

7th and 8th lecture:

Occupational Health

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** No need to memorize the numbers (dates and statistics)



Examples of famous industrial accidents: (purple color = no need to memorize)

September 21, 1921: Oppau explosion in Germany. Occurred when a tower silo storing 4,500 tonnes of a mixture of ammonium sulfate and ammonium nitrate fertilizer exploded at a BASF plant in Oppau, now part of Ludwigshafen, Germany, killing 500–600 people and injuring about 2,000 more.

1932-1968: The Minamata disaster was caused by the dumping of mercury compounds in Minamata Bay, Japan.

It is estimated that over 3,000 people suffered various deformities, severe mercury poisoning symptoms or death from what became known as Minamata disease. is a medical specialty dealing with **disorders of the nervous system**.

Methylmercury, an organic mercury compound released in factory wastewater and the cause of Minamata disease

December 3, 1984: The Bhopal disaster in India is the largest industrial disaster on record.. A faulty tank containing poisonous methylisocyanate leaked at a Union Carbide plant. About 20,000 people died and about 570,000 suffered bodily damage.

April 26, 1986: Chernobyl disaster.

At the Chernobyl Nuclear Power Plant in Ukraine a test on reactor number four goes out of control, resulting in a nuclear meltdown.

The ensuing steam explosion and fire killed up to 50 people with estimates that there may be up to 4,000 additional cancer deaths over time among the approximately 600,000 most highly exposed people.

March 23, 2005: Texas City Refinery explosion. An explosion occurred at a British Petroleum refinery in Texas City, Texas.

April 20, 2010: Deepwater Horizon oil spill in the Gulf of Mexico.

What you need to memorize: IMP

- **Minamata disaster:** caused by **Methylmercury** (organic mercury). However, Minamata disease is a disorder of the nervous system.
- **Bhopal disaster** caused by **Methylisocyanate**.

Occupational health: can be divided into many divisions and the integration of those divisions is very important. These divisions are:

- ✓ **Occupational diseases.**
- ✓ **Occupational safety.**
- ✓ **Occupational toxicology.**
- ✓ **Occupational environment.**
- ✓ **Analysis of biological samples**
- ✓ **Occupational Ergonomics.**
- ✓ **Air pollution.**
- ✓ **Occupational Legislation.**

Internal factors affect Workers: (IMPORTANT)

1. Worker health.
 2. Age.
 3. Genetics.
 4. Physical fitness.
- Workers with **family history** of certain diseases are not encourages expose to chemicals and radiation hazards. Even at low exposure level.
 - Also **a young worker** of highly physical fitness shows much resistant to occupational diseases than aged one.

External factors affect Workers: (IMPORTANT)

1. **Physical factors:** such as the exposure to **heat stress, noise vibration, electromagnetic fields, and radiation.**
2. **Chemical factors:** exposure to **dust, gases, and acid vapors.**
3. **Biological factors:** such as food deficiency, vitamin deficiency, Anthrax for wool industries, Cow Pox for cow farms, Schistosomiasis for agricultural fields.
4. **Occupational social factors:** for workers how **immigrates seeking** jobs from rural area to urban areas which may cause social problems.

Occupational Hazards:

- **Physical hazards** may include:
 1. Noise
 2. Temperature extremes
 3. Illumination extremes
 4. Ionizing or non-ionizing radiation
 5. Ergonomics.
- **Chemical hazards** related to Dangerous Goods or Hazardous Substances are frequently investigated by Occupational Hygienists. Other related areas including Indoor air quality (IAQ) and safety may also receive the attention of the Occupational Hygienist.
- **Biological hazards** may stem from the potential for legionella exposure at work or the investigation of biological injury or effects at work, such as dermatitis may be investigated.

Appropriate controls (IMPORTANT) : are selected from the hierarchy of control: by

- **Elimination**
- **Substitution**
- **Engineering**

- **Substitution:**

Substitution of a More Hazardous Chemical by a Less Hazardous Chemical

Task	Hazardous Chemical	Substitute
Extraction solvents	Ethyl ether; Methyl-t-butyl ether (MTBE) ¹	Hexanes ¹
Oxidation of organic compounds	Chromate ion	Hypochlorite ion ¹
Qualitative test for heavy metals	Sulfide ion	Hydroxide ion ¹
Freezing point lowering	Benzene	Cyclohexane; Sodium chloride solution

Heavy metal exposure occurs through three primary routes:

➤ **Inhalation:**

Common examples include workers scraping or sanding lead paint and workers in factories where heavy metals are melted and processed.

In the days before leaded gasoline was banned, those living alongside heavily traveled roads faced significant exposure through tailpipe emissions.

➤ **Ingestion:**

The leading cause of lead poisoning in children is eating old paint chips.

A major source of elevated mercury levels in humans comes from eating contaminated fish.

