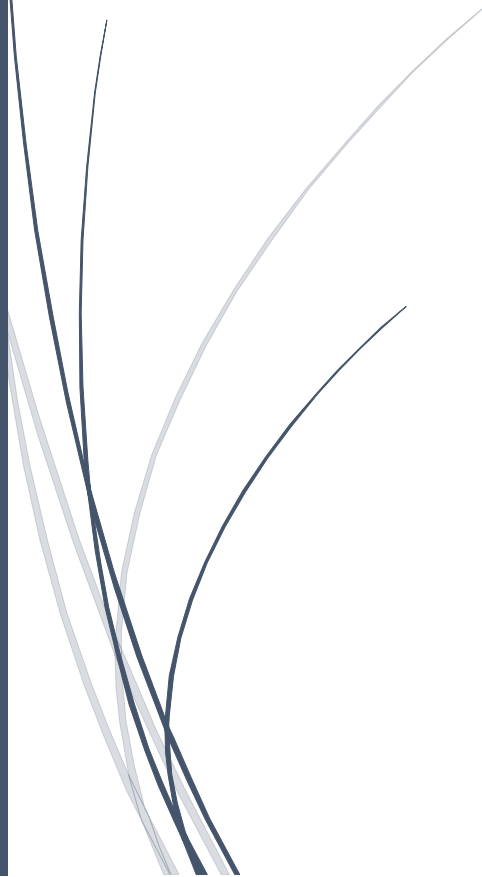


6/18/2020

Guidance on Sample Handling and Biosafety in Laboratories for SARS CoV-2



CONTENTS

I.	Background	2
II.	Purpose of the Document	2
III.	Testing Strategies	2
IV.	Specimens Collection, Transport & Referral:	3
V.	Personal Protective Equipment:	3
VI.	Laboratory Biosafety Requirements	3
VII.	Biosafety Requirements for CBNAAT and TrueNat testing	4
VIII.	Work that Should be Conducted Within a Biosafety Cabinet	4
IX.	How Routine Laboratory Specimens be Handled to Avoid COVID Transmission?	4
X.	Special Considerations:	5
XI.	Appropriate Disinfectants	6
XII.	Biomedical Waste Management	6
XIII.	References:	8

I. Background

Timely and accurate laboratory testing of specimens from individuals under investigation is an essential part of the management of novel Coronavirus Disease discovered in 2019 (COVID-19) and any other emerging infections in general. However, any shortage of laboratory diagnostic capacity at the national or local level will hamper epidemic response due to delay in detection. Laboratories should be aware of Government of India, and state government-issued guidelines issued from time to time and monitor changes in epidemic situations. Anticipating a rapid increase in the demand, it is expected that more decentralization of testing facilities would occur.

II. Purpose of the Document

The document is intended to provide specific guidance on sample collection, packaging, transportation and ensuring safety of laboratory staff and the environment. The document assembles together guidelines issued by ICMR and MoHFW regarding biosafety practices for COVID 19 in laboratories.

Recommendation from other international guidelines like CDC, WHO and others are referenced where relevant but national guidelines are emphasized throughout this document. Regardless of whether it is a tertiary care, district hospital, PHC or a small clinic or standalone lab these guidelines are applicable to ensure staff safety and containment of spread of SARS-CoV-2. This document also describes specimen packaging and transport with adequate details on labelling requirements as per **International Air Transport Association's Dangerous Goods Regulation (IATA/DGR)** guidelines.

III. Testing Strategies

For this section, refer to the following guidelines from ICMR and MoHFW, Government of India:

- Case definitions for COVID -19 clinical management Protocol: COVID-19, EMR Division, Directorate General of Health Services, MoHFW, Government of India (Version dt. 13/06/2020) <https://www.mohfw.gov.in/pdf/ClinicalManagementProtocolforCOVID19.pdf>
- Strategy for COVID19 testing in India (Version 5, dated 18/05/2020) https://www.icmr.gov.in/pdf/covid/strategy/Testing_Strategy_v5_18052020.pdf
- Strategy for COVID19 testing for pregnant women in India (ICMR Version 1, dated 20/04/2020) <https://www.icmr.gov.in/ctechdocad.html>
- Criteria for initiation of additional COVID-19 testing laboratories are available at https://www.icmr.gov.in/pdf/covid/labs/Criteria_for_initiation_additional_COVID19_testing_laboratories.pdf
- Advisory on Use of Rapid Antigen Detection Test for COVID-19 (Version.14/06/2020) available at https://www.icmr.gov.in/pdf/covid/strategy/Advisory_for_rapid_antigen_test_14062020.pdf

