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THE SAFETY GUIDE

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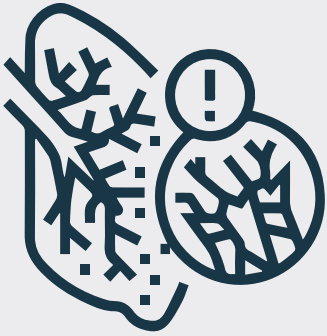
THE SAFETY GUIDE

Everyone talks about safety, but how many know what parameters define it? To meet this need, we have prepared this guide based on the monograph written by Dr. Antonio Moffa, Dr. Claudia Beccaria and Lucrezia Giorgi of the Unit of Integrated Therapies in Otolaryngology at the University Polyclinic Campus Bio-Medical Foundation in Rome.

ASBESTOS

Since the end of the last century, asbestos has been identified as a major carcinogen, so much so that today it is the cause of about half of all occupational cancer deaths.

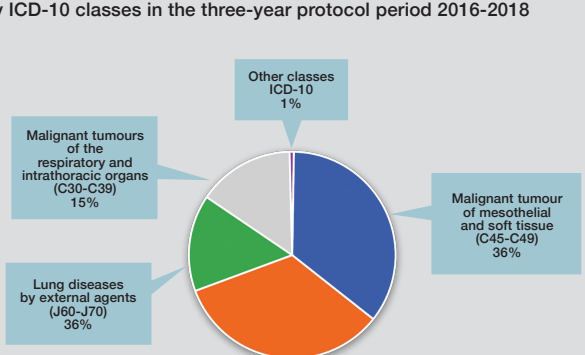
In five-year period 2016-2020, an average of about 1,500 workers per year were recognised as having an asbestos-related disease. In the same years, about 50 per cent of workers who contracted asbestos-related diseases suffered a permanent impairment of no more than 25%, while 37% of technopaths died as a result of the occupational disease. Specifically in 2016, the share of workers with a disability of no more than 25% remained virtually unchanged, but fatally ill workers rose to 43%.



The use of asbestos was banned in Italy in 1992 by Law no. 257, which set the terms and procedures for the cessation of all processing and mining of this mineral. After this date, the only permitted work activities involving exposure to asbestos are its clearance, removal and disposal. The IARC (International Agency for Research on Cancer) has classified asbestos as a human carcinogen (Group 1).

The hazard of asbestos derives from the degrees of freedom of fibres, i.e. the ability of asbestos-containing materials to release potentially inhalable fibres into the air. Since asbestos is a friable and fibrous material, it is easy for very small particles to be released into the air as a result of any type of stress (processing and handling, vibrations, moisture infiltration), which, once inhaled, are capable of being deposited in the pulmonary alveoli, bronchi and pleura, causing irreversible tissue damage and the

Graph of percentage distribution of asbestos-related diseases by ICD-10 classes in the three-year protocol period 2016-2018



Source: Open Data Inail - Six-monthly national tables updated on 30/04/2021.

onset of lung diseases. Moreover, since there is no risk threshold below which the concentration of asbestos fibres in the air is not dangerous, it follows that the inhalation of even a single fibre can cause fatal pathologies; clearly, prolonged exposure over time or to high quantities will exponentially increase the likelihood of contracting such pathologies.

The European Commission recently approved an exposure limit value (or TLV) 10 times lower than the previous one (0.1 fibres/cm^3), i.e. 0.01 fibres/cm^3, for an 8-hour exposure reference.

The harmful effects that occur

The respiratory incidences are summarised below based on the size of the fibres:
- over 7 µm: oral and nasal cavity
- up to 7 µm: larynx
- up to 4.7 µm: trachea and primary bronchi
- up to 3.3 µm: secondary bronchi
- up to 2.1 µm: terminal bronchi
- up to 1.1 µm: lung alveoli.

The exposure limit values (or TLVs) are 0.1 fibres/cm³ for an 8-hour exposure reference

following the inhalation of asbestos fibres are derived from pathogenic mechanisms of an irritative, degenerative and carcinogenic nature and can lead to the onset of various diseases.
Diseases resulting from breathing in asbestos fibres are all characterised by a long interval between the start of exposure and the appearance of the first symptoms of the disease: this interval, termed 'latency time', can generally last up to decades.
From these pathologies related to asbestos exposure derives the importance of worker protection, which must be on several fronts: the worker must be equipped with personal respiratory protective equipment with an operational protection factor such that the filtered air inside the PPE is no more than

1/10 of the limit value. The use of PPE must also be interspersed with rest periods appropriate to the physical demands of the job and the employer must carry out periodic measurements of the concentration of fibres in the air, reporting the results in the Risk Assessment Document.

