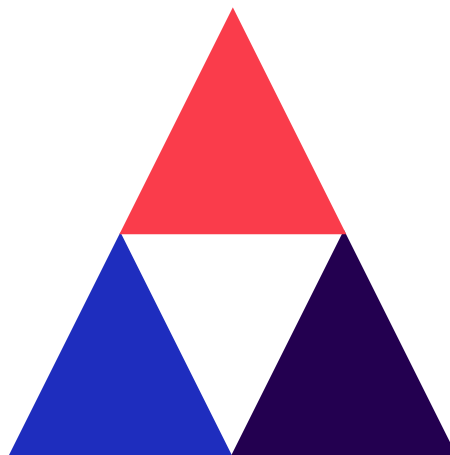




# ► Technical guidelines on biological hazards

Meeting of Experts for the tripartite validation of the technical guidelines  
on biological hazards  
(Geneva, 20–24 June 2022)



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## ► Introduction

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Biological hazards, both infectious and non-infectious, can be a significant health threat in numerous sectors and workplaces worldwide, and can cause occupational and work-related diseases.<sup>1</sup>

Since the ILO adopted the Anthrax Prevention Recommendation, 1919 (No. 3),<sup>2</sup> there have been significant advances in the knowledge of biological hazards, their prevention and the treatment of the diseases they cause. The importance of non-infectious biological hazards is becoming increasingly apparent in both workplaces and communities and it is recognized that workplaces can help prevent and control global health threats such as tuberculosis, HIV/AIDS, malaria and influenza, as well as pandemics such as the COVID-19 pandemic.

The Global Strategy on Occupational Safety and Health, which was adopted by the International Labour Conference at its 91st Session in 2003, underscored that the development of new instruments in the area of biological hazards should be given the highest priority.<sup>3</sup>

In November 2011, the ILO's Governing Body agreed to the establishment of a Standards Review Mechanism (SRM) to contribute to the implementation of the ILO standards policy and to consolidate tripartite consensus on the role of international labour standards in achieving the ILO's objectives. In 2015, a tripartite working group (TWG) was established as one component of the SRM.<sup>4</sup> At its third meeting in September 2017, the SRM/TWG reviewed 19 instruments related to occupational safety and health (OSH) and recommended to the Governing Body that: (a) follow-up action should be taken to revise Recommendation No. 3 through an instrument addressing all biological hazards; and (b) technical guidelines on biological hazards should be published. The COVID-19 pandemic has heightened the urgency of those recommendations.

The Governing Body decided to place on the agenda of the 112th and 113th Sessions (2024–2025) of the International Labour Conference an item related to OSH protection against biological hazards. The establishment of technical guidelines on the control of workplace biological hazards will provide the technical basis for that discussion.

Guidelines are not legally binding. These guidelines are based on the full principles, rights and obligations set out in the international labour standards and nothing set out in these guidelines should be understood as altering the obligations of the Member States that ratified those standards.

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<sup>1</sup> See ILO, *List of Occupational Diseases Recommendation, 2002 (No. 194)*.

<sup>2</sup> ILO, *Anthrax Prevention Recommendation, 1919 (No. 3)*.

<sup>3</sup> ILO, *Global Strategy on Occupational Safety and Health: Conclusions adopted by the International Labour Conference at its 91st Session, 2003*, para. 8, 2004. See also *GB.331/LILS/2*, para. 5(f)(i).

<sup>4</sup> See *GB.323/INS/5*, para. 25.

## Purpose and scope

The technical guidelines on biological hazards apply to all workers in all branches of economic activity.<sup>5</sup> The aim of the guidelines shall be to provide advice to governments, employers, workers and their representatives on what should be done to prevent and control work-related injuries, ill health, diseases, and deaths related to exposure to biological hazards in the working environment.

For the purposes of these guidelines, a biological hazard refers to any micro-organism, cell, or other organic material that may be of plant, animal or human origin, including any which have been genetically modified and which can cause harm to human health.

This may include but is not limited to bacteria, viruses, parasites, fungi, moulds, prions, DNA materials, bodily fluids, and any other microorganisms and their associated allergens and toxins.

Biological hazards can also be considered to include biological vectors or transmitters of disease.<sup>6</sup>

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<sup>5</sup> ILO, *Occupational Safety and Health Convention, 1981 (No. 155)*, Arts 1 and 2.

<sup>6</sup> Definition adapted from the Directive 2000/54/EC of the European Parliament and of the Council, 2000; South African Occupational Health and Safety Act 85, 1993; and Safe Work Australia, *National Hazard Exposure Worker Surveillance: Exposure to Biological Hazards and the Provision of Controls against Biological Hazards in Australian Workplaces*, 2011.

## ► Chapter 1. General obligations responsibilities, duties and rights

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The prevention of accidents or injury to health arising out of, linked with, or occurring in the course of work due to exposure to biological hazards should be the concern of all those involved in the design, organization and performance of any work involving biological hazards and all those involved in manufacturing, importing, exporting, handling and treating wastes, as well as all those concerned with the protection of workers' health.

The control of biological hazards at the workplace should be organized in accordance with the general principles described in ILO Conventions, Recommendations and protocols relating to OSH <sup>7</sup> and in ILO guidelines <sup>8</sup> and codes of practice.

### 1.1. The competent authority

1.1.1. The competent authority should, in consultation with the most representative organizations of employers and workers, formulate a comprehensive national policy on occupational health in general, and on biological hazards in particular, as respectively required or recommended by the Occupational Safety and Health Convention (No. 155) and Recommendation (No. 164), 1981; the Occupational Health Services Convention (No. 161) and Recommendation (No. 171), 1985; and the Promotional Framework for Occupational Safety and Health Convention (No. 187) and Recommendation (No. 197), 2006. <sup>9</sup>

1.1.2. Such a policy should:

- (a) be supported by laws and regulations and any other relevant instruments on OSH;
- (b) be supported by mechanisms for ensuring compliance with national laws and regulations, including systems of inspection;
- (c) indicate the goal of covering all workers and providing for a progressive extension of occupational health services;
- (d) make provisions for coordination so that national health and labour infrastructures, expertise and resources are used efficiently to provide occupational healthcare to populations; and
- (e) include provisions for workers' health surveillance that would be an integral part of the programme of prevention, protection and promotion at national, community and enterprise levels. <sup>10</sup>

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<sup>7</sup> In particular Convention No.155; the [Protocol of 2002 to the Occupational Safety and Health Convention, 1981](#); the [Occupational Health Services Convention, 1985 \(No. 161\)](#); and the [Promotional Framework for Occupational Safety and Health Convention, 2006 \(No. 187\)](#).

