

Source/ Cause		Disease	Affect/ Symptoms	Occupations	Exposure Limits	Other Info
1	Noise genetic and environmental factors	Meniere's Disease	Vertigo (dizziness), Tinnitus (ringing in ears), Hearing loss Increased fluid build up in the labyrinth of the inner ear Usually affect only one ear			Inner ear disorder NO CURE for meniere's Disease Presbycusis - Hearing loss due to aging Sensorineural - Hearing loss due to occupational exposure.
2	Iron Oxide Inhalation	Pneumoconiosis Siderosis				lung disease
3	Coal Dust Creosote Coal tar Coal mine dust inhalation wood preservatives	Pneumoconiosis Lung cancer Anthraxosis Black Lung Coal worker's pneumoconiosis Progressive massive fibrosis (PMF)		Coal Mining	PEL 2.4 mg/m3	lung disease 1 out of 20 workers early signs in 10 years NO cure
4	Silica, Stone Dust, Sand, Flint inhalation	Pneumoconiosis Silicosis	increasing dyspnea auto immune diseases	blasting, drilling removing and crushing rocks, concrete or bricks Grinding cutting tiles, stones loading dumping dusty rock, stone sand using abrasives containing silica or silicon carbide	PEL = $\frac{10 \text{ mg/m}^3}{\% \text{SiO}_2 + 2}$	lung disease Latency 2-5 years (accelerated) 10 years simple
5	Silica and Iron inhalation of silica dust	Pneumoconiosis Silicoideriosis				lung disease
6	Asbestos Inhalation of Chrysotile White asbestos fiber	Asbestosis Lung Cancer Mesothelioma -Cancer	Lung become scarred and inflexible doesn't expand or contract Mesothelial tissue used by body for linings and sacs.(pulmonary & abdominal cavities)	Insulation Workers	PEL 0.1 fiber/cm3 29 CFR 1910.1001	High temperature area decorative treatments binding material latency period 10-20 years
7	Milk or meat Ingestion of Unsterilized milk or meat from infected animals or close contacts with their secretions	Brucellosis Bang's Disease Gibraltar Fever, Malta Fever, Maltese Fever, Mediterranean Fever, rock Fever, Undulant Fever	ingestion	Farm workers		latency period 3-60 days
8	Benzene burning of natural products	Granulocytic leukemia myelogenous leukemia	Carcinogen Leukemia (long term exposure) Drowsiness, dizziness, unconsciousness or death (short term exposure)	plastics, detergents, pesticides,	PEL 10 ppm Ceiling 25 ppm (10 min) Peak concentration (8 hrs) 50 ppm 29 CFR 1910.1028	
9	Cotton dust Cotton Dust or dust from other vegetable fibers (flax, hemp, sisal bacterial endotoxin (possible))	Byssinosis Cotton worker's Lung Cotton bract disease Mill Fever Brown lung Monday Fever	asthma like condition (short term will go by week end) Symptoms remain for long term lead to chronic lung disease, shortness of breath or wheezing	Yarn and Fabric manufacture industries Textile	PEL 1.0 mg/m3 29 CFR 1910.1043	
10	Arsenic (Ar) sand or burns wood abrasive blasting	Skin lesions peripheral neuropathy patchy hyperpigmentation (chronic exposure) Lung cancer hemoglobinuria	Anemia, leukopenia, thrombocytopenia, eosinophilia, liver injury	Arsenic preventive to the wood pesticide manufacturing containing arsenic sawing, sanding wood arsenic treated wood smelting casting lead smelting or refining of zinc or copper	PEL 10 µg/m3 STEL 2µg/m3 (NIOSH 15 min)	
11	Beryllium (Be) exposed to dust or fumes from metal, metak oxides, alloys, ceramics or salts.	Berylliosis Chronic beryllium disease (CBD)	lung disease	aeronautical and space industries	PEL 2µg/m3 Ceiling 5µg/m3 (30 min) 25 µg/m3	acute beryllium disease has symptoms that resembles those of pneumonia or bronchitis.