STEEL INDUSTRY

WELDING AND METALWORKING

Metal handling operations are recognised and classified as those that pose the highest health risk, due to both the substances used and the alloys obtained and their various production processes.

The metallurgical industry deals mainly with the processing of base and precious metals to produce what are called mineral or metal matrix composites. The steel sector, on the other hand, deals more specifically with the production of ferrous metals (iron and steel).
Products from both industries are widely used in construction, transport, vehicle manufacturing and household appliances. However, there are specific hazards for this category of workers, namely the melting of compounds, the use of quartz dusts and various metals, iron oxide fumes and gases and vapours such as carbon monoxide (CO), hydrogen cyanide (HCN), hydrogen sulphide (H2S), benzene (C6H6), asbestos, talc and others. The particles released into the air are deposited in the respiratory tract from the moment they are inhaled.

In the iron and steel industry, the highest risk is posed by the use of blast furnaces, which are required for the continuous pro-

duction and casting of cast iron.
During steel production, many toxic gases are released, such as carbon monoxide (CO), carbon dioxide (CO2) and other explosive gases such as methane (CH4). This means that the atmosphere must be constantly monitored with powerful gas detectors to observe the current occupational exposure limits.

All respiratory diseases of the lungs, generated by prolonged exposure to and inhalation of air pollutants, are classified as pneumoconiosis. All those affecting the bronchial mucous membranes are termed bronchopathies.
Various occupational agents, on the other hand, are associated with lung cancer. The main ones are asbestos fibres, nickel compounds, arsenic, diesel exhaust and radon gas.

In general, diseases with a shorter latency period, such as allergic

diseases, prevail among younger people: asthma and rhinitis in the 16-29 age group account for 58.3% and 33.3% of respiratory diseases, respectively. Pneumoconiosis, on the other hand, occurs almost exclusively in the older age groups; asbestosis in the 60+ age group accounts for 37.9% of respiratory diseases and silicosis in the 50-59 age group for 21.9%. In fact, the control of silica dust in workplaces and the banning of asbestos have led to a decline in these diseases, which nevertheless continue to be found in people who have been exposed in the past.
Specific safety measures for the respiratory tract should there-

fore be evaluated and risk assessment should take into account the emergence of new risk situations. For example, in recent years, cases of silicosis, even with a short latency onset (acute silicosis), have been reported in the literature.

Experience suggests the usefulness of dust suppression and wet processing, in addition to the systematic use of PPE appropriate to the level of risk (FFP3 masks).

BODYSHOP SECTOR

The body shop sector is made up of a large number of companies, most of them artisan-type, which have risk factors that may be related to building structures, equipment, machines and installations as well as the products used.

The activity of car repairer includes the maintenance and repair of motor vehicles, including mopeds, agricultural machinery, trailers and carts, used for road transport of persons and goods.
The activity of car repair can be distinguished into:
• mechanics and motoring, which includes work on fuel systems, work on LPG-methane systems, engine overhaul and rectification, work on radiators, replacement of mufflers, and general mechanical overhaul;
• car electricians, which includes repair workshops for electrical and power systems of motor vehicles;
• tyre repair, which consists of repair and replacement of motor vehicle tyres, rebalancing and convergence of tyres;
• bodyshop, which involves repairing the bodywork of industrial vehicles, buses, camping vehicles and the like by means of sheet metal work and paint-

ing, replacing or repairing windscreens and windows, rust treatment, etc.

The work of body repairers involves a multitude of risks, including inhalation of fumes, welding gases, grinding or sanding dust, paint aerosols, solvent vapours during the filling and painting of car parts or complete cars, vapours and aromatic hydrocarbons, exposure to solvents when cleaning work tools and airbrushes.

