



# Occupational Health and Safety

Week 6

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# General Information

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- The institutions authorized in diagnosing occupational diseases are; Occupational diseases hospitals, medical faculties of state universities, and state training and research hospitals.
- The following is the way to find out if there is an occupational disease in a person who is admitted with a suspicion of occupational disease in these hospitals:
  - Identification of an exposure that may cause disease,
  - Examination of clinical signs known to be associated with special exposure,
  - Exclusion of non-professional factors as a possible cause of the disease,



# General Information

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- Creation of recommendations for preventive measures at work,
- Notification of occupational diseases to the competent authorities.
- Laboratory tests used in the process of diagnosing the occupational disease can be grouped into 5 titles:
  - 1. General health assessment: blood count, chest X-ray, ECG, complete urine analysis.
  - 2. Nonspecific tests of exposure: mean corpuscular volume, mean corpuscular hemoglobin concentration, eosinophil, liver enzymes, respiratory function test.
  - 3. Tests of the exposed agent or its metabolites: hippuric acid in the urine when exposed to toluene, lead analysis in the blood for inorganic lead poisoning, etc.



# General Information

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- 4. Genetic or allergy tests: serum alpha 1 antitrypsin deficiency in chronic obstructive pulmonary diseases, glucose 6 phosphate dehydrogenase deficiency insensitivity to hemolytic chemicals, looking for IgE or IgG, in organic matter hypersensitivities, etc.
- 5. Chromosomal changes: Some physical and chemical agent exposures can cause chromosomal changes.
- If for any reason there is a suspicion that the disease in the employee who is sick at work is an occupational disease, the method to be followed should be as follows:
  - If the occupational physician is the first to see the employee with suspected illness, he directs the employee to the employer for referral to the Occupational Diseases Hospital.



# General Information

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- The employer is obliged to make an occupational disease notification about the employee within 72 hours.
- If the first person who sees the sick employee and suspects an occupational disease is a family doctor, the patient is referred to an Occupational Disease Hospital and the employer is obliged to make an occupational disease notification about the employee within 72 hours.

# Occupational Diseases Caused by Dust

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- Dusts are dry, solid particles of various sizes. Their size can reach up to  $300\mu$ . They form as a result of abrasion, fragmentation, grinding, and burning in various organic and inorganic substances. Based on their chemical properties dust are divided into two groups: organic and inorganic
- Organic dust can be of natural origin like vegetables (e.g. cottonseed, wood dust, flour dust) and animals (such as feathers, hair, etc.) in addition, dust can also be caused by synthetic components (DDT, trinitro, toluene, etc.)
- Inorganic dust can be classified as; metallic dust (iron, copper, zinc powder, etc.), non-metallic dust (sulfur, coal powder), the dust of chemical compounds (zinc oxide, manganese oxide, etc.), and dust of natural compounds (minerals, clays, mineral ores, etc.)

# Occupational Diseases Caused by Dust

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- The general name of the diseases that are caused by powders is "Pneumoconiosis". Pneumoconiosis is named according to the dust that causes it. Depending on the occupational groups, diseases such as silicosis, asbestosis, berylliosis, and byssinosis occur most often.
- In order for pneumoconiosis to be considered an occupational disease, the insured person must have worked for a total of at least three years in underground and above-ground jobs where there is dust in the air of density and feature to cause pneumoconiosis.
- The 3-year period can be reduced, provided that the approval of the Higher Medical Council approves.



# Silicosis

- Silicosis: it is a lung fibrosis that occurs with silica oxide. It is a common and a dangerous dust disease.
- The symptoms in patients with silicosis are; shortness of breath, cough, and expectoration. In rare cases, severe advanced silicosis may cause shortness of breath and chronic cor pulmonale due to restrictive pulmonary function abnormality.
- The diagnosis of quartz dust lung is made on the basis of radiography in the presence of related work history.
- Although there is no cure for the disease, it is a disease that can be fully prevented if the necessary preventive measures are taken. In addition to silicosis, the inhalation of crystalline silica particles can lead to diseases such as bronchitis and tuberculosis.



# Asbestosis

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- Asbestosis: it is bronchopulmonary fibrosis that occurs due to the inhalation of asbestos fibers.
- Exposure to asbestos is experienced in sectors such as the asbestos textile industry (fibers, fabrics, ropes), asbestos cement industry, building materials industry (processing the asbestos cement products) chemical industry (paint filler, filling materials, molding materials of synthetic resin compression, thermoplastics, rubber products), insulation industry (heat, sound, and fire insulation), paper industry (asbestos paper, cardboard), production of brake pads and clutches and the construction of wagons and ships.
- There are no acute and subacute effects of asbestos inhalation.



