

Biosafety concept for Cell-Sorting with focus on laboratory needs

Introduction

It is critical to understand when sorting any infectious or hazardous material, even if classified as BSL-2, that droplet based procedures are considered BSL-3 practices. The material itself gains its inherent biosafety level back when it is resolved or resuspended in fluids.

The operators therefore re-classify the infectious material to be sorted prior to each sort!

Background

The four biosafety levels (BSL-1, BSL-2, BSL-3, and BSL-4) consist of a combination of laboratory facilities, laboratory practices and techniques, and safety equipment. In the following a concept mainly for the laboratory needs for the newly developed FACS Core Facility (FCF) at the University Zürich is outlined.

A concept for laboratory practices in cell sorting will be established separately.

The aim is to facilitate sorting of unfixed specimens, especially human cells at Irchel Campus and at satellite locations likewise.

Description of laboratory needs

Laboratory needs and sorter specific requirements.

Biosafetylevel 1: fixed cells, fixed pathogens. No sorter specific requirements necessary

Biosafetylevel 2: a) free standing instrument

- place in BSL-3 Facility or separate BSL-2 room (especially equipped as outlined in laboratory needs for BSL-2)
- test for efficiency of aerosol containment
- adhere to BSL-3 practices

b) instrument in a biosafety cabinet

- place unit into BSL-2 room
- test for efficiency of aerosol containment
- observe BSL-2 practices

Biosafetylevel 3: search for alternative separation technology or sort under complete BSL-3 containment

Biosafetylevel 4: do not sort

A) Laboratory needs for BSL-2

1. The air venting system discharges air towards the outside away from occupied areas or it is HEPA filtered.
2. The cell sorter is located in a separate, lockable room where no other laboratory activity is performed.
3. Air flow in the room is balanced to create airflow into the room with no less than 10 changes of air per hour. It is recommended that a visual monitoring device located at the door measure negative airflow.

4. Access to the sorting room is restricted to allow the operator to concentrate on the sort and to maintain regular air flow and negative air pressure in the room. A sign should be placed on the outside of the door to indicate that a potentially biohazardous sort is in progress. This sign should also contain all necessary information, including warning for Class IV lasers, for entering the room safely, if needed.
5. All the other safety recommendations for BSL-3 practices and personal protective equipment (PPE) are followed rigorously.

Conclusion

1. Infections material is sorted at the FCF
2. The FACS release note is a prerequisite for a sort
3. Operators can reject sorts due to biosafety reasons

B) Additional devices necessary for FACS Aria at Irchel Campus to fulfil BSL-2 requirements and to protect the operator.

Aerosol Management System Approx 12`000 sFr

Safety cabinet for the sorter (e.g. Labgard S-125, Nuair)

Aerotech Collection Device for FACS Aria (GloGerm collection)

If a safety cabinet is installed the airflow as described in 3. does not need to be balanced by the room ventilation system.