The main occupational diseases of workers in the sector are respiratory diseases and in particular bronchial irritative diseases and bronchial asthma. (see table)
Thus, many products are used in auto body shops that are useful and necessary to carry out the activity, but which can be hazardous to human health and/or safety.
The risk due to the use of hazardous substances is often poorly perceived as many chemicals can be dispersed in

Tumours (C00-D48)
Malignant tumours of the respiratory system and intrathoracic organs (C30-C39)
1. Malignant tumour of the bronchi and lung
2. Malignant tumour of the paranasal sinuses
3. Malignant tumour of the larynx
Malignant tumour of mesothelial and soft tissue (C45-C49)
1. Mesothelioma
2. Mesothelioma of the peritoneum
3. Pleural mesothelioma

Diseases of the Respiratory System (J00-J99)
Other diseases of the pleura (J90-J94)
1. Pleural plaque
2. Pleural effusion not elsewhere classified
Other upper respiratory tract diseases (J30-J39)
1. Chronic laryngitis and laryngotracheitis
Chronic lower respiratory tract diseases (J40-J47)
1. Other chronic obstructive pulmonary diseases
2. Asthma
3. Predominantly allergic asthma
4. Chronic unspecified bronchitis, chronic bronchitis s.a.i., chronic tracheobronchitis
5. Unspecified chronic obstructive pulmonary disease
Pulmonary diseases caused by external agents (J60-J70)
1. Other acute and subacute morbid conditions of the respiratory system from chemical substances gas fumes and vapours
2. Chronic respiratory morbid conditions caused by chemicals gases fumes and vapours
3. Bauxite fibrosis of lung
4. Pneumoconiosis from other dusts containing silica s.a.i.
5. Pneumoconiosis due to asbestos (asbestos) and other mineral fibres asbestosis
6. Siderosis

the working environment (in the air) and enter the body through different routes (inhalation, swallowing and through the skin) without even being aware of it.
The use of personal protective equipment for the respiratory system is therefore necessary for exposure to organic dusts and vapours. In particular, half-masks with combined dust and vapour filters should be used for painters, and disposable FFP2 or FFP3 filtering masks for plasterers and sanders.

CARPENTRY CRAFTSMANSHIP SECTOR

Since 2000, with the entry into force of Legislative Decree No. 66, work involving exposure to hardwood dusts has in fact been included in the list of work with a carcinogenic risk for humans, since exposure to these substances can cause the onset of various diseases if inhaled through the air.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Wood dust can be hard or soft. According to the literature, hardwood dust (i.e. from wood belonging to trees of the broadleaf or angiosperm family) is among the harmful substances that can cause various diseases if inhaled via the air. These include tumours of epithelial origin, slow induction, with an estimated latency period between 20 and 40 years and an age of onset between 55 and 70 years. These diseases, which are rare in absolute terms (about 1% of all malignant neoplasms), occur about 5-10 times more frequently in woodworkers. In addition, dry coughs, chronic coughs, recurring colds, as well as eye and nose irritation and asthma are also recognised as woodwork-associated diseases with a short latency period.

Occupations that may expose workers to hardwood dust are mainly those related to timber production and processing. In particular, wood processing: debarking, sawmilling, joinery and carpentry (sawing, sanding, planing, profiling, polishing, dusting, assembling), the manufacture and repair of furniture, shelving and other wooden artefacts. Therefore, the categories of workers most at risk are carpenters, furniture makers, forestry workers, woodworkers.

The production of furniture, fixtures and other wooden artefacts almost always also involves a risk of exposure to hazardous chemical agents, which can mainly develop in the form of dusts, aerosols and vapours. These chemical-physical characteristics result in an inhalation risk that is clearly more prevalent than contact and ingestion, the latter being mainly linked to accidental events or incorrect occupational hygiene procedures. The presence of chemical agents that are hazardous to health may be due to their direct use (e.g. paints

and solvents) or determined by the work process (the production of fine dust during sanding, sanding, etc.).

The extremely small size of wood dust certainly poses a risk. The diameter of wood dust generated in machining can, in fact, be between 10 and 30 thousandths of a millimetre. Such fine dusts are potentially harmful first of all because of the ease of airborne, inhalation and penetration into the tissues of exposed personnel. The carcinogenic risk is, in fact, related to the inhalable fraction of airborne dust.

The very microscopic size also allows these agents to act at the cellular level, through mechanical, allergic and toxic mechanisms that can compromise the organism.

It should also be taken into account that exposure to wood dust can often be associated with exposure to formaldehyde, a chemical widely used in the carpentry sector for the manufacture of plywood, laminated wood, chipboard, plywood; furni-

ture and furnishings production; restoration and repair of wooden furniture and fixtures; painting of wooden furniture and floors. Exposure to asbestos, a fibre once used in the wood and cork industry for the production of plywood and panels, is also possible.

