Considerations for Handling Potential Viral Hemorrhagic Fever (VHFs) Samples

These considerations do not override any regulatory or country-specific mandates. This document provides general considerations for handling potential VHF samples; however, a pathogen-specific risk assessment must be conducted for each cases. [1]

BSL2 with enhanced BSL3 practices

Laboratory procedures:

- Diagnostic handling of blood or body fluids (urine, throat washing, tissue specimens, blood, cerebrospinal fluid, pleural and peritoneal fluid) of a person who is sick with or has died from VHF disease – excludes viral amplification
- Contact with objects or surfaces that have been contaminated with body fluids (like blood, feces, vomit) from a person sick with the disease or who has died from the disease.

Healthcare practices:

- Collection of clinical specimens – point of care analysis
- Assess the risks prior to specimen collection- see the NETEC considerations[1]
- The CDC provides the following examples for occupational exposure[2]:
  - Providing health care, performing environmental cleaning, or handling waste in an Ebola treatment unit (ETU), or for patients with Bundibugyo Virus Disease (BVD) in any clinical setting
  - Entry into a patient care area of an ETU for any reason
  - Providing health care to an acutely ill patient not known to have BVD
  - Environmental cleaning or handling of waste in a regular healthcare facility
  - Clinical laboratory work associated with a treatment unit or other health care setting
  - Burial work

Laboratory Practices

- Review reference documents to ensure that your SOPs are current
  - Good (Standard) Laboratory Practices - US HHS - CDC/NIH Biosafety in Microbiological and Biomedical Laboratories 6th Edition Appendix N – Clinical Laboratories. [3]
  - Centers for Disease Control and Prevention Guidelines for Safe Work Practices in Human and Animal Medical Diagnostic Laboratories Recommendations of a CDC-convened, Biosafety Blue Ribbon Panel for biosafety practices in virology laboratories, page 55 [4]
  - ISO 35001:2019 Biorisk management for laboratories and other related organisations[5]
  - CEN Workshop Agreement 15793: Laboratory Biorisk Management Standard [6]
  - In the USA: follow the OSHA Bloodborne Pathogens Standard[7]
  - Government of Canada – Biosafety guidelines for laboratories handling specimens from patients under investigation for Ebola disease[8]
- Pre-analytical risk assessment (reference CDC Clinical Guidance for Ebola[9])
  - Travel and exposure history
  - Clinical syndrome compatibility
  - Epidemiological linkage to known outbreaks
  - Coordination with public health authorities
  - Differential diagnosis considerations (e.g., malaria, typhoid fever, severe bacterial infections)
- Risk Assessment considerations:
  - Activities to be performed, their location, and responsible personnel
  - Review data or fact sheets about the closest virus known [10]
  - Potential for sprays, splashes, aerosols
  - Patient status (screening, suspected, confirmed)
  - Collecting samples v. handling samples
  - Inactivation of samples (buffers, fixed smears, temperature)[11]
  - Use of Point of Care instruments v. automated laboratory equipment
  - Assessment of whether Laboratory-Acquired Infections (LAI) infections linked to similar procedure[12]
  - Potential for animal samples to be processed
  - Apply a risk-based approach to all laboratory manipulations, considering:[13], [14]
    - specimen type
    - procedure performed
    - likelihood of aerosol generation
    - staff competency
    - engineering controls available
- Standard Precautions During Sample or Specimen Testing
  - Have a laboratory activation checklist. See example provided by the National Emerging Special Pathogens Training & Education Center –NETEC [15]
  - Access to the laboratory should be restricted when testing is in progress

- Only trained personnel should participate in specimen handling and processing activities. Verify that lab personnel demonstrate competency in standard precautions and biosafety
  - Establish clean and contaminated zones
  - Clearly pre-label tubes prior to the collection of patient specimens, and segregate VHF suspect samples when handling in the laboratory
  - Manipulate samples on a plastic-backed absorbent pad
  - Where possible, avoid activities that may generate aerosols (e.g., mixing samples by pipetting, centrifugation). Use safety seal cups to avoid exposure to aerosols.
  - Limit the use of glass or sharps wherever possible and substitute with plastic items.