<sup>8</sup> Including ILO, [Guidelines on Occupational Safety and Health Management Systems ILO-OSH 2001](#), 2001; and ILO, [Technical and Ethical Guidelines for Workers' Health Surveillance](#), 1998.

<sup>9</sup> Based on ILO, [Technical and Ethical Guidelines for Workers' Health Surveillance](#), para. 6.1.

<sup>10</sup> Based on ILO, [Technical and Ethical Guidelines for Workers' Health Surveillance](#), para. 6.2.

1.1.3. The competent authority should establish requirements for the protection of workers against occupational exposure to biological hazards. Such requirements should be based on sound scientific criteria and accepted international practice.<sup>11</sup>

1.1.4. The competent authority should make available information on the prevention of biological hazards and provide appropriate support with regard to public health and occupational health measures.<sup>12</sup>

1.1.5. The competent authority should establish, implement and review regularly, in the light of national conditions and in consultation with the most representative organizations of employers and workers, procedures for:

- (a) the recording, notification and investigation of occupational diseases, accidents and as appropriate dangerous occurrences caused by workplace biological hazards;
- (b) the production and publication of annual statistics on occupational diseases, accidents and dangerous occurrences arising from biological hazards in the workplace;
- (c) the holding of inquiries for cases of occupational disease or any other accident that arises from occupational exposure to biological hazards in the course of (or in connection with) work that appears to reflect situations which are serious; and
- (d) the publication, annually, of information on measures taken in pursuance of the national OSH policy, which arise from exposure to biological hazards in the workplace.

1.1.6. The competent authority should establish a list of occupational diseases, including those caused by biological hazards, which should be periodically reviewed,<sup>13</sup> as provided for by the List of Occupational Diseases Recommendation, 2002 (No.194).<sup>14</sup>

1.1.7 Workers who have contracted illnesses or diseases caused by biological hazards due to their work, where they are considered to be an occupational disease or injury in line with national law, should be entitled to employment injury benefits as prescribed in the Employment Injury Benefits Convention (No. 121)<sup>15</sup> and Recommendation (No. 121), 1964.<sup>16</sup>

## 1.2. Employers

1.2.1. Employers have a duty to coordinate, manage, protect and promote the safety and health of all workers. Employers should develop OSH management systems and comply with the measures to be taken regarding risks to safety and health in general and to biological hazards in particular, including appropriate nationally and internationally recognized instruments, codes and guidelines, as prescribed, approved or recognized by the competent authority.<sup>17</sup>

1.2.2. Employers, in consultation with workers and their representatives, should:

- (a) have systems in place to identify hazards and make an assessment of the risks to the safety and health of workers arising from biological hazards, while making effective use of the

<sup>11</sup> Based on ILO, *ILO Code of Practice on Safety and Health in Textiles, Clothing, Leather and Footwear*, MESHT/2021/8, section 8.2, para. 1.

<sup>12</sup> Based on ILO, *ILO Code of Practice on Safety and Health in Textiles, Clothing, Leather and Footwear*, section 8.3.

<sup>13</sup> Based on ILO, *Technical and Ethical Guidelines for Workers' Health Surveillance*, para. 6.7.

<sup>14</sup> ILO, *List of Occupational Diseases Recommendation, 2002 (No. 194)*.

<sup>15</sup> ILO, *Employment Injury Benefits Convention, 1964 [Schedule I amended in 1980] (No. 121)*.

<sup>16</sup> ILO, *Employment Injury Benefits Recommendation, 1964 (No. 121)*.

<sup>17</sup> Based on ILO, *ILO Code of Practice on Safety and Health in Textiles, Clothing, Leather and Footwear*, section 2.3, para. 1.

information provided by the supplier of equipment or materials and from other reasonably available sources; and

- (b) take all reasonable, practicable and feasible measures to eliminate or, if this is not possible, control the risks to safety and health identified in the above-mentioned risk assessment in order to reduce exposure.<sup>18</sup>

1.2.3. In taking preventive and protective measures, the employer should address biological hazards and associated risk in accordance with the hierarchy of controls.

1.2.4. Employers should make the necessary arrangements to provide and integrate prevention activities as follows:

- (a) ensure regular surveillance of the working environment and appropriate health surveillance;
- (b) ensure adequate and competent supervision of work and work practices;
- (c) ensure the application and use of appropriate control measures and the periodic review of their effectiveness;
- (d) provide information, instruction and training to managers, supervisors and workers, as well as to workers' safety and health representatives, on safety and health issues in general and biological hazards in particular;
- (e) where necessary, establish measures to deal with emergencies and accidents, including first-aid arrangements; and
- (f) investigate occupational accidents, diseases and dangerous occurrences, in cooperation with safety and health committees and/or workers' representatives, in order to identify all causes and take the necessary measures to prevent recurrences of similar occupational accidents, and diseases.

1.2.5. Employers should be required to provide, where necessary, adequate personal protective equipment (PPE) in order to reduce the risks of accidents or adverse effects on safety and health. OSH measures should not involve any expenditure for workers.

1.2.6. Employers should ensure that all workers are suitably and periodically informed about the biological risks associated with the tasks assigned to them, and about the measures to be taken to prevent damage to their health. This information should also be transmitted to subcontractors and their workers. Training should be provided before the start of any work involving exposure to biological hazards, when there are changes in working methods and materials or when new risks appear, and such training should be repeated periodically if necessary. Such information and training should be translated into languages that all workers can understand and should be conveyed using a pedagogical approach that is tailored to each category of workers.

### 1.3. Occupational health services

1.3.1. Consistent with Convention No. 161 and Recommendation No. 171, the competent authority should develop progressively occupational health services for all workers, including those in the public sector and the members of production cooperatives, in all branches of economic activity and all undertakings. If occupational health services cannot be immediately established for all undertakings,

<sup>18</sup> Based on ILO, *ILO Code of Practice on Safety and Health in Textiles, Clothing, Leather and Footwear*, section 2.3, para. 4.

each Member concerned should draw up plans for the establishment of such services in consultation with the most representative organizations of employers and workers, where they exist.

1.3.2. The employer should arrange for the provision of occupational health services to his or her workers, as requested by Convention No. 161.