In this respect, the implementation and observance of specifically prescribed safety measures, such as environmental prevention systems (e.g. extraction systems) and personal protective equipment (e.g. respiratory protective equipment), is essential.

The tumour pathologies recognised by INAIL in List I, i.e. among the diseases with a high probability of occupational origin, in Group 6, i.e. among occupational cancers, relate to nasal neoplasms:

- cancer of the nasal cavities. Identification code I.6.25. C30.0;
- cancer of the nasopharynx. Identification code I.6.25. C11;
- cancer of the paranasal sinuses. Identification code I.6.25. C31.

In particular, hardwood dusts are believed to be responsible for the development of tumours of

the nasal cavities, nasopharynx, carcinoma of the ethmoid and paranasal sinuses; pathologies recognised by INAIL among tumours with a high probability of occupational origin. (see table)

However, other pathologies are also associated with exposure to hardwood dusts. (see table page 28)

Filtering facepieces with FFP2/FFP3 protection are required against wood dust. However, the use of FFP3 filtering masks, which have a minimum efficiency of over 98%, is recommended.

Joinery workshops, which are increasingly integrated with the end users of timber (furniture factories, window and other woodwork manufacturers), are also beginning to carry out treatments to the timber to suit the

Tumours (C00-D48)
Malignant tumour of mesothelial and soft tissue (C45-C49)
1. Pleural mesothelioma
Malignant tumours of the lip, oral cavity and pharynx (C00-C14)
1. Malignant tumour of the nasopharynx
Malignant tumours of the respiratory tract and intrathoracic organs (C30-C39)
1. Malignant tumour of the bronchi and lung
2. Malignant tumour of the paranasal sinuses
3. Malignant ethmoid sinus tumour
4. Malignant tumour of the nasal cavity and middle ear

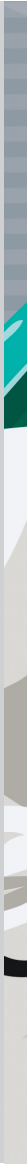
Diseases of the Respiratory System (J00-J99)	
Other diseases of the pleura (J90-J94)	
	1. Pleural plaque
Other upper respiratory tract diseases (J30-J39)	
	1. Perforation of the nasal septum
	2. Unspecified allergic rhinitis
	3. Chronic sinusitis
	4. Chronic rhinitis
	5. Vasomotor rhinitis
	6. Pharyngitis
Chronic lower respiratory tract diseases (J40-J47)	
	1. Asthma
	2. Predominantly allergic asthma
	3. Allergic alveolitis
	4. Bronchitis not specified as acute or chronic
	5. Chronic obstructive pulmonary disease (COPD)
	6. Chronic unspecified bronchitis, chronic bronchitis s.a.i., chronic tracheobronchitis
	7. Unspecified chronic obstructive pulmonary disease
	8. ODTS: organic dust toxic syndrome

Lung diseases caused by external agents (J60-J70)
1. Pneumoconiosis due to asbestos and other mineral fibres asbestosis
2. Byssinosis
3. Respiratory morbid conditions from other external agents
4. Pneumonia due to hypersensitivity to organic dusts

end uses (e.g. impregnation with mordants, colours, woodworm treatments, etc.). These are volatile organic substances that generate toxic vapours and gases in the working environment by inhalation. Therefore, in addition to filtering face masks against dust, compartment operators must be equipped with systems that protect against the inhalation of vapours and gases (type A and AX filters, which protect against organic gases and vapours with boiling points >65 °C and <65 °C, respectively). These, of course, being individual protections for residual risks, are in addition to the collective ones represented by forced ventilation and localised exhaust systems.

PEST CONTROL DERATIZATION SECTOR

The MD 7 July 1997 n. 274 distinguishes between cleaning, disinfection, pest control, rodent control and sanitisation activities and indicates the main chemicals used in these occasions, which require the use of PPE for respiratory protection.



