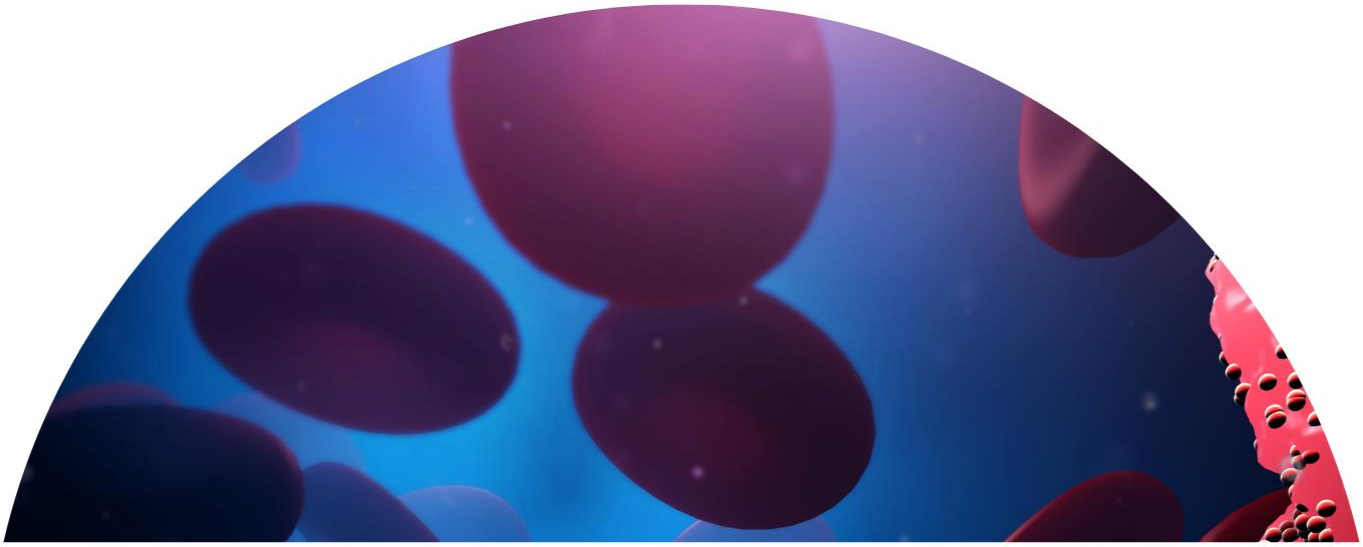
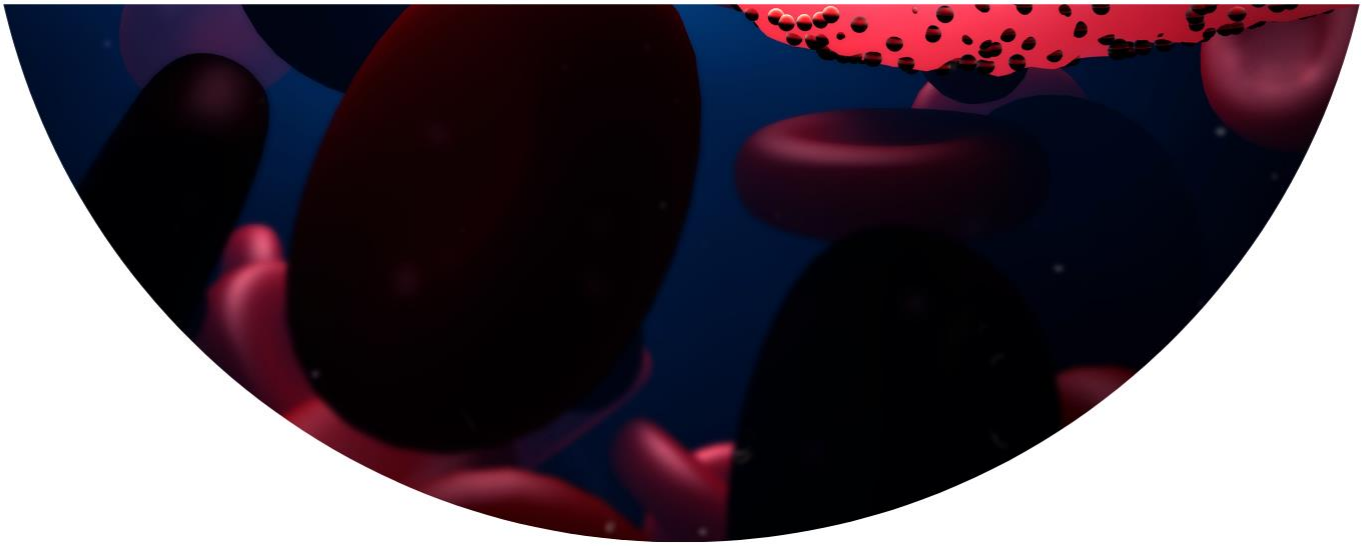
NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division of the National Health Laboratory Service



GUIDELINES FOR THE SPECIALIZED LABORATORY INVESTIGATION OF SUSPECTED EBOLA VIRUS DISEASE IN SOUTH AFRICA



UPDATED AUGUST 2019

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1. INTRODUCTION

Specific diagnostic tests for the Ebola Virus Disease (EVD) and other haemorrhagic fevers are available from the Special Viral Pathogens Laboratory (SVPL), Centre for Emerging Zoonotic and Parasitic Diseases of the National Institute for Communicable Diseases, a Division of the National Health Laboratory Service. The Laboratory offers a full repertoire of specific testing for the laboratory investigation of EVD and other haemorrhagic fevers. In order to investigate these cases securely and safely the Laboratory operates the only Biosafety Level 4 laboratory in Africa.