1.3.3. The occupational health services arranged by the employer should have the following functions, as adequate and appropriate to the risks of exposure to biological hazards:<sup>19</sup>

- (a) identification and assessment of the risks from biological hazards at the workplace;
- (b) surveillance of the biological hazards in the working environment and working practices which may affect workers' health, including sanitary installations, canteens, welfare facilities and housing where these facilities are provided by the employer;
- (c) advice on planning and organization of work, including the design of workplaces, on the choice, maintenance and condition of machinery and other equipment and on substances used at work;
- (d) participation in the development of programmes for the improvement of workplace biological hazards control;
- (e) advice on occupational health, safety and hygiene and individual and collective protective equipment;
- (f) surveillance of workers' health in relation to biological hazards at work;
- (g) promotion of the adaptation of work to the worker;
- (h) contribution to measures of vocational rehabilitation;
- (i) collaboration in providing information, training and education on the control of biological hazards at the workplace;
- (j) organization of first-aid and emergency treatment;
- (k) any reasonable adjustments to accommodate workers with disabilities; and
- (l) participation in analysis of occupational accidents and occupational diseases.

1.3.5. Occupational health services should ensure that workers' health advisers/primary care physicians are notified of the potential risks that the occupational conditions can present in order to facilitate early interventions and treatment.

1.3.6. Where the continued employment of a worker in a particular job is contraindicated for health reasons due to exposure to biological hazards, the occupational health service should collaborate in efforts to find alternative employment for that worker in the undertaking, or another appropriate solution.<sup>20</sup>

<sup>19</sup> Based on ILO, Convention No. 161, Art. 5.

<sup>20</sup> Based on ILO, Recommendation No. 171, para. 17.



## 1.4. Workers

1.4.1. Workers and their representatives have the right to:<sup>21</sup>

- (a) be consulted on measures taken to control any workplace hazards or risks to OSH in general and biological hazards in particular;
- (b) receive information on the identity and properties of the biological hazards to which they are exposed at work, as well as on preventive and protective measures and their application. Such information, including labelling, markings or other formats, should be provided in a manner and in language that is easily understood by all workers, including pathogen safety data sheets where they exist.
- (c) take adequate precautions, in cooperation with their employer, to protect themselves and other workers against hazards or risks to safety;
- (d) be consulted and be involved in the identification of hazards and the assessment of risks to OSH that are conducted by the employer and/or by the competent authority. They should also have the right to be involved and participate in investigations of accidents, dangerous occurrences and occupational diseases; and
- (e) to receive, subject to the confidentiality rules for personal and medical data, individual and collective reports on health surveillance and medical examinations, as well as to review occupational sickness records and records of notifiable/reportable diseases/conditions.

1.4.2. Workers have the right to:<sup>22</sup>

- (a) bring to the attention of their representatives, the employer or the competent authority hazards or risks to safety and health;
- (b) request an assessment of health (that is a medical examination or other tests, as appropriate), if a disorder occurs which the worker believes is due to or related to exposure to biological hazards at work;
- (c) appeal to the competent authority if they consider that the measures taken and the means used by the employer are inadequate for the purpose of ensuring OSH at work;
- (d) remove themselves and their co-workers in the vicinity from danger when they have reasonable justification to believe that there is an imminent and serious danger to their safety and health;
- (e) ask for a full investigation and request that remedial actions are taken before commencing or continuing work when, based on their training and job experience, they have reasonable justification believe that a work situation presents an imminent and serious danger to their lives or health due to exposure to biological hazards;
- (f) be provided with adequate medical treatment and compensation for occupational accidents and occupational diseases resulting from the exposure to biological hazards at the workplace, including compensation to dependent family members in case of death of the worker due to a work-related injury or disease, in accordance with national laws and regulations.

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<sup>21</sup> Based on ILO, *ILO Code of Practice on Safety and Health in Textiles, Clothing, Leather and Footwear*.

<sup>22</sup> Based on ILO, *ILO Code of Practice on Safety and Health in Textiles, Clothing, Leather and Footwear*, section 2.4, para. 10.

1.4.3. Workers should participate in instruction and training programmes provided by the employer or required by the competent authority and should demonstrate such acquired knowledge and understanding of OSH measures on the job. Workers and their representatives should review the instruction and training programmes for effectiveness. Where they determine that these programmes are ineffective, they should make recommendations to the employer to improve their effectiveness.<sup>23</sup>

1.4.4. Where continued assignment to work involving exposure to biological hazards is found to be medically inadvisable, every effort should be made, consistent with national practice and conditions, to provide the worker concerned with suitable alternative employment or to maintain his or her income through social security measures or otherwise.

1.4.5. Workers have the responsibility, in accordance with their training, and the instructions and means given by their employers, to:

- (a) comply with prescribed OSH measures on the elimination or control of hazards or risks to themselves and to others, including through the proper care and use of the protective clothing, facilities and equipment placed at their disposal for this purpose;
- (b) report promptly to their immediate supervisor or safety and health representative any unusual conditions at work which they believe could present a hazard or risk to their safety or health or that of other people; and
- (c) cooperate with the employer and other workers in order to ensure compliance with OSH requirements and participate in the development and implementation of the OSH management system at the workplace.

## 1.5. Collaboration and cooperation

1.5.1. The competent authority should promote and establish reliable systems for communication and cooperation on workplace biological hazards control with relevant institutions and jurisdictions at the national level and all other appropriate levels, up to and including at the level of the workplace. Where appropriate, there should be full cooperation at all levels between the competent authority, employers, workers and their representatives, scientific research institutions, occupational health services, designers, manufacturers, suppliers and quality control institutions in order to ensure the optimal control of biological hazards at the workplace.

1.5.2. There should be regular consultations at the workplace level between the employer and the workers' representatives. These consultations should include exchanges of information on the nature of the biological hazards to which workers are exposed and the risks which such exposure entails; on the results of monitoring the working environment; and on preventive and protective actions or measures to be taken.

1.5.3. Employers should set up OSH committees, in accordance with national legislation, in workplaces where biological hazards are handled. These committees should endeavour to ensure the application of regulations on the prevention of contamination by biological hazards and should acquaint themselves regularly with the results of the monitoring and assessment of the working environment.

1.5.4. Whenever two or more undertakings engage in activities simultaneously at one workplace, they should collaborate in applying the provisions regarding OSH and the working environment, including with respect to the prevention of biological hazards, without prejudice to the responsibility of each undertaking for the health and safety of its workers. In appropriate cases, the competent authority should prescribe general procedures for this collaboration.

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<sup>23</sup> Based on ILO, *ILO Code of Practice on Safety and Health in Textiles, Clothing, Leather and Footwear*, section 2.4, para. 4.

## ► Chapter 2. Risk management at the workplace level

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The management of biological hazards enables organizations to effectively identify the hazards and assess the biosafety and biosecurity risks inherent in their activities, and to develop prevention and mitigation strategies to control or reduce the risk to an acceptable level. The biological risk management system should be built upon the concept of continual improvement through a cycle of planning, implementing, reviewing and improving the processes and actions that an organization undertakes to meet its goals.<sup>24</sup>

### 2.1. Biological hazard identification and risk assessment

2.1.1. Hazard identification should consider the pathological mechanisms, modes of transmission (direct or indirect contact, aerosols, water, surfaces, vectors, food) and transmission portal of entry/routes of exposure (for example, inhalation, ingestion, dermal, percutaneous, mucous membranes).

