

What are Dangerous Substances?

Dangerous substances are any liquid, solid or gas that poses a risk to the health and safety of the workers. These can be found in almost all workplaces, and although some highly dangerous substances, such as asbestos, are under control or prohibited, others are still in use and legislation is in place to ensure that the risks associated with these substances are mitigated and controlled.

Research shows that millions of workers come into contact with harmful chemical agents. In fact, in 2015 it was reported that 17% of EU workers are exposed to dangerous substances for at least a quarter of their working time, while 15% of EU workers have reported breathing in smoke, fumes, powder or dust at work. Such findings indicate the high risk associated with the use of dangerous substances at the workplace, and thus the importance of providing the necessary control measures to reduce or control the workers' exposure to these substances.

Uses of Dangerous Substances – Sectors of Work

Dangerous substances are used by different sectors and professions, different groups of workers and in different tasks.

Examples of sectors where the use of dangerous substances is often encountered include:

- Agriculture, forestry
- Construction
- Manufacturing
- Health care laboratories and pharmaceuticals
- Cleaning
- Hairdressing
- Transportation and storage
- Mining and quarrying
- Waste treatment and disposal



Fig 2

Emerging risks

The introduction of new technologies, growing sectors and changes to the way work is organised can result in greater risk of harm from chemical agents. In the environmental sector, for example, innovative technologies can introduce new risks which are poorly understood. To give another example, more and more workers are exposed to dangerous substances in service professions such as home care and waste management, where the exposure is varied but awareness of the hazards involved is low. This entails, that both employers and employees understand the potential risks and take preventive action as necessary.

How do dangerous substances enter the body?

The main routes of entry of toxic substances at work into the body are:

- Inhalation – for gases, vapours, dusts, fumes and aerosols
- Skin absorption
- Ingestion – this is rare but can result from the consumption of food and drink at process areas in workplaces; also inhaled particles trapped in the respiratory tract can be coughed up and then ingested.
- Placental transfer/ingestion of breastmilk – from the pregnant/breastfeeding worker to offspring

Health Effects

Health effects can be acute or long term and some substances can have a cumulative effect. The most common effects are:

- Local effects – include skin and mucous membrane irritation e.g. to the eyes, nose and throat and to the lower respiratory tract
- Systemic effects – any organ in the body can be affected such as the liver, kidney, heart, reproductive, endocrine and nervous system. Toxicity can be caused by the chemical itself, or by metabolites usually produced on passage through the liver.
- Sensitization – repeated exposure even at low concentrations of certain chemicals can cause an allergic reaction of the skin known as dermatitis or of the respiratory tract such as asthma.
- Reproductive problems or birth defects
- Cancer

Some dangerous substances pose safety risks, such as risk of fire, explosion or suffocation. In addition, dangerous substances normally have several of these properties.



Preventive measures and management of dangerous substances

To protect workers from dangerous substances, the first step is to carry out a risk assessment. Then, actions should be taken to remove or reduce the risks as far as possible. Finally, the situation should be regularly monitored, and the effectiveness of the steps taken reviewed.

Employers also need to take into account any vulnerable groups, such as workers who are young, pregnant or breastfeeding, for whom special protection is required by law. Other groups of workers, such as migrant workers, untrained or inexperienced staff, and contractors, such as cleaners, also need to be considered and prevention has to be provided tailored to their needs.

Risk assessment of dangerous substances

Risk assessment is fundamentally a process of information and investigation of the hazardous properties of substances present and of the conditions under which people work with these. This process is then used to determine the existing risks to the persons exposed and the harm which may occur with a final evaluation of the possibility of such harm being attained. Such a risk assessment is a legal obligation and should be carried out concomitantly or as part of the general risk assessment if substances are present in the workplace.

Risks due to exposure to a hazardous chemical agent are assessed through the criteria usually used for industrial hygiene, bearing in mind the following variables:

- the hazardous properties of the chemical agents, in particular the information contained in the safety data sheets which the supplier is obliged to provide, and the occupational exposure limit values or biological limit values established by law;
- the type of exposure (skin, inhalation, etc.);
- the duration of the exposure;
- the working conditions with regards to said agents, including quantities of the agent;
- when available, conclusions drawn from health surveillance studies.

Occupational health and safety (OHS) legislation establishes a hierarchy of measures that employers need to take to control the risks associated with dangerous substances.

- *Elimination and substitution* are at the top of the hierarchy of control measures. Where possible, eliminate the use of dangerous substances by changing the process or product in which the substance is used.
- If elimination is not possible, substitute the dangerous substance with a non-hazardous or less hazardous one.



- If a substance or process cannot be eliminated or substituted, the exposure can be prevented or reduced by means of *engineering solutions* and *administrative control*. These include, for example, control of the emission at the source (closed system or local exhaust ventilation) or reducing the number of workers exposed to the dangerous substance, and the duration and intensity of exposure.
- Finally, the use of *personal protective equipment* (PPE) is the last resort where exposure cannot be adequately controlled by other means.