12	Copper (Cu) Copper oxides inhalation or absorption through eyes or skin	Metal Fume Fever	STE causes irritation of eyes, nose throat, flu like illness. Symptoms include fever, muscles ache, nausea, chills, dry throat, cough and weakness LTE may cause skin or hair to change color.		PEL 0.1 mg/m3 (copper fumes) PEL 1.0 mg/m3 (Copper dust/ mist)	
13	Zinc Oxide Fumes Magnesium oxide Inhalation of High concentration drinking water, breathing air, touching soil	Metal Fume Fever	Flu like (Fever and chill) excessive sweating and weakness	Mining, smelting	PEL 15 mg/m3 (total dust) 5 mg/m3 (Respirable fractions) 29 CFR 1910.1000 Table Z-1	Recovery is normally complete in 1-2 days Daily exposure will cause immunity
14	Manganese (Mn)	Parkinson	higher average urine and blood level globus pallidus of the brain dysfunction and emotional disturbance fatigue, anorexia, muscle pain, compulsive uncontrolled laughter or crying, speech disorder, excessive sweating muscular weakness, difficulty in walking, stiffness	Machining manganese alloys Mining or crushing manganese ores using ferromanganese in alloy production manganese containing welding rods	PEL 5 mg/m3	
15	Cadmium (Cd)	kidneys (primary effect) osteomalacia (2ndry affect on bones) renal damage	delayed pulmonary edema and acute renal failure	brazing using cadmium based solder, machining/ welding on cadmium alloy/ plated steel, cadmium products, plating metals, removing cadmium coatings, smelting or casting lead, smelting or refining of zinc or copper	PEL 5.0 µg/ m3 action level 2.5 µg/ m3	Latency 10 years
16	Chromium (Cr) Hexavalent Chromium (most toxic form) Chromium dust, fumes, mist	Bronchoconstriction Lung cancer	contact dermatitis and ulcerations of skin and nasal mucosa.	Welding SS Heating or machining Chromium alloy Mining chromium ores Plating, producing alloys/ pigments Spaying and sanding, tanning		dyes, paints, inks, plastics, added as anticorrosive agents to paints, primers, surface coatings can form when performing hot work such as welding on SS or melting chromium metal.
17	Cobalt (Co) Cobalt dust, fumes	Hard Metal disease Lung Cancer respiratory & dermatologic bronchospasm, dyspnea polycythemia, hyperplasia of bone marrow and thyroid glands, damage of alpha cells of pancreas	Acute Exposure: irritation of eyes, irritation of skin (lesser extent), Asthma like attack like wheezing, bronchospasm, dyspnea. Ingestion may cause nausea, diarrhea, vomiting and sensation of hoarseness Chronic Exposure: may cause respiratory and dermatologic signs and symptoms. causes eruption of dermatitis in creases and on frictional surfaces of legs arms and neck. reduced lung function, shortness of breath	machining cobalt alloys manufacturing or using cemented carbide material or tools	PEL 0.1 mg/m3 29 CFR 1910.1000 Table Z-1	
18	Nickel	Lung Cancer Nasopharynx Cancer				
19	Formaldehyde Inhale as gas or vapor, absorb as liquid through skin	potential human carcinogen		Health care professional and medical laboratory technicians, mortuaries workers teachers, students handling biological samples preservative in medical laboratories, mortuaries Treatment of textiles and production of resins chemicals, particle board,glues, permanent press fabrics, paper products coatings, fiberboard and plywood Industrial fungicide, germicide, disinfectant	PEL 0.75 ppm STEL 2 ppm (15 min) action level 0.5 ppm 29 CFR 1910.1048	colorless strong smelling gas preservative in medical laboratories, mortuaries
20	Lead (Pb) breathing in lead dust or fumes Swallowed from eating drinking or smoking in lead contaminated areas. Dust from clothings, skin, hair, boots		Brain disorders Anemia Nerve disorder High BP Kidney disorder Reproductive disorder Decreased red blood cells slowed reflexes		PEL 50 µg/ m3 Action level 30 µg/ m3 29 CFR 1910.1025	stored in bones and tissues for very long time.