ICMR has released a list of mentor oversight labs to review the requests for approving any new laboratory for COVID testing which can be found at https://www.icmr.gov.in/pdf/covid/labs/Mentor_Institutes.pdf

IV. Specimens Collection, Transport & Referral:

Refer to the following guidelines to learn more about COVID-19, Case definition, when to test, when, and what samples to be taken, specimen referral, transportation, when PCR testing should be done while discharging patients from hospital etc.

- Clinical Management Protocol: COVID-19, Version 3, 13.06.20
<https://www.mohfw.gov.in/pdf/ClinicalManagementProtocolforCOVID19.pdf>
- Specimen Collection, Packaging and Transport Guidelines for 2019 nCoV - Acute Respiratory Disease. National Center for Disease Control, Government of India
<https://ncdc.gov.in/WriteReadData/1892s/50471431021580628750.pdf>

V. Personal Protective Equipment:

Refer to the following guidelines to know more on PPE for laboratory procedures:

- MoHFW guidance on Novel Coronavirus Disease 2019 (COVID-19): Guidelines on rational use of Personal Protective Equipment
<https://www.mohfw.gov.in/pdf/GuidelinesonrationaluseofPersonalProtectiveEquipment.pdf>

VI. Laboratory Biosafety Requirements

As per WHO biosafety guidelines, **non-propagative diagnostic laboratory work** (for example, sequencing, nucleic acid amplification test [NAAT]) should be conducted at a facility using procedures equivalent to Biosafety Level 2 (BSL-2) and propagative work (for example, virus culture, isolation or neutralization assays) should be conducted at a containment laboratory with inward directional airflow (BSL-3). Ministry of Health and Family Welfare (MoHFW), Government of India, requires inclusion of BSL-2 laboratory testing facility for all infectious pathogens in the microbiology departments of all medical colleges/institutes in view of COVID 19 pandemic (Order No: MCI (34)(41)(Gen)-Med/2020/03203; dated: 2nd June 2020)

The following tests and activities can be done in BSL-2 facilities using Standard Precautions:

- Molecular analysis of extracted nucleic acid preparations
- Final packaging of specimens for transport to diagnostic laboratories for additional testing (specimens should already be in a sealed, decontaminated primary container)
- Using inactivated specimens, such as specimens in nucleic acid extraction buffer
- Diagnostic assays using whole blood, serum and plasma, including routine biochemistry and haematology, unless there is a risk of generating aerosols
- Assays using virus-inactivated specimens, including molecular testing of inactivated specimens
- Examination of bacterial or fungal cultures
- Staining and microscopy of heat-fixed or chemically fixed smears

VII. Biosafety Requirements for CBNAAT and TrueNat testing

To learn more about biosafety requirement for using CBNAAT or TruNat for COVID-19 diagnosis please use the following guidelines from ICMR

1. Advisory for use of Cartridge Based Nucleic Acid Amplification Test (CBNAAT) using Cepheid Xpert Xpress SARS-CoV2 (9 June 2020)
https://www.icmr.gov.in/pdf/covid/labs/Cepheid_Xpert_Xpress_SARS-CoV2_advisory_v2.pdf
2. Revised Guidelines for TrueNat testing for COVID-19 (19 June 2020)
https://www.icmr.gov.in/pdf/covid/labs/Revised_Guidelines_TrueNat_Testing_19052020.pdf