2.1.2. The identification of biological hazards at the workplace should also take into account:<sup>25</sup>

- (a) the situation or events or combination of circumstances that have the potential to give rise to injury or illness;
- (b) the nature of potential injury or illness relevant to the activity, product or service;
- (c) those likely to be harmed (including but not limited to young workers, older workers, temporary workers, pregnant workers); and
- (d) past injuries and illness.

2.1.3. Risk assessment is a process used to determine the level of risk of injury or illness associated with each identified hazard for the purpose of control. In determining the level of risk, special attention should be given to factors such as sex, age, disability,<sup>26</sup> the health status of workers and comorbidities.

2.1.4. Carrying out a biological risk assessment involves five steps:<sup>27</sup>

1. the identification of biological hazards;
2. the identification of who might be harmed and how;
3. an evaluation of the biological risks and how to control them;
4. recording the results of the biological risk assessment and setting priorities for improvement; and
5. reviewing and updating the biological risk assessment, as necessary.

2.1.5. The assessment of biological risks should categorize each hazard based on its potential to cause harm (infection, allergy, toxicity); the severity of its potential harm; the reservoir of the agent; its stability in the environment; its possible aerosol generation or splatter; the mode of its transmission; its

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<sup>24</sup> For more information, see ILO, *Guidelines on Occupational Safety and Health Management Systems ILO-OSH 2001*.

<sup>25</sup> Based on ILO, *Code of Practice on Safety and Health in Agriculture*, MESH/2010/10, para. 4.2.2.

<sup>26</sup> Based on ILO, *Code of Practice on Safety and Health in Textiles, Clothing, Leather and Footwear*, para. 3.4.2.

<sup>27</sup> Based on ILO, *Code of Practice on Safety and Health in Agriculture*, para. 4.2.5; and ILO, *ILO Code of Practice on Safety and Health in Textiles, Clothing, Leather and Footwear*, section 3.4, para. 2.

communicability within a population; the availability and effectiveness of preventive measures; the availability of effective control measures; the availability and effectiveness of medical treatments; whether or not a pathogen is rare, partially or fully eradicated to account for the risk of re-emergence and its ability to be weaponized.

2.1.6. The identification of workers who might be harmed when exposed to biological hazards (a process also known as “worker vulnerability assessment”) should take into consideration the health status of workers, including their medical history; vaccination status; antigen or antibody test results; baseline antibody titre information for particular agents of interest, when appropriate; the use and availability of prophylactic treatments; and any underlying conditions.

2.1.7. Methods and techniques for risk assessment should be selected based on a characterization of the hazards concerned and adapted to the actual conditions of work. Priorities for action should be determined based on the likelihood and severity of harm that the biological hazards can cause.<sup>28</sup>

## 2.2. Control measures

2.2.1 Preventive and protective measures should be implemented according to the following principles:

- (a) Biological containment: prevent and reduce exposure potentials and their consequences by using attenuated, substitute organisms or procedures that can inactivate the biological agent, resulting in reduced replicability, infectivity, transmissibility and virulence. Where the accidental release of biological agents could pose a significant risk to workers’ health or the environment, a plan should be drawn up detailing the emergency actions to be taken to minimize these risks. Emergency plans are required only for higher-risk worksites.
- (b) Work restrictions: keep as low as possible the number of workers exposed or likely to be exposed; limit the workload and restrict work to as few work sites as possible so that there are few risk areas.
- (c) Operational protection: minimize exposure by enforcing safe working techniques (for example, wearing PPE, preventing aerosol generation, no mouth pipetting, training).
- (d) Physical containment: provide additional protection by means of primary and secondary physical barriers that prevent the escape of biological agents from the containment area, including doors, biological safety cabinets, air filtration systems, waste-water management systems and so on. Primary barriers minimize occupational exposure by limiting transmission. Secondary barriers provide supplementary containment, mainly to prevent the escape of biological agents when primary barriers fail.
- (e) Hazard minimization: carry out a combination of activities to reduce the consequences of exposure should it occur (for example, emergency procedures, contingency plans, health and medical surveillance or vaccinations to reduce the consequence of inadvertent exposure).

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<sup>28</sup> Examples of risk assessments, using a numerical weighting system to determine priorities for action, are given in the appendix.

2.2.2. The elimination of biological hazards can be achieved through, among other things, a combination of disease-eradication measures; the provision of safe water supplies; the proper disposal of human and animal waste; the sanitation of buildings, workspaces and housing; the cleaning and protection of open wounds; and the disinfection of potential sources (for example, by biocides, ultraviolet light).<sup>29</sup>

## 2.3. Risk communication

2.3.1. Risk communication should be carried out in an open and honest manner in order to convey credible information in ways that avoid misinterpretation. The information to be communicated should be understandable by the interested parties, including employers and workers.

2.3.2. Risk communication should use language at the literacy level of relevant workers and should be conducive to implementing an effective system for the management of risks, in consultation with workers and their representatives and with their full informed participation.

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<sup>29</sup> Based on ILO, *ILO Code of Practice on Safety and Health in Textiles, Clothing, Leather and Footwear*, section 8.3.1, para. 2.

## ► Chapter 3. Workers' health surveillance

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3.1. Workers' health surveillance should be carried out with the central purpose of the primary prevention of occupational and work-related injuries, ill health and diseases, and under controlled conditions within an organized framework, in accordance with Convention No. 161, Recommendation No. 171 and the ILO's *Technical and Ethical Guidelines for Workers' Health Surveillance*.

3.2. The surveillance of workers' health should be appropriate to the occupational risks posed by biological hazards in the enterprise and should combine in a suitable manner both individual and collective health assessments. The surveillance of workers' health should be accompanied by a number of safeguards concerning its purpose; its quality; the protection of workers' interests; and the collection, transmission, use and protection of health and medical data.

3.3. The surveillance of workers' health in relation to biological hazards at work should involve no loss of earnings, be free of charge and take place as far as possible during working hours.

3.4. Workers' personal medical data should be collected in conformity with medical confidentiality. Workers' personal health data covered by medical confidentiality should be stored only by personnel bound by the rules of medical confidentiality. Such data should be maintained separately from all other health data. Access to medical files and data should be restricted to medical professionals.<sup>30</sup>

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<sup>30</sup> Based on ILO, *Technical and Ethical Guidelines for Workers' Health Surveillance*.