Personal Protective Equipment (PPE):

- Minimal: Gloves, Water-resistant gowns, Goggles, Full face shields, Mask that covers nose and mouth
- Shoes and leg covers could be appropriate in certain circumstances such as if specimen collection is performed in a highly contaminated room. [16]
- Single-use PPE should not be reused and should be discarded per SOP after removal
- Reusable PPE must be decontaminated per SOP
- Waterproof rubber boots are preferred in patient-care areas with suspected/confirmed EBOD or MARD [17]
- Inspect all PPE before use. Consider using the Trained Observer method or buddy system to remove contaminated PPE[18]
- Generate PPE donning and doffing charts including the available supplies, see the example from University of Nebraska Medical Center[19]

Secondary Barriers for samples from suspected cases

- Use of certified, Class II biosafety cabinet (BSC) (properly maintained) for manipulation/processing of samples.
- Use of sealed safety cups or rotors for centrifuges for sample processing (load/unload in certified Class II biosafety cabinet).
- Mechanical ventilation systems that provide an inward flow of air without recirculation to spaces outside of the laboratory (recommended)
- Review the WHO Laboratory biosafety manual, 4th edition: Biological safety cabinets and other primary containment devices[20]

Decontamination

- Use of chemical disinfectants effective against enveloped viruses must be applied to surfaces and equipment for the recommended contact time for proper decontamination. EPA Registered Antimicrobial Products Effective Against Ebola Virus List L
- VHFs are susceptible to a broad range of hospital disinfectants. Surfaces and objects contaminated with body fluids should be disinfected ensuring appropriate contact time.
- Decontamination of Point of Care instruments: consult with manufacturer
- Training and Validation: Personnel must be trained in handling waste
- Consider establishing a validation protocol for effective decontamination
- Review country-specific infection control recommendations and resilience measures [21]
- Disinfection methods and solutions should be selected based on the specific pathogen involved [22]

Spill Response

- Review existing SOP to ensure that appropriate PPE and disinfectant are included for the specific pathogen
- Review notifications including Occupational health

Waste Management

- All waste contaminated with materials from patients or specimens suspected or confirmed to be infected with VHF pathogens must be treated and managed as biohazardous (regulated medical) waste.
- A method for decontaminating all laboratory waste should be available in the facility
- Review WHO document from 2021 on Ebola Virus Disease – Key Questions and answers concerning health-care waste.[23]

Packaging & Transport

- Potentially infectious materials must be placed in a durable, leak proof container during collection, handling, processing, storage, or transport within a facility. To reduce the risk of breakage or leaks, do not use any pneumatic tube system for transporting suspected Ebola virus disease specimens.
- Follow local, national and international guidelines for identification, classification, packaging, labeling, and shipping. Ebola virus is classified as a Category A infectious substance by the US Department of Transportation (DOT) and International Air Transport Association (IATA).

- Specimens from persons under investigation (PUIs) for Ebola or patients confirmed to have Ebola virus infection must be packaged and shipped as Category A infectious substances.
    - Packing and shipping Category A infectious substances must be performed by persons trained and certified in compliance with US DOT and/or IATA requirements.[24]
    - Review the WHO Interim Guidance for shipping human blood samples from suspected Ebola or Marburg cases in-country.[25]
    - CDC Guidance for Collection, Transport and Submission of Specimens for Ebola Virus Testing in the United States.[26]

Administrative Controls:

- Training and competency verification in donning and doffing required PPE
- Documented respirator training, clinical clearance, and fit testing per country requirement (e.g. N-95, PAPR).
- Training and competency verification for each procedure performed
- Specialized training in handling/manipulating pathogenic agents under qualified and competent supervisors.
- Demonstrated competency in working within a BSC (if available)
    - Checklist for Safe use of Biological Safety Cabinets [27]
    - WHO Biological safety cabinets and other primary containment devices [28]
- Biosecurity plan for managing samples (intake and transfers to other laboratories)
- Specimen accountability and chain-of-custody procedures should be maintained whenever applicable [29]
- Established communication pathways with public health authorities should be activated before specimen shipment or testing decisions

Preparedness and Organizational Readiness[29]

- Laboratory activation checklist
- Communication pathways
- Public health notification procedures
- Trained personnel availability
- Occupational health readiness
- Emergency spill response capability
- Inventory of supplies
- Waste management
- See NETEC's example for response plan. [30]

Diagnostic considerations

- A negative result obtained within the first 72 hours after symptom onset may require repeat testing according to national guidance. [14]

Occupational Health

- Mandatory reporting of any symptoms, any laboratory exposure
- Consider baseline blood, baseline questionnaire, emergency wallet card, differential diagnosis
- Exposure follow-up procedures
- Post-exposure medical evaluation
- Healthcare personnel with potential exposure to Ebola virus should undergo active monitoring for symptoms during the 21-day incubation period following the last exposure.[18]

