



## Biological agents



### Introduction

The theme for the European Week for Safety and Health at Work 2003 is the prevention of risks from dangerous substances. The Agency is producing a series of factsheets focusing on the communication of occupational safety and health-related information on dangerous substances including biological agents.

Biological agents are found in many sectors. As they are rarely visible, the risks they pose are not always appreciated. They include bacteria, viruses, fungi (yeasts and moulds) and parasites.

### Legislation

European legislation aims to minimise the health risks from biological agents in the workplace<sup>1</sup>.

The relevant Directive classifies biological agents into four risk categories according to their potential to cause diseases and the possibilities of prevention and treatment. The list of biological agents provides indications of allergenic potential and toxic effects. Measures proposed include containment categories for laboratory work and industrial processes.

The Directive also lays down requirements for notification of selected activities to authorities. For workers likely to be exposed to certain biological agents, employers have to keep records including information about exposure and health surveillance. Workers have to be provided with access to their personal data.

These regulations are minimum requirements and have been implemented into national legislation. Some Member States have introduced Codes of Practice and guidelines for safe handling of biological agents including selected sectors and occupations. It is therefore important to refer to the relevant national regulations related to biohazards at workplaces.

### Occupational exposure limits

Currently, no occupational exposure limits have been set for biological agents, although some Member States have set limits for their toxins. The essential difference between biological agents and other hazardous substances is their ability to reproduce. A small amount of a microorganism may grow considerably in a very short time under favourable conditions.

### Risk assessment, prevention and control

The Directive requires the employer to

- assess the risks posed by biological agents, and
- reduce the risk to the workers by
  - elimination or substitution

- exposure prevention and control
- information and training of the workers, and
- provide health surveillance as appropriate.

#### Where exposure to biological agents can occur

Whenever people are in contact at work with

- natural or organic materials like soil, clay, plant materials (hay, straw, cotton, etc.)
- substances of animal origin (wool, hair, etc.)
- food
- organic dust (e.g. flour, paper dust, animal dander)
- waste, wastewater
- blood and other body fluids

they may be exposed to biological agents.

When a work activity involves the deliberate, **intentional use** of biological agents, such as cultivating a microorganism in a microbiological laboratory or using it in food production, the biological agent will be known, can be monitored more easily and prevention measures can be tailored to the risk posed by the organism. Information about the nature and effects of the biological agent used should then be included in the inventory of hazardous substances.

When the occurrence of the biological agents is an **unintentional** consequence of the work – this is the case for waste sorting or agricultural activities – the assessment of risks that workers are exposed to will be more difficult. Nevertheless, for some of the activities involved, information on exposures and protection measures is available.

Occupations at risk	Hazards/Risks	Preventive measures
Food (cheese, yoghurt, salami) or food additive production, bakeries	Moulds/yeasts, bacteria and mites cause allergies Organic dusts of grain, milk powder or flour contaminated with biological agents Toxins such as botulinustoxins or aflatoxins	Closed processes Avoid aerosol formation Separate contaminated work areas Appropriate hygiene measures
Health care	Several viral and bacterial infections such as HIV, hepatitis, or tuberculosis Needlestick injuries	Safe handling of infectious specimens, sharps waste, contaminated linen and other material Safe handling and cleaning of blood spills and other body fluids Adequate protective equipment, gloves, clothing, glasses Appropriate hygienic measures
Laboratories	Infections and allergies when handling microorganisms and cell cultures, e.g. of human tissues Accidental spills and needlestick injuries	Microbiological safety cabinets Dust and aerosol-reducing measures Safe handling and transport of samples Appropriate personal protection and hygiene measures Decontamination and emergency measures for spills Restricted access Biosafety label

<sup>(1)</sup> Directive 2000/54/EC of the European Parliament and of the Council of 18 September 2000 on the protection of workers from risks related to exposure to biological agents at work.