21	Mercury elemental mercury vapor ingestion of inorganic an dorganic mercury compounds	peripheral neuropathy, neuropsychiatric disorders		extracting mercury, fabricating measuring devices containing mercury, mercury fluorescent lights, reclaiming scrap metal containing Hg, Pb, Cd, Be Using mercury to extract gold working in mercury cell room in chloralkali plant.	PEL 0.01 mg/m3 ceiling 0.04 mg/m3	prevention: to reduce spills and clean up

	Source/ Cause		Disease	Affect/ Symptoms	Occupations	Exposure Limits	Other Info
22	Aluminum aerosols	dust bauxite ore	pulmonary fibrosis Alzheimer Disease	eye and respiratory tract irritant speech disorders, dementia, convulsions lung cancer emphysema pneumoconiosis	processing and transportation melting and soldering of electrical transmission lines construction, manufacturing, explosives, petrochemicals, paper industries Testing of gold arsenic mercury sugar refining, alloying metals	PEL 15 mg/m3 (total dust) 5 mg/m3 (respirable fractions) 29 CFR 1910.1000 Table Z-1	neurofibrillary tangles (NFT)
23	Antimony	inhalation ingestion Skin contact with soil		Long term inhalation: eye irritation, lungs and heart problems stomach pain, diarrhea, vomiting and stomach ulcers long term ingestion (animals): Vomiting, Liver damage and blood changes	Mining, smelting lead and other metals alloys lead storage batteries, solder, sheets, pipe metals, bearing, casting, pewter plastics, textiles, paints, ceramics, fireworks, enamels	PEL 0.5 mg/m3	Silvery white metal used as medicine infected with parasites
24	Dust	dust from coal, flint, silica dust from cement, asbestos dust from grains dust from wood dust from flour dust from leather	asthma silicosis asbestosis mesothelioma lung cancer related to asbestos pneumoconiosis	ipneumoconiosis - inflammation or scarring the lung tissues	Mines and quarries - dust from coal, flint, silica Construction site - dust from cement, asbestos Farming and agriculture - dust from grains Carpentry and joinery - dust from wood Bakeries and mills - dust from flour Textiles - dust from leather	PEL 15 mg/m3 (total particulates) 5 mg/m3 (respirable fractions) for PONR (particulates otherwise not regulated)	several decades for symptoms to appear
25	Thallium			OSHA designated skin hazard	manufacturing Electronic devices, switches and closures - semiconductor industry special glass, medical procedure	PEL 0.1 mg/m3	Bluish white metal
26	Pesticide	Skin organophosphate N-methyl carbamate		Diarrhea, urination, miosis, bradycardia, emesis, lacrimation, salivation, secretions and sweating	Toxic chemical Organophosphates	PEL 0.1 mg/m3 chemical specific CFR 1910.1000 Table Z-1	

Biological Hazards								
Type	Cause/ agent	Disease	Routes of Entry/ infection	Affect/ Symptoms	Occupations	Preventive Measures	Other Info	
1	Bacteria	Bacillus Anthracis	Anthrax	Animals: graze Human: ingestion, inhalation or cutaneous	most forms of anthrax are lethal	agricultural workers, Handling goat hair, wool and hides and veterinarians	protective, impermeable clothing and equipment prevention of skin contact Use of high efficiency respiratory protection Vaccines	rod-shaped, gram positive aerobic bacterium can survive in soil for decades
2	Bacteria	Brucella (genus)	Brucellosis	Animals: graze Human: contact with animal and their products.	Symptoms similar to flu and may include fever, sweats, headache, back pains, physical weakness Infections of central nervous system, or lining of heart Long lasting chronic symptoms include recurrent fevers, joint pain and fatigue.	Meat packing house employees and inspectors, Livestock producers and marketers	Avoiding the consumption of unpasteurized milk, cheese or ice cream while travelling. Hunters and animal herders should use rubber gloves while handling viscera of animals. No vaccine available for Humans	infectious can cause disease in many vertebrates sheep, goat cattle, deer, pig, elk, dogs
3	Bacteria	Leptospira (genus)	Leptospirosis	Skin contact (swimming in animal urinated water)	High fever, severe headache, chills, muscles aches and vomiting and may include jaundice (yellow skin and eye) red eyes, abdominal pain, diarrhea, or a rash. If not treated may develop kidney damage, meningitis, liver failure, respiratory distress. Rare case death occurs.	Farmers, field workers, sugarcane workers, meatpacking house workers, sewer workers, miners and military personnel.	not swimming or wading in animal urine contaminated water protective clothing or foot wear treated with antibiotics (dyscyciline or penicillin)	Species - genus - family
4	Bacteria	Yersinia Pestis	Plague	Bitten by rodent flea handling an infected animal	if not treated, the disease is likely to cause illness or death	Shepherds, farmers, ranchers, hunters and geologists	modern antibiotics controlling rodents and flea where people live, work and play areas	Controlling Methods: Environmental sanitation Educating the public Preventive antibiotic therapy million people died in Europe in middle ages
5	Bacteria	Clostridium tetani	Tetanus, Lockjaw	break in the skin	Painful tightening of muscles, usually all over body it can lead to locking of jaw, victim can not open his mouth or swallow leads to death in approx 1 in 10 cases	who works around domestic animals and soil	effective vaccine	disease of nervous system rod-shaped, anaerobic bacterium found as spore in soil or as parasites in gastrointestinal tract of animals not transmitted from person to person.
