

Procedure working safely with human material

Introduction

This procedure is written as a guideline for the safe handling of human material. This includes:

- Blood, lymph fluid, tissues (biopsies), and fluids excreted by the body, such as urine, saliva, sputum, feces, semen, etc.;
- Materials derived from human material, such as cells, whether or not programmed into cell lines;
- Microorganisms isolated from human material.

Working with biological material derived from volunteers, test subjects, or patients poses a risk of exposure to pathogens. Such material may be contaminated with pathogenic microorganisms capable of causing infection in humans, such as hepatitis viruses, HIV, enterobacteria, and influenza viruses (see Table 1). Since blood, tissue, and other body fluids are considered potential sources of biological agents, it is necessary to implement targeted, strict safety measures to protect employees and the environment. All material originating from volunteers, test subjects, and patients must be considered potentially contaminated at all times. Individuals are not always aware that they may carry an infectious disease, and screening for it is not performed routinely in the hospital.

Table 1: Risks when working with human material

Material	Main risks	Pathogens / Agents	Main route of infection
Blood (Serum/Plasma)	High risk of transmission of bloodborne pathogens	HIV Hepatitis B Hepatitis C	Needle stick/cut accidents Contact with non-intact skin Contact with mucous membranes (eyes, mouth)
Lung (Sputum/Tissue/Lavage)	Aerosol formation (inhalation), high concentration of infectious agents	SARS-CoV-2 Influenza (flu virus) <i>Mycobacterium tuberculosis</i> (TBC)	Aerosol-generating procedures
Brain (Brain/Spinal Cord)	Very high risk due to chronic infections; unpredictable	Prions (Creutzfeldt-Jakob) HIV Herpes simplex	Aerosol-generating procedures Cuts Contact with mucous membranes
Feces (Stool)	High risk of enteric infections; often highly contagious	<i>Salmonella</i> , <i>E. Coli</i> Norovirus Hepatitis A/E Parasites	Fecal-oral route (ingestion) Aerosol-generating procedures

Biological agents (BA) are microorganisms, including genetically modified variants, cell cultures, and human endoparasites. They are classified into four classes (1-4) based on their risk to employees and the population, ranging from virtually harmless to very hazardous with a high risk of spread and without effective treatment (see Table 2). This classification determines the safety measures and laboratory facilities required to work safely with biological and human material and to protect both employees and the environment.

Table 2: Risk classes of biological agents

Class		Examples
1	An agent that is unlikely to cause disease in humans.	<i>E.Coli</i> K12 <i>Saccharomyces cerevisiae</i> (baker's yeast)
2	An agent that can cause disease in humans. It is unlikely to spread among the population.	Norovirus Influenza virus <i>Salmonella</i> <i>E.Coli</i>
3	An agent that can cause serious disease in humans. There is a chance that it will spread among the population.	HIV Hepatitis B, C, E <i>Mycobacterium Tuberculosis</i>
4	An agent that causes serious disease in humans. There is a high chance that it will spread among the population.	Ebola virus Lassa virus

This applies to a lesser extent to biological material derived from animals ([see Procedure working safely with animal material](#)). In every laboratory within the UM/MUMC, you may potentially come into contact with biological agents. To work safely in any laboratory, it is important to follow the rules described in this procedure.

1. Preparatory activities

When an experiment involves activities with microorganisms isolated from human material, a thorough risk analysis of the experiment must be carried out in cooperation with the BSO. This requirement also applies when the microorganisms are obtained from commercial sources. Examples include *Staphylococcus aureus* acquired via the ATCC and *Escherichia coli* isolated from stool. To do this, consider the following questions:

- What is the route of transmission of the microorganisms?
- What are the potential symptoms of illness?
- Is targeted vaccination possible?
- How can the microorganism be inactivated or destroyed?
- Are there high-risk procedures in the experiment (use of sharps, aerosol-generating steps such as centrifugation, etc.)?
- Can these high-risk procedures be avoided or replaced?
- Which precautions are required to perform these procedures safely (working in a BSC, using PPE, etc.)?
- How must the waste be collected and disposed of?

Everyone who may come into contact with human material during their work is offered a Hepatitis B vaccination, although participation is not mandatory. New employees at UM will be informed by People & Development (P&D) about the option to receive this Hepatitis B vaccination if it is relevant to their intended tasks. Employees, students, and interns who will eventually work with human material must also be informed (by their supervisor) about the availability of the Hepatitis B vaccination. For any questions regarding the vaccination, please contact the Prevention Officer or the Head of Occupational Health and Safety.

2. Activities

To work safely with human material, one must adhere to the hygiene measures and safe working procedures listed below.