The MD 7 July 1997 n. 274 'Regulations implementing Articles 1 and 4 of L. 25 January 1994, no. 82, for the regulation of cleaning, disinfection, pest control, deratization and sanitisation activities' provides the following definitions:

• Cleaning activities are those involving the combination of processes and operations to remove dust, unwanted material or dirt from surfaces, objects, confined spaces and areas;

• *Disinfection activities are all procedures and operations aimed at making certain confined spaces and areas healthy by destroying or inactivating pathogenic micro-organisms*;

• Disinfestation activities are those involving the complex of procedures and operations designed to destroy small animals, in particular arthropods, either because they are parasites, vectors or reservoirs of infectious agents, or because they are nuisances and unwanted plant species. Pest control can be comprehensive if directed at all pest species or targeted if directed at a single species;

• Deratization activities are those that concern the set of pest control procedures and operations designed to bring about either the complete destruction or the reduction of the number of the rat or mice population below a certain threshold;

• *Sanitising activities are those that concern the complex of procedures and operations aimed to make certain environments healthy through the activity of cleaning and/or disinfection and/or pest control or control and improvement of the conditions of the microclimate (temperature, humidity and ventilation) or light-*

ing and noise.

Below is a list of common chemicals used on these occasions, which require the use of PPE for respiratory protection devices:

• Hydrogen peroxide (H2O2): when inhaled, it can irritate the respiratory tract and cause sore throat, coughing, dizziness, headache, nausea and shortness of breath. In addition, it can cause damage to the upper respiratory tract and lungs with prolonged or repeated exposure, and is corrosive to the eyes, skin and respiratory tract.

• Pyrethrum: if inhaled it causes headaches, nausea and vomiting. In addition, repeated or prolonged exposure may cause asthma.

• Boric acid: if inhaled it causes coughing and sore throat.

• Ethyl carbamate: if inhaled it causes coughing and wheezing.

• Formaldehyde: when inhaled it causes coughing, sore throat, retrosternal burning sensation, headache and shortness of

breath. This substance is severely irritating to the eyes and respiratory tract. Inhalation of high concentrations may cause pulmonary oedema and corrosive effects on the upper respiratory tract. Chronic or repeated inhalation of vapour can cause inflammation of the upper respiratory tract. Finally, it is a carcinogen.

• 2,3,7,8-Tetrachlorodibenzo-p-Dioxin: The substance is irritating to the eyes, skin and respiratory tract, and may cause cancer. It is important to note that the effects of this substance on the body can be delayed.

• Ethylene oxide: when inhaled it causes coughing, drowsiness, headache, nausea, sore throat, vomiting and weakness. It is also toxic and can cause irritation of the respiratory tract. In particular, the vapour is irritating to the eyes, skin and respiratory tract. It is a carcinogen and repeated or prolonged exposure can cause asthma.

• Active chlorine: if inhaled it causes coughing, difficulty breathing, wheezing, sore throat and pulmonary oedema. Symptoms may appear late.

• Ozone: if inhaled it can lead to sore throat, coughing, shortness of breath, difficulty breathing, headaches and pulmonary oedema.

In conclusion, it is imperative to promote the appropriate training of personnel involved in cleaning operations, to instruct them on the proper methods of cleaning and environmental hygiene, the appropriate use of detergents and disinfectants, prevention and personal protection measures, and the criteria and methods for verifying the correct execution of these operations.

It is indeed necessary to use the most suitable specific PPE, including those for respiratory protection: filtering masks, half-masks, full-face mask and self-contained breathing apparatus.
The latter are indicated in environments where there is a

shortage of oxygen and/or the presence of toxic, irritant or respiratory pollutants in a certain concentration or airborne biological agents.

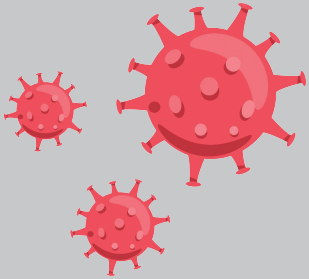
Finally, cleaning operations should be conducted if possible at times, times and places where people are not present so as not to create interference or risks to humans.

HEALTHCARE SECTOR

The healthcare sector employs around 10% of workers in the European Union and is therefore one of the largest employment sectors, encompassing a wide range of professions.

In various circumstances, workers in the healthcare sector are exposed to risks related to the use of chemical substances (disinfectants, anaesthetic gases, detergents, etc.) as well as medicines that, especially during preparation, may come into contact with the skin or penetrate the respiratory tract and cause local or systemic reactions, such as skin diseases (urticaria and contact dermatitis), more often of toxic-irritative than non-allergic origin, nasal affections (allergic rhinitis), sinus and eye diseases and asthma.