## ► Chapter 4. Information, instruction and training

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4.1. Information, instruction and training should be organized and provided for all workers to understand the potential exposure and health impacts of biological hazards at the workplace, including how they are transmitted, their symptoms, their treatment, and how to prevent and control exposure. Workers should be kept up to date with any changes that may take place that could affect their exposure to biological hazards.

4.2. Other individuals that may be affected (for example, maintenance workers, contractors) should also receive sufficient and appropriate information, instruction and training about the biological hazards they may encounter. They should be appropriately supervised while carrying out their work using the correct PPE.

4.3. Employers should determine the requirements for each competency of the task to be performed in order to minimize risks from biological hazards, keeping in mind that the level of competency required will depend on the complexity of the situation or task.

4.4. Worker training should be provided in accordance with the guidance or standards prescribed by the competent authority with regard to biological hazards. Where no such guidance or standards exist, other national or internationally recognized standards should be applied, while always taking into account the specific needs of the particular workplace, including emergency procedures.

4.5. Where appropriate, a special training programme for migrant workers – and for other workers, as relevant – should be provided in their own language by the competent authority.

4.6. Workers' safety and health delegates, workers' safety and health committees, and joint safety and health committees or, as appropriate, other workers' representatives should have the necessary resources and reasonable time during paid working hours to receive training on the prevention of and protection against biological hazards.

4.7. Such training and information requirements and procedures should be kept under review, including an evaluation of the effectiveness of the training, in line with the results of periodic risk assessments, in order to ensure that trainees have the appropriate knowledge and skills needed to work with biological agents.

4.8. Records of the training and dates of training should be available for each trainee and records of the trainers/evaluators should be maintained, as prescribed by the competent authority. Where there are no such requirements, other national or internationally recognized procedures should be applied.

4.9. Training should be conducted so far as possible during paid work time. Where this is not possible suitable compensation and time off should be provided.

## ► Chapter 5. Investigation of dangerous occurrences occupational accidents and diseases

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5.1. Following the incidence of a dangerous occurrence, occupational accident or occupational disease due to biological hazards, an investigation of its origin and underlying causes should be organized and carried out to identify any failures in existing prevention and control measures against the biological risks at the workplace and the investigation should be documented.

5.2. The competent authority should hold inquiries (and publish reports on those inquiries) into cases of dangerous occurrences, occupational accidents and occupational diseases due to workplace biological hazards that appear to reflect serious situations in terms of the actual or potential risk to workers or the public. In these cases, the competent authority should arrange for investigations to be carried out by labour inspectorates, OSH services or other authorized agencies. Representatives of the employers and of the workers of the undertaking should have the opportunity to accompany investigators, unless the latter consider, in the light of the general instructions of the competent authority, that this may be prejudicial to the performance of their duties.

5.3. Where the investigation is not entrusted to an institution authorized by the competent authority or to a government department that is responsible to the legislature, national laws or regulations should specify arrangements for the participation of the most representative organizations of employers and workers, as well as public authorities, in the planning of the investigation, and for the participation in the investigations of the representatives of the employers and of the workers affected.

5.4. The competent authority should require employers to report on the results of their investigations of dangerous occurrences, occupational accidents and occupational diseases due to workplace biological hazards and on the action taken to prevent a recurrence.

5.5. The employer should ensure that arrangements are in place at the undertaking for an immediate investigation of all reported dangerous occurrence, occupational accidents and occupational diseases due to biological hazards. The employer should ensure that a competent person, as specified by the competent authority, is identified within the undertaking to carry out such investigations, with the appropriate participation of workers and their representatives.

5.6. Where the employer lacks the necessary expertise within the undertaking to carry out such investigations, he or she should call upon the assistance of an external competent institution.

5.7. The results of such investigations should be communicated to the safety and health committee of the undertaking, where it exists, and the committee should make appropriate recommendations. The results of investigations, in addition to any recommendations made by the safety and health committee, should be communicated to appropriate persons for corrective action, included in the management review and considered for continual improvement activities.

5.8. The corrective action resulting from such investigations should be implemented in order to avoid any repetition of similar dangerous occurrences, occupational accidents or occupational diseases due to biological hazards.

5.9. The employer should arrange for the site of an occupational accident or a dangerous occurrence to be left undisturbed before the start of the investigation, apart any requirements for first aid or to prevent further risk to any other persons.

5.10. Where, for reasons of first aid or to prevent further risk to any other persons, it is necessary to disturb the site before the start of the investigation, the employer should record the site, including



where necessary by taking photographs, making drawings or recording the identities of eyewitnesses prior to any intervention.

5.11. The employer should ensure that the investigations of dangerous occurrences, occupational accidents and occupational diseases should, as far as possible:

- (a) establish what happened;
- (b) determine the causes of what happened; and
- (c) identify measures necessary to prevent a recurrence.

5.12. Employers should promptly inform the competent authority of any dangerous occurrence or accident which may have resulted in the release of a biological agent and could cause severe human infection and diseases. The employer should ensure that the report is sent to the competent authority by the quickest practicable means, in accordance with the requirements of the competent authority.

5.13. The employer should make the results of investigations available to workers and their representatives with a view to preventing similar occurrences and so that they may assist the employer in the more effective implementation of the workplace OSH policy.

5.14. Workers and their representatives should have the right, the facilities and the necessary time, without loss of pay, to request and participate in an investigation by the employer or the competent authority of possible risks resulting from the use of biological agents at work. This should include the assessment of risks arising from the use of biological agents and investigations of dangerous occurrences, occupational accidents and occupational diseases.

5.15. Workers and their representatives should cooperate with management in the investigation of any exposures, dangerous occurrences and accidents at the workplace.

5.16. Records of occupational accidents, occupational diseases and, as appropriate, dangerous occurrences should include:

- (a) the causal biological agents;
- (b) the source and location of the exposure;
- (c) the mode(s) of spread or transmission of the biological or toxic agent;
- (d) sex- and age-disaggregated information on the workers who might have been exposed;
- (e) safety and health problems arising from exposure to biological agents at the workplace;
- (f) measures for dealing with dangerous occurrences, occupational accidents and diseases and the action taken in order to prevent a recurrence; and
- (g) effectiveness of the measures taken to secure satisfactory levels of safety and health.

5.17. Epidemiological surveillance and record-keeping (especially of accidents involving biological agents) should always be in place. The capacity of epidemiologic surveillance should be increased through networking or dedicated websites for collecting and analysing accidents, injuries, infections or adverse events experienced by workers in research and development laboratories.