# Asbestosis

- Symptoms of asbestosis usually depend on the prevalence of anatomical changes. Complications can make the symptoms more severe. The first symptoms of asbestos inhalation are those associated with restrictive pulmonary function abnormality.
- The symptoms in patients with silicosis are; shortness of breath, cough, and expectoration. Whether the employee has asbestosis is determined by the severity of chronic bronchitis and the extent of pulmonary fibrosis. The same applies to listening signs such as crepitations. The diagnosis of asbestosis is made on the basis of radiography in the presence of related work history.
- Asbestos-related lung fibrosis usually progresses slowly. In most cases of asbestosis, people have been exposed to asbestos fiber-containing dust for many years.



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# Dust Diseases

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- Berylliosis: it is common pneumoconiosis that occurs due to the inhalation of beryllium powders.
- Byssinosis: it is the fibrosis that is characterized by asthma attacks that manifest themselves at certain times, which occur by inhaling cotton fibers, leaf, linen, and hemp dust.
- Siderosis: is the pneumoconiosis that is caused by exposure to iron dust Anthracosis: is the pneumoconiosis that is caused by exposure to coal dust.

# Occupational Diseases Caused by Heavy Metal Exposure

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- Around 0.01-3% of the particles found in nature are formed by heavy metals, that have very toxic effects on health.
- Their importance from the point of view of health stems from the fact that they have the property of accumulating in human tissues and their possible synergistic effect.
- In addition to the airborne particles taken into the body through respiration, a significant amount of metallic particulate matter is also taken into the body through the food we eat and the water we drink.

# Occupational Diseases Caused by Heavy Metal Exposure

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- Metals, which make up a part of atmospheric pollution, spread to the environment as a result of fossil fuel usage, industrial processes, and the burning of metal-containing products in incinerators.
- Lead, cadmium, nickel, and mercury, which are commonly found in the atmosphere, are important among the metals that have a negative impact on human health on a large scale.

# Lead

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- Lead: it is a soft metal of a bluish or silvery-gray color. As organic components of lead, such as tetraethyl or tetramethyl are used as fuel additives they are important pollutant parameters.
- Negative health effects are observed if the concentration of lead in the blood exceeds the limit of 0.2 µg/ml.
- When lead concentration in the blood exceeds the limit of 0.2 µg/ml, blood synthesis inhibition is observed. When it exceeds the limit of 0.3-0.8 µg/ml, a decrease in communication between motor and sensory neurons is observed. In addition, it has been observed that when the lead concentration in the blood exceeds the limit of 1.2 µg/ml, irreversible brain damage occurs.



# Lead

- Lead is mainly taken into the body through the respiratory and the gastrointestinal tract in the form of dust or smoke.
- Lead has effects on hemoglobin synthesis and erythropoiesis, smooth muscle system, peripheral and central nervous system, and vascular system in particular.
- Acute effects of lead are rarely observed.
- Symptoms such as mild anemia, basophilic stippling in erythrocytes, pale skin and mucous membranes, general fatigue, anorexia, headache, weakness, pain in the limbs and sometimes the joints, and gastrointestinal disorders such as constipation are observed due to chronic lead exposure.



# Cadmium

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- Cadmium (Cd) is a silver-white colored metal. It quickly turns into cadmium oxide in the air. Its organic salts such as cadmium sulfate, cadmium nitrate, and cadmium chloride are water-soluble.
- In the case of concentration of cadmium fumes in the air exceeding the limit of  $1\text{mg/m}^3$ , it is possible to observe acute effects on respiration.
- Due to the low excretion rate of cadmium from the body and its accumulation, its negative effects on health are observed over time.



# Cadmium

- The organs that will be affected the most by prolonged exposure are the kidneys. Studies showed that; if the cadmium concentration (based on weight) in the kidneys reaches 200 mg/ kg, deteriorations in kidney functions are observed.
- The damage caused to the kidney is not reversible.
- The effect of cadmium in the formation of lung and prostate cancers has been determined precisely.

# Nickel

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- Nickel is a silvery-white, hard metal. Nickel compounds are practically insoluble in water. Its water-soluble salts are; chloride, sulfate and nitrate. In biological systems, nickel forms complexes with adenosine triphosphate, amino acids, peptides, proteins, and deoxyribonucleic acids.
- As a result of inhalation of nickel compounds in the air, abnormal functions such as; respiratory tract irritation, respiratory tract destruction, immunological change, an increase in the number of alveolar macrophage cells, a decrease in cilia activity, and immune system power occur in relation to the respiratory defense system.
- As a result of skin absorption, allergic skin diseases occur.

# Nickel

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- Although there is no reliable evidence about the effects of long-term exposure to nickel in the air on human health; nickel has been proven to cause nasal and laryngeal cancers, as well as adverse health effects such as asthma in those working in the nickel business.
- Due to its carcinogenic effect, it is not possible to specify the safety limit of nickel.