Workplace air monitoring and Biological monitoring

Air monitoring

Air monitoring measures the concentration of a chemical in the air in a person's breathing zone. Air sampling in the workplace is required when a risk assessment indicates that monitoring is necessary. It is also used to ensure compliance with appropriate legislation and to evaluate control measures. The chemical agents regulations SL 424.24 Article 4 states that if it can be shown that existing preventive or control measures adequately reduce the risk then monitoring may not be required.

Air monitoring can be either periodic or continuous and is the quantitative or qualitative assessment of the extent of pollutants in or around the workplace. There are numerous approaches to measuring dangerous substances in air ranging from simple passive sampling techniques to sophisticated remote sensing devices. A monitoring strategy should be in place taking into account the most appropriate methodology in terms of costs and practicability.

Biological monitoring

Biological monitoring for chemical exposure contributes to the aim of preventing unacceptable health risks by providing information on the control of occupational exposure. It can give an indication of absorption by all routes of exposure, consequently, it is often used to complement workplace air monitoring. Therefore, biological monitoring may be particularly useful for those chemicals which are easily absorbed through the skin or taken in by ingestion, or where exposure is controlled by personal protective equipment.

Health Surveillance

Health surveillance is the regular assessment of the worker's health to detect early signs of ill health effects resulting from exposures to dangerous substances at the place of work. In the cases of certain substances such as lead and asbestos there is a legal obligation to carry out health surveillance.



SL 424.24 obliges an employer to make arrangements for carrying out appropriate health surveillance of workers for whom the results of the risk assessment reveal a risk to health.

When is a health surveillance appropriate?

- (i) the exposure of the worker to a hazardous chemical agent is such that an identifiable disease or adverse health effect may be related to the exposure, and
- (ii) there is a likelihood that the disease or effect may occur under the particular conditions of the worker's work, and
- (iii) the technique of investigation is of low risk to workers.
- (iv) Furthermore, there shall be valid techniques for detecting indications of the disease or effect.

Dangerous Substances – Carcinogens

There are many dangerous substances classified as carcinogens to which workers may be exposed. Some are generated by work processes themselves.

There are specific provisions in the EU to protect workers. According to LN 122 of 2003, employers must assess and avoid or minimise the exposure to carcinogens or mutagens. In addition to applying the hierarchy of prevention measures:

- They shall replace a carcinogen or mutagen in so far as is technically possible with a substance, mixture or process which is not or is less dangerous.
- Where this is not possible, ensure that it is, in so far as is technically possible, manufactured and used in a closed system.
- Where a closed system is not technically possible, employers shall reduce exposure to as low as is technically possible, limiting the quantities and keeping the number of workers exposed as low as possible.

They must also:

- Demarcate risk areas and use adequate warning and safety signs
- Design the work processes to minimise the substance release
- Evacuate carcinogens or mutagens at source, but respect the environment
- Use appropriate measurement procedures (especially for early detection of abnormal exposures from an unforeseeable event or accident)
- Use individual protection measures if collective protection measures are not enough
- Provide for hygiene measures (regular cleaning)
- Draw up emergency plans
- Use sealed and clearly and visibly labelled containers for storage, handling, transportation and waste disposal





They also have specific information requirements for workers and authorities and need to keep records of exposed workers, measurements and health surveillance results.

The benefits

Everyone benefits from preventing the risks of exposure to dangerous substances - workers benefit from improved safety and health, while the management benefits from improved reputation of the organisation. Other benefits include:

- Improves immediate and long-term health of the workers exposed to the dangerous substance. This can significantly lower sickness absence;
- Less dangerous substances generally mean less costs for control measures and waste disposal;
- Reduced hazardous air emissions;
- Easier compliance with legislation

Biological Agents

Biological agents are mainly bacteria, viruses, fungi (yeasts and moulds) and parasites, and are found in many sectors. Although biological agents do not exist in liquid, solid or gas form, and are usually invisible, exposure to such agents pose many risks. Workers in some sectors are particularly at risk of exposure to harmful biological agents, these include: healthcare, agriculture, veterinary services, cleaning and maintenance, sewage and waste management, gardening and laboratory work.

LN 228 of 2003 classifies biological agents into four risk categories according to their potential to cause diseases and the possibilities of prevention and treatment. The list of biological agents provides indications of allergenic potential and toxic effects. Measures proposed include containment categories for laboratory work and industrial processes. These regulations also lay down requirements for notification of selected activities to authorities. For workers likely to be exposed to certain biological agents, employers must keep records including information about exposure and health surveillance. Moreover, workers must be provided with access to their personal data.



Fig 4

References

Dangerous Substances. [online] Available at:

<https://osha.europa.eu/en/themes/dangerous-substances>

Image resources

Fig 1: <https://www.hibiscus-plc.co.uk/eu-osha-healthy-workplaces-campaign-advises-on-managing-worker-exposure-to-dangerous-substances/>

Fig 2: <https://www.gsmsds.com/wp-content/uploads/2017/10/Common-Chemical-Safety-1024x645.jpeg>

Fig 3: <http://weekly.uhm.org.mt/wp-content/uploads/2018/05/chemical-hazards-st-louis-workers-comp.jpg>

Fig 4: <https://www.tensator.com/wp-content/uploads/close-up-of-a-scientist-in-protective-suit-with-hazardous-blue-chemical-in-flask-at-the-laboratory.jpeg>