And people can drink arsenic from wells contaminated by arsenic-containing pesticides.

➤ **Skin absorption:**

Day to day contact with heavy metals can cause poisoning.

Dermal exposure is a serious concern for workers in fields where the irrigation water contains naturally-occurring arsenic (such as Asian rice paddies).

Occupational disease:

(It is important to differentiate between occupational disease and injury)

The term "occupational disease" refers to those illnesses caused by exposures at the workplace. **They should be separated, conceptually, from injuries that may also occur at workplaces due to a variety of hazards.**

Occupational diseases may **occur in varying time frames**, from the instantaneous development of illness following exposure to toxic chemicals to decades between onset of exposure and the development of disease, as occurs with many occupationally related cancers.

Although **not all occupational exposures that cause illness lead to death**, considerable numbers of deaths each year are associated with workplace exposures. While it is relatively **easy to count deaths due to occupational injuries**, it is much more difficult for delayed illnesses.

The leading causes of **death from injuries vary by sex**, with motor vehicles accounting for the greatest number of deaths in men, and homicides in women. Workers older than sixty-five have the highest rates of occupational-injury deaths.

As noted above, deaths from occupational illness for most diseases are hard to enumerate. **The only diseases for which reasonably good data exists are the pneumoconiosis**, such as **asbestosis**, coal-workers pneumoconiosis, and **silicosis**.

For many other diseases, such as those from chemical exposure, various occupational cancers, and other problems, individual fatalities are difficult to recognize and record.

Asbestosis is a lung disease that occurs from breathing in asbestos fibers. Causes scar tissue (fibrosis) to form inside the lung. Scarred lung tissue does not expand and contract normally.

Severity of the disease depends on how long the person was exposed to asbestos and the amount breathed in.

Silicosis is a lung disease that is caused by inhaling tiny bits of silica. Silica is a common mineral that is part of sand, rock and mineral ores like quartz. Mask does not prevent silicosis.

Examples of varying time frames include: (IMPORTANT)

- **Instantaneous reactions** to exposure to chemicals such as chlorine or ammonia gas
- **Delay of some six to twelve hours** with fumes of aerosolized zinc, as occurs when welding on galvanized steel.
- **Delay of weeks to months** with lead poisoning.
- **Delay of decades** with occupational carcinogens.
- **Congenital malformations** in children whose parents may have been exposed to hazardous materials.

Most common report occupational diseases:

Those relating **to repeated trauma**:

- **Carpal tunnel syndrome**
- **Tendonitis**
- **Noise-induced hearing loss:** Most common reported occupational disease in the EU

For those cases of **carpal tunnel syndrome** with workplace absence, half needed twenty-five or more days away from work.

Occupational Dermatitis is often an inflammatory skin reaction caused by occupational contact factors. Dermatitis, or inflammation of the skin cases required time away from work.

❖ Noise:

Noise is most obviously a problem in industries such as manufacturing and construction; it can also be an issue in a wide range of other working environments

What is noise?

Noise is an unwanted sound. its intensity ('loudness') is measured in **decibels (dB)**.

The decibel scale is logarithmic, so **a three-decibel increase in the sound level already represents a doubling of the noise intensity.**

For example, a normal conversation may be about 65 dB and someone shouting typically can be around 80dB. The difference is **only 15 dB but the shouting is 30 times as intensive.**

The **duration of exposure is also very important**. To take this into account, time-weighted average sound levels are used. For workplace noise, this is usually based on an 8-hour working day.

PERMISSIBLE NOISE EXPOSURES	
Duration per day, hours	Sound level dBA slow response
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
.25 or less	115

What problems can noise cause?

- **Increasing the risk of accidents** by masking warning signals
- Physiological effects
- Increase the risk of **hearing loss**
- Being a causal factor in work-related stress.

Who is at risk: (IMPORTANT)

Anyone who is exposed to noise is potentially at risk. The **higher the noise level**, and the **longer you are exposed** to it, the **more risk** you have of suffering harm from noise.

- Noise is being recognized as a problem in service sectors such as education and healthcare, bars and restaurants.
- A study of noise in kindergartens found some averaging noise levels over 85dB
- During a performance of Swan Lake, a conductor was recorded as being exposed to 88dB
- Truck drivers can be exposed to 89dB
- Noise on pig farms has been measured up to 115dB

**** No need to memorize the numbers**

Important points:

- The causes of Minamata disaster and Bhopal disaster
- Internal and external factors that affect worker
- Differentiate between occupational disease and injury
- Appropriate controls of occupational hazards
- Examples of varying time frames of occupational diseases
- The only diseases for which reasonably good data exists are the pneumoconiosis, such as asbestosis
- Most common report occupational diseases are repeated trauma such as Carpal tunnel syndrome
- Maximum sound level that is exposed for 8 hours is 90 dB
- Risk factors of the noise

Thank you ☺