# Occupational Diseases Caused by Exposure to Solvents

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- Solvents are used in almost every sector of industry. Paint, varnish, lacquer manufacturing, application, removal, metal polishing, ink, toner printing jobs, priming, coating jobs, and dry cleaning are jobs that use heavy solvents.
- Solvents have wider use in industry; solvents are used in metal goods production before painting, in degreasing before welding, in the washing machines in parts machine maintenance, in almost every stage in the production of plastic goods, in almost all works where adhesives are used, in the manufacture of insecticides, in the manufacture of chemicals and even in the production of cosmetics.
- The material safety forms of the solvents should be obtained and the chemicals they contain and their health effects should be examined.

# Occupational Diseases Caused by Exposure to Solvents

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- Solvents enter the human body in three ways:
  - Through inhalation: Most solvents can evaporate rapidly at room temperature. Solvent vapor, particles, and solvent-contaminated powders easily get into the blood flow through the lungs. This is the most important way of being affected.
  - Through swallowing: Ingestion of food eaten with solvent-contaminated hands or direct consumption of solvent-contaminated food causes exposure through digestion.
  - Through the skin: they reduce the protective effect of the skin with their fat-dissolving characteristics. They are easily absorbed through the skin and pass into the blood.

# Occupational Diseases Caused by Exposure to Hazardous Gases

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- Gases can be released at every production stage in the industry and can adversely affect the health of employees.
- Of the lethal chemical agents; sulfur lewisite and mustard burn and scorch the skin and eyes, as well as shocking the lungs. Phosgene and chlorine irritate the eyes.
- Gases such as hydrogen cyanide and sarin prevent nerve conduction, causing tremors, and death by paralysis of the respiratory organs.

# Occupational Diseases Caused by Exposure to Hazardous Gases

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- Sulfur Compounds: Sulfur gas is released during the combustion of sulfur-containing substances such as oil and coal, as well as during the processing of certain sulfur-containing substances. Inhalation of these sulfur compounds can lead to diseases such as bronchitis and asthma.
- Oxides of Nitrogen: Nitrogen oxides are emitted mainly from power plants and exhaust pipes of motor vehicles. Inhalation of nitrogen dioxide, which is nitrous oxide, leads to heart, lung, and liver disorders and respiratory diseases.

# Occupational Diseases Caused by Exposure to Hazardous Gases

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- Carbon Oxides: as a consequence of the use of fossil fuels and forest fires, a large proportion of carbon dioxide gas is emitted into the atmosphere. In addition, carbon monoxide gas, which is formed by the reaction of methane with oxygen, is also a pollutant. Carbon oxides cause dizziness and slowing of reflexes. Their presence in the air at high rates can lead to death.
- Hydrocarbons: The incomplete combustion of petroleum used in motor vehicles causes the release of hydrocarbons such as ethylene and benzene into the environment. These hydrocarbons have harmful effects on the eyes and respiratory tract when they react with other chemicals in the air.

# Occupational Diseases Caused by Cold Working Conditions

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- A person can be assumed to have been exposed to cold stress when working in technologically cooled spaces below -25°C unless the exposure to low temperatures is short.
- Circulatory disorders may occur in the skin and mucous membranes that are caused by local cooling.
- Cold burns, discharge, or inflammatory reactions of the mucosa are observed on the skin exposed to cold.
- The general effect of cold is directly on the cardiovascular system, respiratory system, and metabolism.

# Occupational Diseases Caused by Hot Working Conditions

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- Human thermal comfort is mainly determined by heat generation and loss.
- Heat loss occurs through convection, conduction, radiation, and the evaporation of sweat.
- Heat loss may increase as a result of an increase in peripheral blood flow and by an increase in sweat evaporation. The adverse effects on comfort and health are usually caused by the imbalance between heat loss and heat generation.
- This imbalance is usually caused by the overloading of heat loss mechanisms due to heat stress from the combination of physical strength in the workplace with heat generation and the high temperature of the workplace air.

# Occupational Diseases Caused by Hot Working Conditions

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- If workers are not acclimatized, all work done in hot conditions involves short-term heat stress.
- Acute illness can reduce heat tolerance. For that reason, the health of the worker should be taken into account during the medical examination of acute cases, even if the attending physician does not find anything serious.
- Heat shock, heat cramps, and heatstroke may occur in people who experience high heat exposure.

# Occupational Diseases Seen in People Working With Screened Tools

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- The work that the employees do by using the screened tools as an important part of their normal work is classified as screened tool work.
- Depending on the intensity and duration of working with the screened tool, -which has restrictive sight distance, or is ergonomically ill-designed- people working with screened tools can develop symptoms such as headaches, burning, and watering of the eyes, and blurred vision and they may develop muscle and joint ailments resulting from poor working positions.
- Acute illness can reduce heat tolerance. For that reason, the health of the worker should be taken into account during the medical examination of acute cases, even if the attending physician does not find anything serious.