## ► Chapter 6. Recording and notification of occupational accidents and diseases

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6.1. The competent authority should establish a national system of information on occupational accidents, injuries and diseases. Where possible, the competent authority should promote digital notification systems in order to reduce the administrative burden. In the establishment, review and application of systems for the reporting, recording and notification of occupational accidents, occupational diseases, and, as appropriate, dangerous occurrences and suspected cases of occupational diseases, the competent authority should take account of Convention No. 121, the Protocol of 2002 to the Occupational Safety and Health Convention, 1981,<sup>31</sup> Recommendation No. 194, the ILO List of Occupational Diseases<sup>32</sup> and the ILO code of practice on the recording and notification of occupational accidents and diseases.<sup>33</sup>

6.2. The reporting, recording, notification and investigation of occupational accidents, occupational diseases and, as appropriate, dangerous occurrences and suspected cases of occupational diseases are essential for the prevention of exposure to biological hazards and should be undertaken to:

- (a) provide reliable sex- and age-disaggregated information on occupational accidents, occupational diseases and, as appropriate, dangerous occurrences and suspected cases of occupational diseases at the enterprise, sectoral and national levels;
- (b) identify safety and health problems for both women and men and young workers arising from exposure to biological agents at the workplace;
- (c) define priorities for taking action;
- (d) develop effective and inclusive methods for dealing with occupational accidents and diseases;
- (e) identify possible gaps in OSH legislation and regulations;
- (f) monitor the effectiveness of any measures taken to secure satisfactory levels of safety and health; and
- (g) monitor improvements over time and reveal new developments and issues.

6.3. In line with international and national regulations and procedures and when required, exposure to specific biological hazards and their effects on health should be notified to relevant statutory agencies.

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<sup>31</sup> ILO, *Protocol of 2002 to the Occupational Safety and Health Convention*, 1981.

<sup>32</sup> ILO, *ILO List of Occupational Diseases (Revised 2010)*, 2010.

<sup>33</sup> ILO, *Recording and Notification of Occupational Accidents and Diseases: An ILO Code of Practice*, 1996.

## ► Chapter 7. Preparedness and response to emergencies

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7.1. In recent decades, the world of work has witnessed a wide range of emergencies related to biological hazards, in particular outbreaks of infectious diseases, such as severe acute respiratory syndrome (SARS), H1N1 influenza, Ebola virus disease, Zika virus disease and COVID-19. Moreover, pandemics can lead to secondary incidents and emergencies in workplaces, as evidenced by the microbial contamination of workplace water networks and Legionnaire's disease outbreaks during re-openings after COVID-19 lockdowns.<sup>34, 35</sup> Climate change, rapid urbanization and changing land-use patterns may increase the risk of biological hazards and infectious disease emergence in the world of work. Temperature rise has increased the transmission and spread of vector-borne diseases such as Lyme disease, dengue, Chikungunya virus disease and Zika virus disease, among others, putting outdoor workers across numerous sectors at heightened risk.<sup>36, 37, 38, 39, 40</sup>

7.2. Emergency preparedness and response arrangements should be established, periodically reviewed and maintained in workplaces. These arrangements should identify the potential for incidents, emergencies and outbreaks due to biological hazards, including risks from emerging and novel biological hazards. Arrangements should be made according to the location and environment of the workplace, as well as the size and nature of its activities.

7.3. Employers should develop an emergency action or response plan that considers the nature of incidents, emergencies and outbreaks, the key responders and their responsibilities, and should:

- (a) ensure that the necessary information, internal communication and coordination are provided to protect all people in the event of an incident, emergency or outbreak;
- (b) provide information to and communication with the relevant competent authorities, as well as the community and emergency response services; and
- (c) provide relevant information, instruction and training to all workers at the workplace and any person who may be involved in an emergency, at all levels and according to their competence, including regular exercises in emergency prevention, preparedness and response procedures.

7.4. Emergency preparedness and response arrangements should be established by the employer in cooperation with other employers, workers, external emergency services and other bodies, where applicable. The emergency response plan should be developed locally for each workplace and should be sufficiently comprehensive to deal with all types of emergencies.

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<sup>34</sup> Chartered Institute of Environmental Health, "Legionnaires' Disease: Lockdown Risks and Reopening Safely".

<sup>35</sup> Osvalda De Giglio et al., "Impact of Lockdown on the Microbiological Status of the Hospital Water Network during COVID-19 Pandemic", *Environmental Research*, 191, 2020.

<sup>36</sup> WHO, "Infectious Diseases in a Changing Climate: Information for Public Health Officials in the WHO European Region", 2013.

<sup>37</sup> European Commission, "Environmental Change and Infectious Disease Workshop, Meeting Report, Stockholm, 29–30 March 2007".

<sup>38</sup> United States Environmental Protection Agency, "Climate Change Indicators: Lyme Disease", 2021.

<sup>39</sup> Elisabet Lindgren and Thomas G.T. Jaenson, "Lyme Borreliosis in Europe: Influences of Climate and Climate Change, Epidemiology, Ecology and Adaptation Measures" (WHO, 2006).

<sup>40</sup> Shlomit Paz, "Climate Change Impacts on Vector-Borne Diseases in Europe: Risks, Predictions and Actions", *The Lancet Regional Health – Europe*, 1 (2021).

7.5. Collaboration between public health, occupational health, veterinary health and other partners is key to contingency preparedness and response to emergencies involving biological hazards, including outbreaks, epidemics and pandemics.

7.6. Occupational health service providers need to be trained in potential biological hazards in both workplaces and communities, and to be supported by laboratory or clinically based surveillance, rapid public health response systems and real-time communication for expert advice to prepare for and manage outbreaks.

7.7. The steps to prepare for and manage outbreaks in workplaces are the following:

- (a) the identification of biological hazards and their elimination or prevention by immunization;
- (b) the early detection of cases of infectious or non-infectious diseases caused by known or unknown biohazards;
- (c) rapid reporting of cases through public health and occupational disease reporting systems through consistent and effective communication;
- (d) obtaining expert advice and assistance, as necessary;
- (e) implementing a locally and nationally coordinated support system; and
- (f) collaboration on research into methods of prevention, treatment and hazard containment of existing biological hazards and those yet to be identified at the global scale.

7.8. Biological agent outbreak preparedness and response plans should be conducted within the framework of analysis focusing on gender considerations, equity and inclusion, in line with existing human rights frameworks.

7.9. National OSH policies and programmes should include measures to be taken at the workplace in case of outbreaks of biological agent pandemics or epidemics, taking into account the epidemiological specificities of the geographical situation, the branches of activities and the specificities of workers. Outbreak preparedness and response at the workplace should be aligned and coordinated with public health preparedness and response.