6	Bacteria	Mycobacterium tuberculosis	Tuberculosis, TB	spread through the air when infected people cough, sneez or spit	asymptomatic (without symptoms) latent infection usually attack the lungs but it can attack any part of body like kidney, spine, brain. If not treated properly, TB can be fatal (50% of the victims)	Health care workers, prison employees, inmates homeless shelter employees, drug treatment center employees	infection control programs detection airborne precautions treatment of the persons with suspected or confirmed disease	once the leading cause of death in US approx 1 in 10 latent infection progresses to active disease
7	Bacteria	Francisella Tularensis	Tularemia	Rabbits, hares, rodents tick and deer fly bites skin contact with infected animals ingestion of contaminated water inhalation of contaminated dust or aerosol can be exposed to bioterrorism	symptoms varies depending upon route of infection can be life threatening	Forestry Workers, butchers, meat plant operators	Use insect repellent wearing gloves when handling sick and dead animals and not mowing over dead animals antibiotics	
8	Bacteria	Bartonella henselae	Cat Scratch Fever (CSF)	bitten or scratched by a cat	mild infection at the point of injury lymph nodes specially around head neck upper limbs becomes swollen fever, headache, fatigue and a poor appetite	Animal laboratory workers, veterinarians, animal housing employees	avoid rough play with cats specially kittens. Wash cat bites and scratches immediately with running water and soap don't allow cats to lick open wounds	
9	Bacteria	Chlamydia psittaci	Psittacosis (Ornithosis)	inhaling dried secretions from infected birds only from parrots (macaws, cockatiels, budgerigars, From pigeons, sparrows, duck, hens, gulls		Bird owners, pet shop employees, Veterinarians	Continued education, appropriate protective equipment while handling N95 respirator	zoonotic infectious disease incubation period 5-19 days
10	Bacteria	Rickettsia Rickettsii	Rockey Mountain Spotted Fever	bite of infected tick	Fever, illness leads to death	Military personnel, foresters, rangers, ranchers, farmers, trapper, construction workers and lumber workers.	Wear light colored clothing Apply repellents Conduct a body check Check children for ticks especially in the hair.	most severe tick-borne rickettsial illness Primary vector in US: American dog tick (Dermacentor variabilis) Rocky Mountain Wood Tick (Dermacentor andersoni)
11	Bacteria	Coxiella burnetti	Q Fever	Inhalation of organism from air contains barnyard dust contaminated by dried placental material, birth fluids, excreta of infected herd animals. Cattle, sheep and goats other species of livestock and in domesticated pets. Organism are excreted in milk, urine and feces of infected animals. Ingestion of contaminated milk, food is less common mode of transmission.		Veterinarian, dairy farmers, ranchers, stockyard workers, slaughterhouse employees, wood handlers, rendering plant workers.	Educate public dispose placenta, birth products, fetal membranes Restrict access to barn and laboratories Use only pasteurized milk and its products Vaccinate Auarantine imported animals	zoonotic disease from 1999, notifiable disease in US Organism are resistant to heat, drying and many common disinfectants.