BSL4 – footnote

In the USA, the cultures and specimens containing ebolavirus must be handled at a Biosafety Level 4 (BSL4) facility with HEPA-filtrated laboratory exhaust. [4]

Other procedures and sample types that should be considered for handling at BSL4 include the following:

- Virus isolation/propagation in cell culture and initial characterization of viral agents recovered in cultures of HFV specimens
- Infectious recombinant nucleic acid
- Infection of experimental animals with any of the above

Follow the BSL4 practices and procedures for your facility

References

1 NETEC Laboratory Testing for Ebola - https://netec.org/2022/10/11/laboratory-testing-for-ebola/
PSDSs for some VHFs-- Junin virus, Lassa virus, Machupo virus, Marburg virus, Ebola virus, Omsk hemorrhagic fever virus, Crimean-Congo hemorrhagic fever virus, Hantavirus, Dengue virus, Yellow fever virus

2 CDC Interim Guidance for Public Health Assessment and Management of Travelers from Countries Affected by the 2026 Ebola Outbreak - https://www.cdc.gov/ebola/php/emergency-guidance/index.html#cdc_er_guidance_recom1-definitions

3 CDC Biosafety in Microbiological and Biomedical Laboratories 6th Edition Appendix N – Clinical Laboratories. https://www.cdc.gov/labs/pdf/SF__19_308133-A_BMBL6_00-BOOK-WEB-final-3.pdf

4 Centers for Disease Control and Prevention Guidelines for Safe Work Practices in Human and Animal Medical Diagnostic Laboratories Recommendations of a CDC-convened, Biosafety Blue Ribbon Panel. MMWR 2012;61(Suppl):page 55 https://www.cdc.gov/mmwr/pdf/other/su6101.pdf

5 ISO 35001:2019(en) Biorisk management for laboratories and other related organisations. https://www.iso.org/obp/ui/#iso:std:iso:35001:ed-1:v1:en [requires license]

6 CEN Workshop Agreement 15793: Laboratory Biorisk Management Standard https://biosecuritycentral.org/resource/requirements-and-protocols/cwa-15793/

7 OSHA **Bloodborne Pathogens and Needlestick Prevention** https://www.osha.gov/bloodborne-pathogens/standards [accessed 5/30/2026]

8 Government of Canada - Biosafety guidelines for laboratories handling specimens from patients under investigation for Ebola disease - https://www.canada.ca/en/public-health/services/infectious-diseases/viral-haemorrhagic-fevers/interim-biosafety-guidelines-laboratories-handling-specimens-patients-under-investigation-ebola-disease.html

9 Guide for Clinicians Evaluating an Ill Person for a Special Pathogen https://www.cdc.gov/viral-hemorrhagic-fevers/media/pdfs/2024/07/336717-F_IG_SpecialPathogensTestingDecisionTree_022324_v2.pdfDisease _ Ebola _ CDC 2026.pdf /336717-F_IG_SpecialPathogensTestingDecisionTree_022324_v2.pdf

10 Fact Sheets for Ebola
Health Canada Ebolaviruses: Infectious substances Pathogen Safety Data Sheet. https://www.canada.ca/en/public-health/services/laboratory-biosafety-biosecurity/pathogen-safety-data-sheets-risk-assessment/ebolavirus.html

WHO Ebola Disease https://www.who.int/news-room/fact-sheets/detail/ebola-disease

US CDC Ebola Fact Sheet https://www.cdc.gov/ebola/media/pdfs/2024/05/ebola-factsheet-P.pdf

European CDC Factsheet about Ebola disease. https://www.ecdc.europa.eu/en/infectious-disease-topics/ebola-disease/disease-information/factsheet-about-ebola-disease

11 GENERAL PROCEDURES FOR INACTIVATION OF POTENTIALLY INFECTIOUS SAMPLES WITH EBOLA VIRUS1 20 May 2026 https://www.paho.org/sites/default/files/2026/05/ebola-inactivation-samples-paho2014-2026.pdf [accessed 5/30/2026]

12 ABSA International Laboratory Acquired Infection Database. https://my.absa.org/LAI [accessed 5/30/2026]

13 Diagnostic testing for Ebola and Marburg virus diseases:interim guidance, 20 December 2024. https://iris.who.int/server/api/core/bitstreams/e209d826-5f3d-4ca8-b278-69254569e7ac/content or https://www.who.int/publications/i/item/B09221