In the context of care-related infections, it must be emphasised that pathogens vary over time; until the early 1980s, hospital infections were mainly due to gram-negative bacteria (e.g. E. coli and Klebsiella pneumoniae). Then, as a result of antibiotic



pressure and the increased use of plastic sanitary ware, infections sustained by gram-positives (especially Enterococci and Staphylococcus epidermidis) and those by fungi (especially Candida) increased, while those sustained by gram-negatives decreased.

However, recently, certain gram-negatives, such as carbapenemase-producing enterobacteria and Acinetobacter spp., which are responsible for serious infections, have become very common in hospital care.

New and emerging infections, therefore, pose a particular threat to hospital workers, such as the cases of acute respiratory illness in the recent Sars-CoV-2 pandemic.

The emergence of these new respiratory pathogens has highlighted the vulnerability of healthcare workers to respiratory infections. Personal protective equipment (PPE) for the respiratory tract is particularly important to de-

crease the occupational risk of respiratory infections when vaccination or specific anti-infective treatments are not available.
In fact, it is essential to use FFP2 and FFP3 masks, which are suitable for protection against group 2 and 3 biological agents and can be used for protection against some group 4 biological agents. The use of P3 protection factor devices is recommended when the pathogen is airborne and risky manoeuvres have to be performed (e.g. bronchoscopies),

while FFP2 masks are specifically designed to protect users from small airborne particles, including aerosols. In contrast, surgical masks can help protect users from large droplets and are not certified to protect users from airborne infections.

Recent studies of a large number of healthcare workers show that, compared to healthcare workers not wearing PPE, those wearing surgical masks and, even more so, those wearing FFP2 throughout their shift were significantly better protected against respiratory infections. There is also evidence that the use of masks in hospital settings should be part of infection control measures to reduce the risk of respiratory infections among healthcare workers.

Overall, FFP2/FFP3 masks can provide greater protection, and their use is particularly recom-

mended when performing procedures that may generate aerosols of patient secretions, such as: performing nasopharyngeal swabs, non-invasive ventilation, bronchoscopy, manual ventilation before intubation, tracheal intubation, tracheotomy and cardiopulmonary resuscitation.

CHEMICAL-PHARMACEUTICAL INDUSTRY

The manufacture of pharmaceutical products involves the use of numerous chemical substances, obtained by fermentation, organic or biological synthesis, which can sometimes be used in very high concentrations and which risk endangering the health or safety of operators.

The handling of chemical or biological substances that enter into the composition of drugs and reagents induces both acute and immediate risks due to high exposures, and chronic and delayed risks due to low but repeated exposures. While for acute effects the causal relationship is clearly identified and fairly easily measurable, the same is not true for chronic effects, which are much more difficult to identify accurately and more frequent.

The toxic effects caused by mutagenesis, carcinogenesis, teratogenesis, allergic sensitisation, neurotoxicity are generally irreversible and the damage persists even after the toxicant has disappeared and the accumulation of effects worsens the pathology over time.

The most commonly used products are in the form of inert products, liquids, powders, and contain not only basic active ingredients, but also solvents, excipients, adjuvants and disinfectants to ensure the hygiene of chambers and equipment, such as corrosive acids (nitric, sulphuric, hydrochloric, hydrofluoric), caustic bases (soda, ammonia), flammable products (solvents,

alcohols), peroxides, very toxic solvents (aromatic and chlorinated hydrocarbons, ketones) ...
Granulating, mixing and wet coating operations can expose operators to high concentrations of solvent vapours. Operators may be particularly exposed to airborne particles during distribution, drying, crushing and mixing operations.
Handling, use or storage of these products leads to exposure by projection, inhalation or ingestion, during plant breakdowns: burst pipe, unexpected opening of a container, failure of filtration equipment to contain pumps, valves or manifolds during extraction and purification phases, lead to accidental leaks and spills.
Below are the risks related to the various working phases of toxic products and associated diseases. (see table)

Toxicity risks arise primarily from

Factor of hazard	Consequence	Work phases
Exposure to dust	Asthma, allergies, contact dermatitis	Weighing of raw materials, preparation of granulate
Sterilisation with ionising (β and γ) and non-ionising (UV) radiation	Damage to cellular DNA, skin diseases (skin ageing, erythema, cutaneous malignant melanoma) and/or visual diseases (conjunctivitis, cataracts), tumours, respiratory tract irritation	Cleaning and sterilisation of chambers and equipment, cleaning and sterilisation of medical devices and containers

the physical-chemical properties of the products (molecule and/or physical form) and the routes of entry into the body. Indeed, the harmful effects of substances on one or more physiological functions depend on the chemical composition of the substance, its molecular structure, the physical form of the product (liquids, aerosols, droplets, solid powders, gases or vapours) and the mode of entry into the body.