12	Virus	Hepatitis A Virus	Hepatitis A (HAV)	person to person transmission through fecal, oral route is primary means close personal contacts with household person or sex partner Fecally contaminated food or water uncooked HAV contaminated food source of outbreaks	liver disease	daycare center workers, food preparation workers, sewer and sanitation workers	Vaccination with full 2 dose series	acute infectious disease
13	Virus	Hepatitis B Virus	Hepatitis B (HBV)	percutaneous or mucous membrane exposure to infectious blood or body fluids that contain blood. Unprotected sex with infected person, birth to infected mother, STD, illegal injection drug use	liver disease	health care workers, emergency medicine	routine screening of all pregnant mothers routine infants vaccination	incubation period is 6 weeks to 6 months can be self limited or chronic highest concentration in blood and lower concentration in other body fluids
14	Virus	poxvirus, orf virus	Orf (Sore Mouth Disease)	By touching infected animals or equipments scabs of infected animals contains virus a flock can become infected by contaminated bedding, feed, truck, or direct contact	sores on hand, mouth sore can last 2 months non transmitted disease in humans	Shepherds, stockyard workers, shearers (sheep and goat)	Wearing nonporous gloves when handling sheep goat practicing good hand hygiene	washing with clean, warm water for atleast 20 seconds
15	Virus	Lyssaviruses Rabies virus	Rabies	bite of a rabid animal animals like raccoon, skunks, bats and foxes Saliva transfer	Infects central nervous system ultimately causing disease in the brain and death. Symptoms similar to other illness including fever, headache and general weakness or discomfort. Specific symptoms may include insomnia, anxiety, confusion, slight or partial paralysis, excitation, hallucinations, agitation, hypersalivation, difficulty swallowing and hydrophobia. Death usually occurs with days after appearing the symptoms	Veterinarian Wild animal handlers cave explorer farmers and ranchers	Vaccine	preventable viral disease
16	Fungus (mold)	Aspergillus Common types: Aspergillus fumigatus Aspergillus flavus	Aspergillosis	inhalation	ABPA: allergic respiratory symptoms, such as wheezing and coughing but doesnot destroy tissues. IA: immune system problems, invades and damage tissues in the body	Farmers, grain workers	impossible to avoid avoid dusty environment low immune system people: N95 respirators and avoid activity like gardening and lawn work	common in environment found in soil, on plants and decaying plant matter. Household dust, building material, even in spices and food items.
17	Fungus	Candida species most common: candida albican	Candidiasis thrush	can be transmitted through sexual intercourse	localized infection of skin or mucosal membrane of oral cavity, pharynx or esophagus, gastrointestinal tract, urinary bladder, genitalia	dishwasher, bartender, cooks, bakers, poultry, packing house workers	Frequent hand washing avoid hand to mouth or hand to genitalia contact while handling contaminated items.	

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18	Fungus	Coccidioides species	Coccidiomycosis Valley Fever	can not be transmitted from person to person or animal to person		Contruction, agriculture work, military field training, archeological exploration digging	avoidance of dusty envimment in endemic regions	soil of semiaird areas it is endemic in areas
19	Fungus	Histoplasma Capsulatum	Histoplasmosis	spores become air borne when contaminated soil is disturbed breathing spores causes infection can transmit from infected person to someone else.	symptoms vary greatly but disease affect the lungs can be fatal if untreated	envirnmental remediation workers, farmers, poultry workers, veterinarians	avoid areas of acuumulations of bat and birds dropping. Consult NIOSH/ NCID before starting the job	grows in soil and material contaminated with bat or birds dropping

Particulate	Fine solid or liquid particles, such as dust, fog, mist, smoke or spray
Dust	solid particles (by crushing etc) size Range: 0.1 to 30 µm
Fume	airborne solid particles (by condensation, welding fumes) Size Range: 0.001 to 1.0 µm
Mist	Suspended liquid droplets (by condensation or atomization, fog) Size Range: 0.01 to 10 µm
Fibers	Particulate with aspect ratio (length to width) 3:1
Cyclones	discard particulates larger than 4.0 µm
Filter Media	to sample for particulates (total and respirable particulates, metal, lead, Zinc)
Sorbent Tubes	for sampling gases and vapors
Limit of detection	Lowest level that can be determined to be statistically different from blank sample.