VIII. Work that Should be Conducted Within a Biosafety Cabinet

- Preparation of specimens for molecular testing (for example respiratory virus PCR) prior to sample inactivation
- Division, aliquoting, or diluting of respiratory tract specimens, faecal specimens, urine specimens, and tissue specimens in which virus has not been inactivated
- Inoculation of bacterial or fungal culture media
- Urine antigen testing (such as for detection of Legionella pneumophila or Streptococcus pneumoniae)
- Rapid antigen tests of respiratory tract specimens
- Processing of any non-inactivated specimen that might result in the generation of aerosols
- Preparation and fixing (chemical or heat) of smears for microscopy
- Hematological or immunological work
- Rapid diagnostic tests for malaria parasites

COVID-19: safe handling and processing for samples in laboratories. Govt of UK. Updated 14 May 2020

(<https://www.gov.uk/government/publications/wuhan-novel-coronavirus-guidance-for-clinical-diagnostic-laboratories/wuhan-novel-coronavirus-handling-and-processing-of-laboratory-specimens>)

Labs performing only PCR and sequencing needs a BSL-2 facility and all samples should be handled in biosafety cabinet Type II A2.

All manipulations of potentially infectious materials, including those that may cause splashes, droplets, or aerosols of infectious materials (e.g. loading and unloading of sealed centrifuge cups, grinding, blending, vigorous shaking or mixing, sonic disruption, opening of containers of infectious materials whose internal pressure may be different from the ambient pressure), should be performed in appropriately maintained and validated BSCs.

IX. How Routine Laboratory Specimens be Handled to Avoid COVID Transmission?

Examples of routine laboratory procedures include:

- a) Diagnostic testing of serum, blood (**including hematology and clinical chemistry**), respiratory specimens such as nasopharyngeal and oropharyngeal swabs, sputum and/or endotracheal aspirate or bronchoalveolar lavage, stool or other specimens

- b) Routine examination of mycotic and bacterial cultures developed from respiratory tract specimens.

While processing

- Adhere to “**Standard Precautions**” while handling clinical specimens, consider all specimen might contain potentially infectious materials
- Handle all samples in a certified Class II A2 Biological Safety Cabinet (BSC) if COVID 19 is suspected
- Even aerosol generating procedures can be safely done inside a certified BSC
- **Do not attempt to process samples for non-propagative diagnostic laboratory tests if the lab does not have a certified BSC in place**
- **Standard Precautions** include hand hygiene and the use of personal protective equipment (PPE), such as laboratory coats or gowns, gloves, and eye protection **as recommended by the national guidelines based on the risk involved**
- For diagnostic testing of specimens conducted outside of a BSL-2 laboratory, such as rapid respiratory testing (antigen tests) performed at the point of care:
 - Perform a site-specific and activity-specific risk assessment to identify and mitigate safety risks
 - Train staff on the proper use of the instrument and ways to minimize the risk of exposures.
 - Follow Standard Precautions when handling clinical specimens, including hand hygiene and the use of PPE, such as laboratory coats or gowns, gloves, and eye protection. If needed, additional precautions can be used, such as a surgical mask or face shield, or other physical barriers, such as a splash shield to work behind. For appropriate PPE national biosafety guidelines to be followed
 - When using patient swabs, minimize contamination of the swab stick and wrapper by widely opening the wrapper prior to placing the swab back into the wrapper
 - Change gloves after adding patient specimens to the instrument.
 - Decontaminate testing area after each run by using an approved disinfectant for SARS-CoV-2
- According to guidance from MoHFW , persons involved in sample collection & testing should wear full PPE.
(MoHFW guidance on Novel Coronavirus Disease 2019 (COVID-19): Guidelines on rational use of Personal Protective Equipment.
<https://www.mohfw.gov.in/pdf/GuidelinesonrationaluseofPersonalProtectiveEquipment.pdf>)
- Follow routine laboratory practices and procedures for decontamination of work surfaces and management of laboratory waste.

X. Special Considerations:

1. **Auto-analyzers should be disinfected after sample processing and before scheduled maintenance** in accordance with manufacturer’s recommendations. Some auto-analyzer protocols for routine laboratory tests may require specimen tubes to be opened first, or initial processing of the sample to be performed. Evidence suggests that capping and uncapping of samples is not a high-risk aerosol generating procedure which is dependent on the cap and tube design. These factors must be considered in a suitable and sufficient risk assessment which also considers if the sample

needs to be centrifuged, vortexed or pipetted manually. The risk assessment must include consideration of whether a BSC needs to be used.