Depending on the nature of their occupational activities and occupational hygiene behaviour, workers in pharmaceutical industries may be exposed to chemicals through different routes:

- inhalation through the respiratory tract to the pulmonary alveoli (rhinitis, asthma, etc.),
- skin contact and more or less deep penetration through the epidermis and dermis
- (dermatitis, eczematous lesions, etc.),
- oral ingestion and swallowing,
- ocular damage due to liquid projection (conjunctivitis) ...

The most frequently recognised occupational diseases in the chemical industry sector in the decade 2010-2019 were those of the osteo-muscular system and connective tissue with 282 cases (35.6%). Followed by:

- diseases of the respiratory system: 156 cases (19.7%)
- diseases of the ear and mastoid apophysis: 127 cases (16%)
- tumours: 126 cases (15.9%)
- other (determined): 101 cases (2.8%)

Particularly with regard to the respiratory system, exposure to irritating and/or sensitising dusts and gaseous compounds (formaldehyde, etc.) and organic solvent vapours generates risks of allergic reactions, respiratory disorders from inflammation of the nasal and bronchial mucosa, and tumours.

The most frequent fatal diseas-

es are malignant tumours of the bronchi and lung, and mesothelioma of the pleura; these are associated with asbestos fibres, halogenated hydrocarbon derivatives, and beta-naphthylamine (2-naphthylamine).

Below is a list of the most frequently used substances in pharmaceutical industry processes and recognised as causes of occupational diseases according to the 'New Table of Occupational Diseases in Industry under Art. 3 of Presidential Decree 1124/1965 as amended and supplemented (annex no. 4 to Presidential Decree 1124/1965)."

Substance	Illness
Formaldehyde	Tumours of the nasopharynx (C11)
	Allergic contact dermatitis (L23)
	Irritative contact dermatitis (L24)
	Tracheobronchitis (J42)
	Bronchial asthma (J45.0)
	Leucemia mieloide (C92)
	Cancer of the nasal cavities (C30.0)
	Tumour of the paranasal sinuses (C31)
Beryllium	Pulmonary granulomatosis (berylliosis) (J63.2)
	Allergic contact dermatitis (L23)
	Cutaneous granulomas (L92.3)
	Lung carcinoma (C34)
Cadmium	Chronic obstructive pulmonary disease (J68.4)
	Tubular nephropathy (N14.3)
	Osteomalacia (M83)
	Lung carcinoma (C34)
Arsenic	Lung carcinoma (C34)
	Cutaneous epitheliomas (C44)
	Haemolytic anaemia (D59.8)
	Peripheral polyneuropathy (G62.2)

	Dermopathy: palm keratoses (L85.1), ulcers (L98.4), melanoderma (L81.4)
	Chronic hepatopathy (K71)

Risk prevention in pharmaceutical industries is based on collective measures such as adequate infrastructure (chambers, work plans, ventilation and pollutant capture devices), automation through remote-controlled and controlled operations, equipment and hygiene standards (safety showers, eye wash stations, hand washing, etc.).

In addition, operators must protect themselves against the chemical risks of pharmaceutical products and excipients, solvents and disinfectants by means of personal protective equipment and receive training and information on the risks associated with the products and materials used. Among the first safety equipment is the need to use protective equipment for:

- hands to protect the upper limbs from allergies, heat, frost, chemicals and pathogens;
- the eyes and face in order to protect the operator from splashes, droplets, dust and gases;
- the body in relation to possible exposure to corrosive substances;
- the respiratory tract to protect against gases and vapours or against dusts, fibres, fumes and mists.

BLS RECOMMENDS

For over 50 years, BLS has been dedicated to protecting your breath, seeking innovative and technologically advanced solutions, always offering state-of-the-art devices and design, and always putting the quality of its products first.