7.10. When developing, implementing and evaluating outbreak response and management plans at the workplace, the competent authority should consult and involve employers' and workers' organizations.<sup>41</sup>

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<sup>41</sup> See ILO, *Anticipate, Prepare and Respond to Crises: Invest Now in Resilient OSH Systems*, 2021, which details the basis of and steps for elaborating and implementing outbreak preparedness and response at the workplace. The World Health Organization has developed a number of guidelines to help Member States develop integrated strategies for outbreak preparedness and response for specific agents, including SARS-CoV-2-2019, Ebola virus and Influenza virus.

## ► Chapter 8. Inspection and compliance with legal provisions

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8.1. The competent authority should ensure adequate control and supervision, in particular by establishing the effective enforcement of national laws and regulations concerning biological hazards through an appropriate system of labour inspection.

8.2. In accordance with the provisions of the Labour Inspection Convention, 1947 (No. 81), and the Labour Inspection (Agriculture) Convention, 1969 (No. 129), the functions of labour inspection should be:

- (a) to secure the enforcement of, among other things, the legal provisions relating to the protection of workers against biological hazards, insofar as such provisions are enforceable by labour inspectors;
- (b) to supply technical information and advice to employers and workers concerning the most effective means of complying with the legal provisions; and
- (c) to bring to the notice of the competent authority any defects or abuses that are not specifically covered by existing legal provisions.

8.3. Labour inspectors and officials of other competent authorities, as appropriate, should undergo specific training with a view to identifying and addressing biological risks at the workplace.

8.4. Labour inspectors should be empowered to those faculties stated in Article 12 of Convention No. 81 and Article 14 of Convention No. 129. In particular, labour inspectors should, in a manner prescribed by national laws and regulations:

- (a) have the right to enter freely and without previous notice at any hour of the day or night any workplace liable to inspection;
- (b) have the authority to investigate occupational accidents and diseases due to workplace biological hazards;
- (c) have the authority to carry out any examination, test or enquiry which they may consider necessary in order to satisfy themselves that legal provisions regarding biological hazards are being strictly observed;
- (d) to take or remove for purposes of analysis samples of materials and substances used or handled, subject to the employer or his representative being notified of any samples or substances taken or removed for such purpose;
- (e) have the authority to take steps with a view to remedying any defects observed in plant, layout or working methods which they may have reasonable cause to believe constitute a threat to the health and/or safety of the workers, including measures with immediate executory force in the event of imminent danger; and
- (f) periodically determine whether an existing OSH management system or OSH elements, including management of biological hazards, are in place, adequate and effective.

8.5. The system of enforcement should provide for corrective measures and adequate penalties for violations of national laws and regulations concerning biological hazards.

8.6. The competent authority should make appropriate arrangements to promote effective cooperation between the inspection services and other public or private services engaged in similar activities, as well as collaboration between these institutions and employers and workers and their representatives on the control of biological hazards at the workplace.

## ► Appendix 1

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### Risk assessments using a numerical weighting system to determine priorities for action

1. There are many established methods and techniques for carrying out risk assessments. Some of them use a numerical weighting system to determine priorities for action. For each hazard identified, a numerical value is assigned to the likelihood of the hazard causing harm, as well as to the severity of the consequences. This can be expressed on a rising scale from low to high, as follows:

#### Likelihood

- (1) Rare: has rarely if ever happened.
- (2) Unlikely: is possible but is not expected to happen.
- (3) Possible: could be expected to happen once a year.
- (4) Likely: will probably occur but is not persistent.
- (5) Almost certain: occurs regularly.

#### Severity of consequences

- (1) Insignificant: no injury or ill health.
  - (2) Minor: short-term impact.
  - (3) Moderate: semi-permanent injury or ill health.
  - (4) Major: disabling injury or ill health.
  - (5) Catastrophic: potentially fatal.
2. The level of risk can be represented in the following manner:  
Risk = likelihood x severity
  3. By determining the level of risk associated with each hazard identified in the working environment, employers and workers and their representatives can identify areas for priority action. For example, a risk that rarely arises (1) and has insignificant consequences (1) would have the lowest priority (1) (that is,  $1 \times 1 = 1$ ), whereas a hazardous event that occurs regularly (5) and has potentially fatal consequences (5) would have the highest priority for action (25) (that is,  $5 \times 5 = 25$ ). The higher the level of risk, the more important it is to apply controls that eliminate, reduce or minimize exposure to the hazard.

A sample matrix that illustrates this numerical approach to the determination of the level of risk is set out below.

Likelihood/severity	Almost certain (5)	Likely (4)	Moderate (3)	Unlikely (2)	Rare (1)
Catastrophic (5)	25	20	15	10	5
Major (4)	20	16	12	8	4
Moderate (3)	15	12	9	6	3
Minor (2)	10	8	6	4	2
Insignificant (1)	5	4	3	2	1