2. Waste from auto-analyzers is unlikely to pose a significant risk due to the low sample volume and dilution steps, therefore **special waste disposal precautions are not recommended for auto-analyzer waste.**
3. Centrifugation of specimens with infectious potential must be performed using sealed centrifuge rotors or sample cups which are loaded and unloaded in a BSC.

XI. Appropriate Disinfectants

For this section, refer to the following guidance:

- Cleaning and disinfection of environmental surfaces in the context of COVID-19. WHO. Interim guidance, 15 May 2020
(<https://www.who.int/publications/i/item/cleaning-and-disinfection-of-environmental-surfaces-inthe-context-of-covid-19>)
- NCDC's guidance on Infection Prevention and Control (IPC) for COVID-19, 3rd April 2020
(<https://ncdc.gov.in/WriteReadData/1892s/53436598731586345131.pdf>)

XII. Biomedical Waste Management

In order to deal with COVID-19 pandemic, State and Central Governments have initiated various steps, which include setting up of quarantine centers/camps, Isolation wards, sample collection centers and laboratories. Following specific guidelines for management of waste generated during diagnostics and treatment of COVID-19 suspected / confirmed patients, are required to be followed by all the stakeholders including isolation wards, quarantine centers, sample collection centers, laboratories, ULBs and common biomedical waste treatment and disposal facilities. These COVID-19 specific guidelines should be used in addition to existing practices under BMW Management Rules, 2016 and Amendments 2018 and 2019 given by Ministry of Environment Forest and Climate Change regarding segregation of biomedical waste at source, collection, transportation, storage, and disposal. (https://tnpcb.gov.in/pdf_2020/BMW-GUIDELINES-COVID_Revised_April2020.pdf)

Labs should implement the following waste disposal rules:

- Report opening or operation of COVID-19 sample collection centers and laboratories to concerned SPCB. Guidelines given at section (a) for isolation wards should be applied suitably in case of test centers and laboratories.
- Keep separate color coded bins/bags/containers in wards and maintain proper segregation of waste as per BMW Rules, 2016 as amended and CPCB guidelines for implementation of BMW Management Rules.
- As precaution double layered bags (using 2 bags) should be used for collection of waste from labs processing COVID samples so as to ensure adequate strength and no-leaks.

- Collect and store biomedical waste separately prior to handing over the same CBWTF. Use a dedicated collection bin labelled as “COVID-19” to store COVID-19 waste and keep separately prior to handing over to authorized staff of CBWTF.
- Containers collecting these wastes should be labelled as “COVID 19 waste.”
- Maintain separate record of waste generated from COVID-19 isolation wards.
- Use dedicated trolleys and collection bins with a label “COVID-19 Waste” to be pasted on these items also.
- The (inner and outer) surface of containers/bins/trolleys used for storage of COVID-19 waste should be disinfected with 1% sodium hypochlorite solution daily.
- Inform SPCBs and respective CBWTF located in the area when the lab starts collecting and testing COVID samples.
- Depute dedicated sanitation workers for timely transport of COVID waste to the designated storage area.
- Collect used PPEs such as goggles, face-shield, splash proof apron, Plastic Coverall, Hazmat suit, nitrile gloves into Red bag
- Collect used masks (including triple layer mask, N95 mask, etc.), head cover/cap, shoe-cover, disposable linen Gown, non-plastic or semi-plastic coverall in Yellow bags.
- Pre-treat viral transport media, plastic vials, vacutainers, eppendorf tubes, plastic cryo-vials, pipette tips as per BMWM Rules, 2016 and collect in Red bags.

This work is supported by US Center for Disease Control and Prevention (CDC), India Country Office towards hospital preparedness and response for COVID-19 for the HAI surveillance network hospitals coordinated by AIIMS, New Delhi.

