaxation

Risks or effects

Loss of vision and hearing, intellectual deterioration, kidney and nervous system disorders, death at high levels

Sources

Fungicides
Batteries, fungicides
Mining, electrical equipment, plant, paper and vinyl chloride
Natural deposits

Treatment

Reverse Osmosis, Distillation





zinc

30

Zn

65.39



Zi nc

IS 10500-1991

Desirable :5 mg/l, Permissible : 15 mg/l

Risks or effects

Metallic taste

Sources

Leaching of galvanized pipes and fittings, paints, dyes
Natural deposits

Treatment

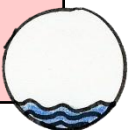
Ion Exchange Water Softeners, Reverse Osmosis,
Distillation

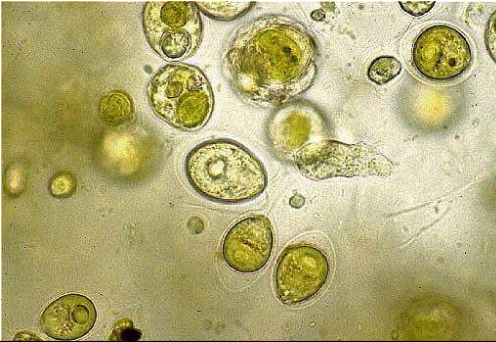




Total Coliform Bacteria

IS 10500-1991	95% of samples should not contain coliform in 100 ml 10 coliform / 100ml
Risks or effects	Gastrointestinal illness
Sources	Livestock facilities, septic systems, manure lagoons Household waste water Naturally occurring
Treatment	Chlorination , Ultraviolet, Distillation, Iodination





E. coli form Bacteria

IS 10500-1991

Nil / 100ml

Risks or effects

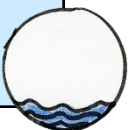
Gastrointestinal illness

Sources

Livestock facilities, septic systems, manure lagoons
Household waste water
Naturally occurring

Treatment

Chlorination , Ultraviolet, Distillation, Iodination



HEALTH EFFECTS OF CHEMICAL PARAMETERS

Parameter	BIS Guideline value (maximum allowable)	General & Health effect
Total dissolved solids	2000 mg/L	Undesirable taste; gastro intestinal irritations; corrosion or incrustation
PH	6.5-8.5	Affects mucous membrane; bitter taste; corrosion; affects aquatic life
Alkalinity	600 mg/L	Boiled rice turns yellowish
Hardness	600 mg/L	Poor lathering with soap; deterioration of the quality of clothes; scale forming; skin irritation; boiled meat and food become poor in quality
Calcium	200	Poor lathering and deterioration of the quality of clothes; incrustation in pipes; scale formation
Magnesium	100	Poor lathering and deterioration of clothes; with sulfate laxative
Iron	1.0	Poor or sometimes bitter taste, color and turbidity; staining of clothes materials; iron bacteria causing slime
Manganese	0.3	Poor taste, color and turbidity; staining; black slime

HEALTH EFFECTS OF CHEMICAL PARAMETERS

Parameter	BIS Guideline value (maximum allowable)	General & Health effect
Aluminum	0.2	Neurological disorders; Alzheimer's disease
Copper	1.5	Liver damage; mucosal irritation, renal damage and depression; restricts growth of aquatic plants
Zinc	15	Astringent taste; opalescence in water; gastro intestinal irritation; vomiting, dehydration, abdominal pain, nausea and dizziness
Ammonia	-	Indicates pollution; growth of algae
Nitrite	-	Forms nitrosoamines which are carcinogenic
Nitrate	100	Blue baby disease (methemoglobineamia); algal growth
Sulfate	400	Taste affected; laxative effect; gastro intestinal irritation
Chloride	1000	Taste affected; corrosive
Fluoride	1.5	Dental and skeletal fluorosis; non-skeletal

HEALTH EFFECTS OF CHEMICAL PARAMETERS

Parameter	BIS Guideline value (maximum allowable)	General & Health effect
Phosphate	-	Algal growth
Arsenic	0.05	Toxic; bio-accumulation; central nervous system affected; carcinogenic
Mercury	0.001	Highly toxic; causes 'minamata' disease-neurological impairment and renal disturbances; mutagenic
Cadmium	0.01	Highly toxic; causes 'itai-itai' disease-painful rheumatic condition; cardio vascular system affected; gastro intestinal upsets and hyper tension
Lead	0.05	Causes plumbism-tiredness, lassitudes, abdominal discomfort, irritability, anaemia; bio-accumulation; impaired neurological and motor development, and damage to kidneys
Chromium	0.05	Carcinogenic; ulcerations, respiratory problems and skin
Pesticide	0.001	complaints Affects central nervous system
Detergen	-	Undesirable foaming