General

- A closed lab coat must be worn;
- Smoking, eating, drinking and storing food, applying cosmetics, or inserting contact lenses is not permitted;
- Long hair must be tied back;
- Avoid hand-face contact;

- Wear gloves if the skin on the hands is not intact (wounds, cracks, eczema, etc.);
- Pipetting by mouth is prohibited; use a bulb or pipette man;
- Filter tips may be used to prevent contamination of the mechanical parts of a pipette;
- Use only paper handkerchiefs or tissues if necessary;
- No administration may be kept in the laboratory other than the recording of experimental data;
- The workspace must be kept neat and clean. No unnecessary furniture or instruments may be present;
- Mobile equipment is operated only with clean hands. Prior to operation, the user must wash their hands with soap and water;
- The workplace (and used equipment) is cleaned and disinfected by the employee after completion of work, see work instruction [Disinfection laboratories](#);
- Everyone must wash their hands with soap and water before leaving the laboratory.

NB: Many activities involving human material take place in GMO laboratories. In that case, GMO regulations must be complied with during the work.

Safe working method

- Blood collection must take place in the designated rooms;
- Use the safe needle-disposal system;
- If the safe needle-disposal system cannot be used, never recap the needles. Dispose of the needle immediately in the designated sharps container;
- When working with human blood, ensure proper eye protection against splashes. Whenever possible, work in a safety cabinet type II (BSC); see [Procedure for the safe use of a biosafety cabinet type II](#). If no BSC is available, work in a fume hood. If this is also not available, wear safety glasses;
- Minimize aerosol formation by allowing tubes to stand for a few minutes before opening them, letting pipette contents run gently along the tube wall, and avoiding forceful expulsion, etc.;
- Place equipment that can form aerosols (e.g., non-self-contained blenders, sonicators) in a BSC, ensuring the protective airflow is not disrupted; see [Procedure for the safe use of a biosafety cabinet type II](#);
- Centrifuge only in closed tubes. If open tubes are unavoidable, use closed buckets and open them inside a BSC; see [Procedure for the safe use of a biosafety cabinet type II](#);
- Rotors contaminated due to leakage or breakage must be disinfected immediately after centrifugation has ended; see the [work instruction Laboratories Disinfection](#) for this;
- Equipment that has been in contact with human material must be cleaned before any maintenance or repair work is performed.
- Internal transport of human material should preferably take place in a double-contained, break-resistant, sealable, and disinfectable container;

3. Daily cleaning and disinfection

The cleaning of laboratories where human material is handled follows the standard cleaning procedures for regular laboratories. This means that floors and household waste bins are cleaned and emptied by the cleaning service, while employees are responsible for cleaning tables, equipment, and sinks.

In addition to routine cleaning, laboratory benches and used equipment must be disinfected after the work has been completed. See the [work instruction Laboratories Disinfection](#) for this.

4. Biological contaminated waste

- The liquid waste may be collected and solidified by adding a gelling agent. Once the liquid has been converted into a gel, the container can be disposed of in the blue (SZA) WIVA container.
- Dispose of solid material as potentially contaminated waste via a blue (SZA) WIVA container. After sealing the container, disinfect its exterior with an appropriate disinfectant. Leave the container in the laboratory until it is collected (UM) or take it to the nearest waste collection point (MUMC).

NB: When work with human material is carried out in GMO laboratories, all biological waste must be disposed of in the yellow (GMO) WIVA container.

5. Accidents and incidents

In the event of an incident involving human material, such as a spill, splash, or cutting incident, the following measures must be taken.

Puncture, cut, or splash incident

- Apply firm pressure to the wound immediately to induce good bleeding, then rinse the wound thoroughly under a strongly running tap.
- Disinfect the wound or affected skin with an appropriate skin disinfectant, such as 70% ethanol, chlorhexidine, or iodine tincture.
- If the eyes are contaminated, rinse them for 10 minutes using the available eye-wash facility.
- If the mouth is contaminated, rinse thoroughly with water.
- In case of severe bleeding, activate the company emergency response immediately via 1333 (UM)/1000 (MUMC+) or 043-3875566 (GSM).
- If there has been potential exposure to biological material, consult with the control room (1333 (UM)/1000 (MUMC+) or 043-3875566 (GSM)) to determine whether (limited) emergency response is required and which expert should be contacted.

Spill

- Contact the BSO immediately.
- Absorb the spilled liquid with tissues and dispose it of in a blue (SZA) WIVA container.
- Clean the affected surface with soap and water, then disinfect it using an appropriate disinfectant.

Incident involving a person

- If someone becomes unwell, always activate the company emergency response team via 1333 (UM) / 1000 (MUMC+) or 043-3875566 (GSM).

After the incident has been handled, it must always be reported using the incident form available on UMPLOYEE via this [link](#).

Abbreviations

BSO	Biosafety officer
GMO	Genetically Modified Organisme
MUMC	Maastricht University Medical Center
OH	Occupational Hygienist
UM	Maastricht University
P&D	People & Development
SZA	Specific Hospital Waste

References

- [LCI richtlijn prikaccidenten](#)
- [Website HSB Maastricht](#)
- [Arbeidsomstandighedenbesluit \(hoofdstuk 4, afdeling 9\)](#)

Further information

For further information, please contact the [BSO/OH](#).