XIII. References:

Sl	Guidelines	Links
1.	Case definitions for COVID -19 clinical management Protocol: COVID-19, EMR Division, Directorate General of Health Services, MoHFW, Government of India (Version dt. 13/06/2020)	https://www.mohfw.gov.in/pdf/ClinicalManagementProtocolforCOVID19.pdf
2.	Strategy for COVID19 testing in India (Version 5, dated 18/05/2020)	https://www.icmr.gov.in/pdf/covid/strategy/Testing_Strategy_v5_18052020.pdf
3.	Criteria for initiation of additional COVID-19 testing laboratories are available at	https://www.icmr.gov.in/pdf/covid/labs/Criteria_for_initiation_additional_COVID19_testing_laboratories.pdf
4.	Advisory on Use of Rapid Antigen Detection Test for COVID-19 (Version.14/06/2020)	https://www.icmr.gov.in/pdf/covid/strategy/Advisory_for_rapid_antigen_test_14062020.pdf
5.	Strategy for COVID19 testing for pregnant women in India (ICMR Version 1, dated 20/04/2020)	https://www.icmr.gov.in/ctechdocad.html
6.	COVID-19: safe handling and processing for samples in laboratories. Govt of UK. Updated 14 May 2020	https://www.gov.uk/government/publications/wuhan-novel-coronavirus-guidance-for-clinical-diagnostic-laboratories/wuhan-novel-coronavirus-handling-and-processing-of-laboratory-specimens
7.	Specimen Collection, Packaging and Transport Guidelines for 2019 nCoV - Acute Respiratory Disease. National Center for Disease Control, Government of India	https://ncdc.gov.in/WriteReadData/1892s/50471431021580628750.pdf
8.	Advisory for use of Cartridge Based Nucleic Acid Amplification Test (CBNAAT) using Cepheid Xpert Xpress SARS-CoV2 (9 June 2020)	https://www.icmr.gov.in/pdf/covid/labs/Cepheid_Xpert_Xpress_SARS-CoV2_advisory_v2.pdf
9.	Revised Guidelines for TrueNat testing for COVID-19 (19 June 2020)	https://www.icmr.gov.in/pdf/covid/labs/Revised_Guidelines_TrueNat_Testing_19052020.pdf
10.	MoHFW guidance on Novel Coronavirus Disease 2019 (COVID-19): Guidelines on rational use of Personal Protective Equipment	https://www.mohfw.gov.in/pdf/GuidelinesonrationaluseofPersonalProtectiveEquipment.pdf
11.	Cleaning and disinfection of environmental surfaces in the context of COVID-19. WHO. Interim guidance, 15 May 2020	https://www.who.int/publications/i/item/cleaning-and-disinfection-of-environmental-surfaces-in-the-context-of-covid-19
12.	Guidance on Infection Prevention and Control (IPC) for COVID-19. NCDC. 3 rd April 2020	https://ncdc.gov.in/WriteReadData/1892s/53436598731586345131.pdf

13.	Frequently Asked Questions about Laboratory Biosafety and SARS-CoV-2. Centers for Disease Control and Prevention; Revised (13 June 2020)	https://www.cdc.gov/coronavirus/2019-ncov/lab/faqs.html
14.	Interim Laboratory Biosafety Guidelines for Handling and Processing Specimens Associated with Coronavirus Disease 2019 (COVID-19). Centers for Disease Control and Prevention; Revised (5 June 2020)	https://www.cdc.gov/coronavirus/2019-ncov/lab/lab-biosafety-guidelines.html
15.	Laboratory biosafety guidance related to the novel coronavirus (2019-nCoV). Geneva: World Health Organization; Interim guidance (12 February 2020)	https://apps.who.int/iris/handle/10665/331138
16.	Laboratory testing for coronavirus disease (COVID-19) in suspected human cases). Geneva: World Health Organization; Interim guidance (19 March 2020)	https://apps.who.int/iris/handle/10665/331329
17.	Central Pollution Control Board. Guidelines for Handling, Treatment, and Disposal of Waste Generated during Treatment/Diagnosis/ Quarantine of COVID-19 Patients – Rev. 2; 18 th April 2020	https://tnpcb.gov.in/pdf_2020/BMW-GUIDELINES-COVID_Revised_April2020.pdf