Limit of Quantification	concentration level above which quantitative results may be obtained with certain degree of confidence
Grab Sampling	direct reading instruments or volume of air collected in a container
Personal Sampling	employee wears personal device. Preferred method of worker exposure
Area Sampling	sampling device is stationary
Integrated Sampling	collecting one or more air samples to estimate 8-hr TWA
Direct Reading	calibrated for specific contaminants (methods include fiber optics, photo ionization, flame ionization (multigas meters))
AIHA	American Industrial Hygiene Association accredited Laboratory
Discarded Sample	Discard the sample in post sampling flow rate having +5% error from presampling flow rate

Nephrotoxins	Kidney	Heavy metals (mercury, arsenic, lithium) Halogenated organic compounds (tetra chloride ethylene, CCl4, Chloroform)
Neurotoxins	Nerve Cells	n-hexane
Hematotoxins	Red Blood Cells,	affects bone marrow : arsenic, bromine, methyl chloride, benzene. Affects platelets : aspirin, benzene, tetrachloroethane.
Hepatotoxins	Liver	Carbon tetrachloride, chloroform, tannic acid, trichloroethylene
Lacrimators	instant tearing at low concentrations	Tear gas, MACE
Independent	2=2, 3=3	
Additive Affect	2+2=4 (adding)	acetaminophen and ibuprofen
Synergistic Affect	2+2=5 (more severe effect)	isopropyl alcohol & chloroform
Potentiation	0+2=10 (more potent and dangerous)	Ethanol(ethyl Alcohol) & Chloroform
Antagonism	4+6=8 (less than expected)	Phenobarbital and Benzopyrene
Irritants	Redness, rash, swelling, coughing, hemorrhaging	Chlorine, ammonia
Sensitizers	allergic type reaction acute response may be swelling of breathing tubes, breathing difficulty, Chronic lung disease	Epoxies, aromatic amines, formaldehyde, nickel metal, maleic anhydride
Mutagens	alteration of genes. Malfunction of specific organ and tissue. Gene damage can be passed on to children Ames Testing	Ethylene Oxide. Benzene. Hydrazine
Teratogens	Can damage or death of developing fetus Can not be passed on further generations does not affect the genetic code	Thalidomide, dioxins, lead, cadmium

Biological Safety Program	Three elements: 1. Laboratory practice and techniques, (SOP, enforcement, technical knowledge, ERP, Training) 2. Safety equipments, (Biological Safety Cabinets, PPE and safety centrifuge cups) 3. Facility design & Construction (Secondary barriers)
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Bacteria	Single cell
Viruses	don't have components of cell
RNA (Ribonucleic Acid)	composed of organic compound, not of Cells
Protozoa	are multi cellular organisms

Biosafety Level I	Basic level of containment and relies on standard microbiologic practices.	No primary or secondary barrier required except hand washing facilities	undergraduate or secondary educational training laboratory
Biosafety Level II	Use of standard microbiological techniques, training of personnel, collection of baseline serum samples taken and stored, warning signage and PPE	Class I or Class II biological safety cabinets	Access to laboratory should be limited and decontamination of equipment and instrument. Adequate for most medical laboratories
Biosafety Level III	performing all manipulations of agents in a BSC or other enclosed equipment, such as a gas tight aerosol generation chamber and strict controlled access to the laboratory environment.	Use of biological safety Cabinets (Class I, II, III) and PPE should be strictly enforced.	adequate for laboratories that perform work on indigenous or exotic agents with a potential for respiratory transmission that can cause serious and potentially lethal infection
Biosafety Level IV	highest levels of protection. All manipulations being performed in biological cabinets, sealing openings to the laboratory, standard microbiological practices, warning signage, frequent hand washing	Safety equipment includes BSC Class I, II and III and depending upon agent, special engineering may required.	an air lock between the laboratory and public areas should be installed to prevent escape of hazardous agent.