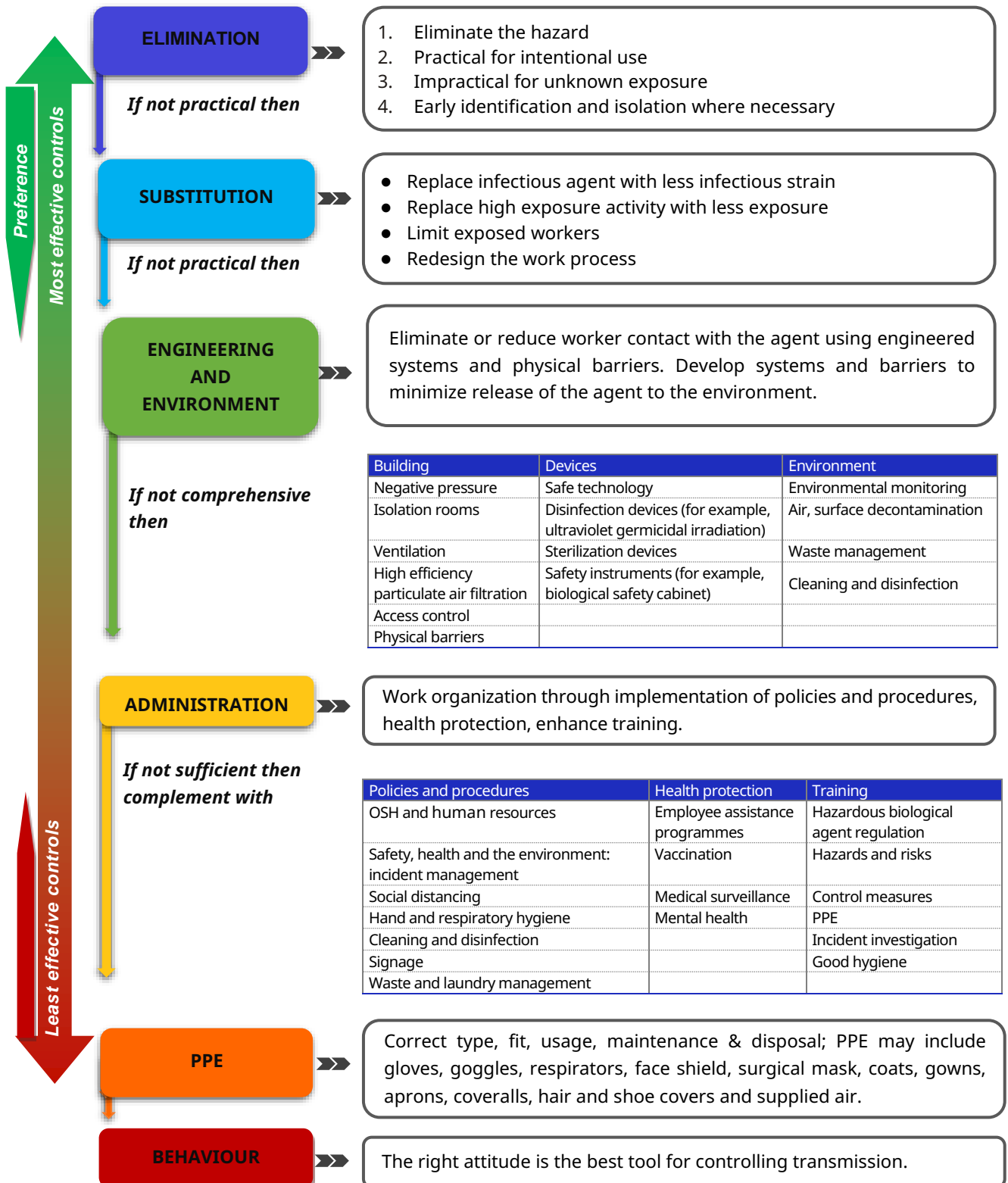
- Priority areas of action can also be determined by evaluating particular hazards at the workplace against the following priority action table set out below. Two questions need to be considered for each hazard: "How often is a person exposed to the hazard?" and "What is the likely outcome?" In the following table, the likelihood of an event occurring is expressed as daily, weekly, monthly or rarely, while the severity of consequences varies from the most severe (death or permanent disability) to the least severe (minor injury requiring only first aid). The areas on the matrix with the darkest shading represent the highest priorities for action.

What is the likely outcome	How often am I, or other people exposed to the hazard?			
	Daily	Weekly	Monthly	Rarely
Death or permanent disability	High	High	High	High
Temporary disability	High	High	Moderate	Moderate
Minor injury (first aid)	High	Moderate	Low	Low

- Those carrying out risk assessments may find it useful to record the results of the assessment in a narrative form, specifying: (a) the activity or workplace being assessed; (b) the main hazards and those at risk; (c) the level of risk; and (d) the measures to be put in place to eliminate, reduce or minimize exposure.

► Appendix 2

Applying the hierarchy of controls





## ► Appendix 3

### Possible biological hazards associated with work activities

List of activities	Possible hazards and risks
Work in food production plants	<ul style="list-style-type: none"> <li>• allergies caused by moulds/yeasts, bacteria and mites;</li> <li>• organic dusts of grain, milk powder or flour contaminated with biological agents; and</li> <li>• toxins such as botulinus toxins or aflatoxins.</li> </ul>
Work in agriculture, forestry, horticulture, animal food and fodder production	<ul style="list-style-type: none"> <li>• bacteria, fungi, mites and viruses transmitted from animals, parasites and ticks;</li> <li>• respiratory problems due to microorganisms and mites in organic dusts of grain, milk powder, flour and spices;</li> <li>• specific allergic diseases such as farmers lung and bird breeders lung; and</li> <li>• specific risks, such as green tobacco sickness, monkey fever, bites, stings and venom.</li> </ul>
Work in healthcare and community services	<ul style="list-style-type: none"> <li>• several viral and bacterial infections such as HIV, hepatitis or tuberculosis; and</li> <li>• sharps and needlestick injuries.</li> </ul>
Work in laboratory	<ul style="list-style-type: none"> <li>• infections and allergies caused by handling microorganisms and cell cultures, especially of human tissues; and</li> <li>• accidental spills and needlestick injuries.</li> </ul>
Work in metal-processing industry, wood-processing industry, mining industry	<ul style="list-style-type: none"> <li>• skin problems due to bacteria and bronchial asthma due to moulds/yeasts in circulating fluids used in industrial processes such as grinding, fluids used in pulp factories, and metal- and stone-cutting fluids.</li> </ul>
Work in refuse disposal plants, sewage purification installations	<ul style="list-style-type: none"> <li>• infections and allergies caused by organic components of biowastes, including bacteria and their fragments, fungi and their spores and mycotoxins, viruses and prions, parasites and vector-borne diseases.</li> </ul>
Working areas with air conditioning systems and high humidity (for example, textile industry, print industry and paper production)	<ul style="list-style-type: none"> <li>• allergies and respiratory disorders due to moulds/yeasts, legionella.</li> </ul>
Work in archives, museums, libraries	<ul style="list-style-type: none"> <li>• moulds/yeasts and bacteria causing allergies and respiratory disorders.</li> </ul>
Work in building and construction industry; processing of natural materials such as clay, straw, and reed; building redevelopment	<ul style="list-style-type: none"> <li>• moulds and bacteria due to deterioration of building materials.</li> </ul>

## ▶ Appendix 4

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### Main ILO and WHO references for the management of biological hazards in specific sectors

#### ▶ ILO codes of practice

Sector	Code of practice
Agriculture	ILO Code of Practice on Safety and Health in Agriculture (2011)
Construction	Code of Practice on Safety and Health in Construction (2022)
Textile, clothing, leather and footwear	ILO Code of Practice on Safety and Health in Textiles, Clothing, Leather and Footwear (2022)

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#### ▶ ILO, WHO, and FAO publications

Sector	Organization	Publication
Food industry	ILO	ILO Working Paper on Occupational Safety and Health in the Food and Drink Industries (1993)
Food industry	FAO and WHO	Report of a Joint FAO–WHO Consultation on Risk Management and Food Safety (1997)
Health	WHO and ILO	Caring for Those who Care: Guide for the Development and Implementation of Occupational Health and Safety Programmes for Health Workers (2022)
Laboratory	WHO	Laboratory Biosafety Manual, Third Edition (2004)

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