14 WHO PAHO Algorithm for handling of samples from suspected Ebola Virus Disease (EVD)1 20 May 2026 https://www.paho.org/sites/default/files/2026/05/ebola-algorithm-updated-handling-samples-paho-2026.pdf

15 NETEC. (2022). Laboratory Activation Checklist. NETEC Resource Library. Retrieved 2026-05-30, from https://repository.netecweb.org/items/show/1671 https://repository.netecweb.org/items/show/1671

16 Cobo F. Viruses Causing Hemorrhagic Fever. Safety Laboratory Procedures. Open Virol J. 2016 Jan 15;10:1-9. doi: 10.2174/1874357901610010001. PMID: 27014378; PMCID: PMC4780467. https://pmc.ncbi.nlm.nih.gov/articles/PMC4780467/ [accessed 5/30/2026]

17 WHO Infection prevention and control guideline for Ebola and Marburg diseases. Geneva: World Health Organization; 2025. Licence: CC BY-NC-SA 3.0 IGO. https://iris.who.int/server/api/core/bitstreams/018890fc-eb18-469d-b295-96ca77b99b34/content [accessed 5/30/2026]

18 CDC VHFs Guidance for Personal Protective Equipment (PPE). https://www.cdc.gov/viral-hemorrhagic-fevers/hcp/guidance/index.html#cdc_listing_intro-donning-and-doffing-ppe-during-management-of-patients-with-selected-vhf-in-u-s-hospitals [Accessed 6/7/2026]

19 University of Nebraska Medical Center PPE Donning and Doffing. https://www.nebraskamed.com/sites/default/files/documents/biocontainment/ebolappechecklist.pdf [Accessed 6/7/2026]

20 WHO **Laboratory biosafety manual, 4th edition: Biological safety cabinets and other primary containment devices. https://www.who.int/publications/i/item/9789240011335 [Accessed 6/7/2026]**

21 Tomczyk S, Twyman A, de Kraker M et al. **The first WHO global survey on infection prevention and control in health-care facilities** The Lancet Infectious Diseases, 2022; 22, 845-856. https://www.thelancet.com/journals/laninf/article/PIIS1473-3099%2821%2900809-4/fulltext [Accessed 6/7/2026]

22 WHO Decontamination and waste management https://www.who.int/publications/i/item/9789240011359

23 WHO EVD Key Questions and answers concerning health-care waste - https://cdn.who.int/media/docs/default-source/wash-documents/wash-in-hcf/ebola_healthcarewaste_q-a_sept20211264f975-47e9-4c7d-9d3e-a7f31368c2f8.pdf

24 Guidance for Collection, Transport and Submission of Specimens for Ebola Virus Testing in the United States https://www.cdc.gov/ebola/media/pdfs/2024/05/Ebola-lab-guidance-collection-transport-508.pdf

25 WHO **How to safely ship human blood samples from suspected Ebola or Marburg cases within a country by road, rail and sea** https://www.who.int/publications/i/item/how-to-safely-ship-human-blood-samples-from-suspected-ebola-or-marburg-cases-within-a-country-by-road-rail-and-sea [Accessed 6/7/2026]

26 Guidance for Collection, Transport and Submission of Specimens for Ebola Virus Testing in the United States https://www.cdc.gov/ebola/media/pdfs/2024/05/Ebola-lab-guidance-collection-transport-508.pdf

27 Checklist for Safe Use of Biological Safety Cabinets - https://www.cdc.gov/safe-labs/docs/BSC-Checklist.pdf

28 **Biological safety cabinets and other primary containment devices - 2020** https://www.who.int/publications/b/54959

29 Mafra, C,. Brandão, P.E., Ochoa Carrera, L. From rodent-borne infections to Ebola virus disease: Biosafety, Biosecurity and Risk Assessment Perspectives. Global Health Security Fund & PANDEMICTech. May 2026. https://absa.org/wp-content/uploads/2026/06/BioPrevail_SB3_From-rodent-borne-infections-to-Ebola-virus-disease-Biosafety-Biosecurity-and-Risk-Management.pdf [Accessed 6/14/2026]

30 NETEC SBAR: Ebola Bundibugyo Virus Disease. SITUATION, BACKGROUND, ASSESSMENT, AND RECOMMENDATION (SBAR) BCU WORKGROUP EFFECTIVE DATE 06.03.2026. https://repository.netecweb.org/items/show/1985 [Accessed 6/7/2026]