Category	Activity detail
Sanding	Iron, aluminium, rust, plaster, wood powder, stainless steel, nickel, lead, platinum, hard-wood
Painting and related activities	Grouting, priming, brush painting, use of thinners, acrylic paints, water-based paints
	Spray painting; toluene, methyl ethyl ketone, polyurethane paints, nitro solvents, solvent enamels, epoxy resins
	Isocyanates
	Acetone
	Powder coating

Industry/ sector	Recommended products	
	Single-use	Reusable
Steel industry, bodywork, carpentry, mechanics, automotive, shipyards	BLS Zer030/BLS Zer031/BLS Zer032; BLS Zer033	BLS 4000next S + BLS 202 P3 R
Steel industry, bodywork, carpentry, mechanics, automotive, shipyards	BLS Zer030C/BLS Zero31C/ BLS Zero32C/BLS Zer033C	BLS 4000next R + BLS 221 A2P3R or BLS 211 A2 + BLS 301 P2
		BLS 4000next R + BLS 221 A2P3R or BLS 211 A2 + BLS 301 P2 or BLS 8100next
		BLS 4000next R + BLS 242 ABE2 and prefilter P2
	BLS Zer030C/BLS Zero31C/ BLS Zero32C/BLS Zer033C	BLS 4000next R + BLS 212 AX
		BLS 4000next S + BLS 202 P3 or BLS 5700 + BLS 202 P3

Metalworking	Cutting, drilling, deburring, sandblasting, turning, boring, milling
	Forging, casting, moulding, protective treatments for paints and painted materials
	Pickling
	Paint strippers
	MIG/TIG welding, brazing
Industrial cleaning	Hydrochloric acid/phosphoric acid/acetic acid / alkaline detergents / ammonia and derivatives / isopropyl alcohol / descaling agents / rodents
Agriculture	Fungicides, herbicides, fungicides, insecticides, deratization
	Oxalic acid beekeeping
	Formic acid beekeeping

Steel industry, mechanical engineering, automotive	BLS 670/680next; BLS Zer030/BLS Zer031; BLS Zer033	BLS 4000next S + BLS 202 P3 R
	BLS Zer030C/BLS Zero31C/ BLS Zero32C/BLS Zer033C	BLS 4000next S + BLS 221 A2P3; BLS 8600next
		BLS 4000next S + BLS 226 ABE1P3 / BLS 222 ABEK1P3
		BLS 4000next S + BLS 211 A2 o BLS 212 AX (*)
	BLS Zer032/BLS Zer032C/BLS Zer032C Flame retardant	BLS 4000next S + BLS 202 P3/BLS 201-3C P3 or BLS 221 A2P3
Healthcare sector, steel industry, pharmaceuticals, chemicals, oil & gas, mechanical engineering, food, pest control		BLS 4000next S + BLS 222 ABEK1P3; BLS 5700 + BLS 254 ABEK2P3
Pest control		BLS 4000next S + BLS 221; BLS 5700 + BLS 221 A2P3
		BLS 5400 + BLS 401 P3
		BLS 5400 + BLS 414 ABE2

Pharmaceutical industry	Formaldehyde, glutaraldehyde
	Antiblastic, active ingredients, excipients, toxic and/or allergenic particulate material
	Organic solvents
	Disinfectants and acids
Construction sector	Asbestos
	Brick dust, quartz, cement, crystalline silica, lime, gravel, glass fibre
Medical field/ hospitals	Viruses/bacteria (reducing the likelihood of infection)
	Formaldehyde, glutaraldehyde
	Disinfectants and acids, sanitisation
Nuclear power plants	Maintenance, dismantling
Meat processing	Slaughter

Health and pharmaceutical sector		BLS 4000next S + BLS 242 ABE2
	BLS Zer031/BLS Zer032; BLS Zer033	
		BLS 4000next S + BLS 211 A2
		BLS 4000next S + BLS 222 ABEK1P3
Asbestos	BLS Zer030	BLS 4000next R + BLS 202; BLS 5600 + BLS 202; BLS 5400 + BLS 401 P3; BLS 2600next
	BLS Zer030/BLS Zer031; BLS Zer033	
Health sector	BLS Zer030NV/BLS 502/BLS 503	
		BLS 4000next S + BLS 242 ABE2
		BLS 4000next S + BLS 222 ABEK1P3
		BLS 5400 + BLS 442 Reaktor A2P3
Food industry	BLS 502; BLS Zer030	

(*)cf. product safety data sheet

Respect for the environment is reflected in all the choices we make.
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SAFETY
KNOWS NO BOUNDARIES

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