Occupations at risk	Hazards/Risks	Preventive measures
Agriculture Forestry Horticulture Animal food and fodder production	Bacteria, fungi, mites and viruses transmitted from animals, parasites and ticks Respiratory problems due to microorganisms and mites in organic dusts of grain, milk powder, flour, spices Specific allergic diseases like farmer's lung and bird breeder's lung	Dust and aerosol-reducing measures Avoid contact with contaminated animals or equipment Protection against animal bites and stings Preservatives for fodder Cleaning and maintenance
Metal processing industry Wood processing industry	Skin problems due to bacteria and bronchial asthma due to moulds/yeasts in circulating fluids in industrial processes such as grinding, pulp factories' and metal and stone cutting fluids	Local exhaust ventilation Regular maintenance, filtering and decontamination of fluids and machinery Skin protection Appropriate hygiene measures
Working areas with air conditioning systems and high humidity (e.g. textile industry, print industry and paper production)	Allergies and respiratory disorders due to moulds/yeasts Legionella	Dust- and aerosol-reducing measures Regular maintenance of ventilation, machinery and work areas Restrict number of workers Maintaining high hot (tap) water temperatures
Archives, museums, libraries	Moulds/yeasts and bacteria cause allergies and respiratory disorders	Dust and aerosol reduction Decontamination Adequate personal protective equipment
Building and construction industry, processing of natural materials like clay, straw, reed; redevelopment of buildings	Moulds and bacteria due to deterioration of building materials	Dust and aerosol reducing measures Appropriate personal protection and hygiene measures

### Who might be harmed and how

If you have identified an activity where workers may be exposed to biological agents, collect information about these exposures. Think about the people directly involved and also others who might be affected such as cleaning personnel. Look at how the work is actually done, rather than how it should be done or how you think it's done.

### Health effects

Biological agents can cause three types of disease:

- infections caused by parasites, viruses or bacteria,
- allergies initiated by exposure to mould organic dusts like flour dust and animal dander, enzymes and mites, and
- poisoning or toxic effects.

Some biohazards have the potential to cause cancer or foetal harm.

Microorganisms can enter the human body via damaged skin or mucous membranes. They can be inhaled or swallowed, leading to infections of the upper respiratory tract or the digestive system. Exposure also occurs accidentally by animal bites or needle stick injuries.

### Evaluate the risks and identify how to reduce the risk

Consider whether existing measures give adequate protection and what more should be done to reduce risks. Is it possible to get rid of the risk altogether by using a different agent or process?

If the exposure is not avoidable, it should be kept to a minimum by limiting the number of exposed workers and the exposure time. The

control measures must be tailored to the working process, and the workers must be well trained to follow safe working practices.

The steps needed to remove or reduce the risks to workers will depend upon the particular biohazard, but there are a number of common actions that can be applied:

- Many biological agents are communicated via air, such as exhaled bacteria or toxins of mouldy grain. **Avoid the formation of aerosols and dusts**, also when cleaning or during maintenance.
- **Good housekeeping, hygienic working procedures and use of relevant warning signs** are key elements of safe and healthy working conditions.
- Many microorganisms have developed mechanisms to survive or resist heat, dehydration or radiation, for example by producing spores. Include **decontamination measures** for waste, equipment and clothing and appropriate hygienic measures for workers. Include instructions for safe disposal of waste, emergency procedures, and first aid.

In some cases preventive measures include **vaccination** to be provided to workers on a voluntary basis.

### Record your findings

Review and revise your assessment where necessary, when there are significant changes in materials, equipment, work methods, location or people involved and if there are accidents or complaints associated with the work



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### Waste sorting: how to tackle a new risk

Environmental requirements and new waste management technologies have increased risks for workers involved in sewage, waste collection, sorting and disposal.

In recycling plants for paper, glass, synthetic and wrapping materials and composting plants, moulds cause allergies and respiratory disorders, especially aspergillosis. In sewage plants bacteria cause diarrhoea and salmonellosis. Handling hospital waste and needlestick injuries may lead to infections with viruses such as hepatitis.

Several Member States have therefore developed preventive measures including the prevention of handsorting, e.g. by mechanical presorting, sorting cabins with proper ventilation, local exhaust ventilation for sorting lines, closed vehicles equipped with air filters and the use of adequate protective clothing, including proper gloves. Hygiene plans, regular cleaning and decontamination measures have also contributed to a considerable reduction in exposure of workers.

### Further information

Other factsheets available in this series on dangerous substances and further information are also available at <http://osha.eu.int/ew2003/>. This source is being continually updated and developed.