

	Environmental Health and Safety Standard Operating Procedure (SOP) - Working Safely with <i>Candida albicans</i>
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1. Introduction

Candida albicans, a diploid sexual fungus, is the causal agent of opportunistic infections in humans, the most common being oral and vaginal infections. Systemic fungal infections have emerged as important causes of morbidity and mortality in immunocompromised patients (e.g., AIDS, cancer chemotherapy, organ or bone marrow transplantation). In addition, hospital-related infections in patients not previously considered at risk (e.g., patients on an intensive care unit) have become a cause of major health concern. To date, two (2) laboratory acquired infections involving *Candida albicans* have been recorded.

2. Modes of Transmission

Candida albicans may be transmitted by:

- Penetration of the skin via puncture or absorption (through scratches, cuts, abrasions, dermatitis or other lesions)
- Mucous membrane exposure of the eyes, nose, and mouth
- Ingestion
- Inhalation

3. Containment Level

Work with *Candida albicans* must be conducted utilizing Biological Safety Level 2 (BSL-2) practices and procedures as identified by Carnegie Mellon University's Institutional Biological Safety Committee (IBC).

4. Approval

Experiments using *Candida albicans* require the approval of the Biosafety Officer before initiation. In addition, all recombinant DNA work must be registered with the Institutional Biosafety Committee (IBC).

5. Facility Considerations

The Principal Investigator must designate a laboratory that fulfills the facility requirements as outlined in the CDC/NIH publication [Biosafety in Microbiological and Biomedical Laboratories for Biological Safety Level 2 Laboratories](#). It is preferable that this be an inner lab with two doors between the Biological Safety Cabinet and the hallway. Air must flow from the hallway to this lab (negative to the hallway) and all air is exhausted outside the building, not recirculated.

Environmental Health and Safety (EHS) can evaluate the negative pressure status of the laboratory.

6. Engineering Controls

The following safety equipment **MUST** be used when working with *Candida albicans*:

- a. Certified Class II Biological Safety Cabinets for all procedures that are likely to generate splashes and aerosols
- b. Sealed centrifuge rotors and/or safety cups
- c. Vacuum lines equipped with an in-line HEPA filter as well as a primary and secondary vacuum flash containing a 10% bleach solution.

7. Administrative Controls

Work with *Candida albicans* should only be carried out by trained personnel who must be directed by a competent scientist. Access to the laboratory must be limited when the agent is in use. The laboratory must be posted with Carnegie Mellon University's Biohazard signage. Standard Operating Procedures (SOP's) for the planned procedures must be written and shall be present in the laboratory at all times. All persons involved with the handling and administration of *Candida albicans* must receive Carnegie Mellon University's Biosafety training that covers safety procedures. It is the Principal Investigator's responsibility to identify the persons requiring this training, and to contact the Biosafety office to schedule a training session. All persons must be informed of the risks of working with *Candida albicans* and should consult with their physician in the event they are an immunocompromised patient.

8. Personal Protective Equipment

The following personal protective equipment **MUST** be worn when working with *Candida albicans*:

- a. Gloves (consider double-gloving depending on the procedures being performed)
- b. Lab Coat
- c. Goggles

9. Special Handling Procedures

- a. Specimens or containers of *Candida albicans* may not be removed from the laboratory for experimental purposes unless they are transported in a sealable, secondary container.
- b. If you need to aerate cultures, it must be done slowly and in a manner that minimizes the potential for aerosol creation. This action must be carried out in a class II biological safety cabinet.
- c. When pouring and pipetting samples, it must be done gently and slowly and must be carried out in a Class II biological safety cabinet.
- d. Extra precautions must be taken when using sharps. Appropriate substitutes for sharp items must be used whenever they are available. Use plastic aspiration pipettes instead of glass Pasteur pipettes.

- e. For Aspiration- Use a plastic vacuum flask with a second vacuum flask connected to it as a backup, with non-collapsible tubing capable of withstanding disinfection. To the second vacuum flask attach a hydrophobic and a HEPA filter (or combination filter) to ensure that nothing is sucked into the house vacuum system. These 3 items must be attached in series from the vacuum source in the hood or a vacuum pump.

10. Decontamination/Clean-Up Procedures

All materials that have come into contact with *Candida albicans* should be disinfected using a 1:10 bleach solution before disposal. Additionally, all work surfaces must be disinfected with a 1:10 solution of bleach once work is completed and at the end of the work day. (Note: A 15-minute contact time is required for decontamination).

11. Waste Disposal Procedures

- a. Non-Sharp Waste- All cultures, stocks, and cell culture materials must be disinfected and autoclaved prior to being disposed of into a double red bag-lined biohazard box.
- b. Sharps Waste-All needles, syringes, razors, scalpels, Pasteur pipettes and pipette tips must be disposed of in an approved, puncture resistant sharps container. Sharps containers must not be filled more than 2/3 of their capacity.
- c. Liquid Waste-All liquid waste contaminated or potentially contaminated with *Candida albicans* must be disinfected with a 1:10 bleach solution before disposal via sanitary sewer. Liquid waste containers must be stored in secondary containment that is capable of containing the entire volume of liquid in the event of a spill.

12. Injury/Exposure Incident Procedures

- a. Eye or Mucous Membrane Exposure from Splash or Aerosols- rinse a minimum of 15-minutes using eye wash and report the incident to your supervisor immediately.
- b. Skin Contamination-Wash affected areas with soap and water for 15-minutes and report the incident to your supervisor immediately.
- c. Needle stick and/or Sharps Exposure- Wash affected areas with soap and water for 15-minutes. Immediately notify your supervisor. The supervisor will complete the Post-Exposure Incident Report and submit it to EHS within 24-hours of the exposure. Contact University Police at 8-2323 to arrange for appropriate medical attention.

13. Spill Response Procedures

The following steps must be taken when cleaning up a spill:

- a. Stop, notify others and isolate the area!
- b. Put on appropriate PPE (lab coat, gloves, eye and face protection).
- c. Remove glass/lumps with forceps or scoop if applicable and place into a rigid, puncture resistant container.
- d. Place paper towels soaked in bleach directly on the spill and let soak for 20 minutes.

- e. Wipe up area and discard towels in biohazard waste container.
- f. Continue wiping area with paper towels soaked in bleach until the spill area is completely cleaned.
- g. Discard all materials in biohazard waste container.
- h. Wash hands thoroughly.

14. References

- a. *Biological Safety Principles and Practices*, 3rd edition, 2000. ASM Press. Edited by Diane O. Fleming, Ph.D, and Debra Hunt, Dr.P.H.
- b. [Biosafety in Microbiological and Biomedical Laboratories for Biological Safety Level 2 Laboratories](#), 6th edition, December 2024. Centers for Disease Control.
- c. [Canadian Laboratory Centre for Disease Control Material Safety Data Sheets](#).
- d. [Guidelines for Research Involving Recombinant DNA Molecules](#), April 2024. National Institutes of Health.

15. Revisions

Date	Documented Changes	Initials
1/2020	Initial	
1/14/2021	Updated Format and Accessibility Update	MAS
1/19/2024	Reviewed – no updates necessary	AJL
3/11/2025	Updated links for BMBL and NIH Guidelines	MAS