This document summarizes the procedure for submitting, types and interpretation of testing for EVD. For further information, related to the EVD outbreak and other related documents please refer to www.nicd.ac.za (http://www.nicd.ac.za/diseases-a-z-index/ebola-virus-disease/).

2. CASE DEFINITION

The case definition for suspected EVD cases is –

Any person presenting with one or more of the following symptoms: an acute onset of fever (≥38°C), nausea, vomiting, diarrhoea, severe headache, muscle pain, abdominal pain, or unexplained haemorrhage

AND

who has visited or been resident in the outbreak areas (provinces of Northern Kivu and/or Ituri) of the Democratic Republic of Congo, in the 21 days prior to onset of illness

AND

had direct contact with or cared for suspected/confirmed EVD cases in the 21 days prior to onset of illness OR has unexplained multisystem illness that is malaria-negative.

** health care workers are at high risk*

2.1 Differential diagnosis

Malaria is the most likely cause of an acute febrile in returning travellers from most African countries and has to be prioritized for testing as a likely cause of disease in such patients.

Other common causes of febrile illness in returning travellers from African countries include **Dengue fever, Hepatitis A, tick bite fever and typhoid. Lassa fever** is an important cause of haemorrhagic fever in the West African region in mainly rural areas where there is potential exposure to rodent urine. **Crimean-Congo haemorrhagic fever** or **Marburg virus disease** may be considered as cause of VHF for patients with travel history to Central and East Africa.

Specialized testing for EVD is not warranted for patients without a compatible clinical picture and history or risk of possible exposure, even in the event of a history of travel to an affected Ebola area. The tests cannot be used to determine if the patient has been exposed to the virus and may develop the disease later. The tests are not indicated for healthy returning travellers.

3. PROCEDURE FOR SUBMISSION OF SPECIMENS FOR INVESTIGATIONS

STEP 1: REPORT THE SUSPECTED CASE TO THE NICD TO ALLOW A RISK ASSESSMENT TO BE CARRIED OUT AND GUIDE LABORATORY TESTING

- Contact the NICD Hotline ☎ **+2782-883-9920**

STEP 2: COMPLETE THE CASE INVESTIGATION FORM

- Fully complete the case investigation form (see appendix 1)

STEP 3: SUBMIT SPECIMENS FOR SPECIALIZED LABORATORY INVESTIGATION

- Submit both a clotted blood (red or yellow top tube) and EDTA treated tube (purple top tube) per patient
- The specimens should be packaged in accordance with the guidelines for the transport of dangerous biological goods (triple packaging using absorbent material) and transported directly and urgently to:

  Centre for Emerging Zoonotic and Parasitic Diseases
  Special Viral Pathogens Laboratory
  National Institute for Communicable Diseases (NICD)
  National Health Laboratory Service (NHLS)
  No. 1 Modderfontein Rd
  Sandringham, 2131

- See section 4 for transport requirements and complete Appendix 2 (if transported via flight to Johannesburg)
- Ensure the that completed case investigation form accompanies the specimens
- Samples should be kept cold during transport (cold packs are sufficient).

4. PACKAGING OF SPECIMENS FOR TRANSFER TO NICD

The principle of triple layer packaging should be followed (Figure 1 and 2).

It is required that designated staff members per site are trained by approved provider in the packaging and transport of dangerous goods (see Appendix 2). The IATA of WHO websites may be consulted for international regulations and guidelines in this regard.

Primary specimen containers such as blood tubes (properly labeled) should be wrapped in sufficient absorbent material (paper towels or tissues) to absorb the entire contents in the event of leakage.

The wrapped primary containers must be placed in durable, leak-proof **secondary containers** such as several layers of sealed plastic bags or, preferably, rigid screw-cap metal, plastic or similar containers (suitable containers are usually available from hospital dispensaries). The secondary container should be taped closed to prevent leakage.

The secondary containers and data forms, sealed separately in plastic, must then be placed in a **rigid outer (tertiary) container s**uch as a fibre carton or polystyrene cold box with cold packs. Specimens, particularly whole blood, should not be frozen.

The outer wrapping should be addressed to:

The Centre for Emerging Zoonotic and Parasitic Diseases, Special Viral Pathogens Laboratory, National Institute for Communicable Diseases, 1 Modderfontein Road, Sandringham, South Africa.

Contact telephone numbers: 011 386 6376 or 6339, 082 903 9131

The parcel should bear appropriate outer warning that it contains biohazardous material.

If transported by air, IATA regulations must be followed and appropriate labeling applied (refer to www.iata.org. In addition to completing an ordinary air waybill for parcels sent by air, it is necessary to complete a shipper's declaration for dangerous goods (refer to www.iata.org or your courier company).

Useful links:
The IATA of WHO websites may be consulted for international regulations and guidelines in this regard.

International Air Transport Association. Dangerous Goods Regulations. http://www.iata.org/publications/dgr/Pages/index.aspx, Accessed on 15 August 2019.

World Health Organization. Guidance on the regulations for the transportation of dangerous goods, 2017. WHO/WHE/CPI/2017.8, Geneva, Switzerland. https://www.who.int/ihr/publications/WHO-WHE-CPI-2017.8/en/, Accessed on 15 August 2019.

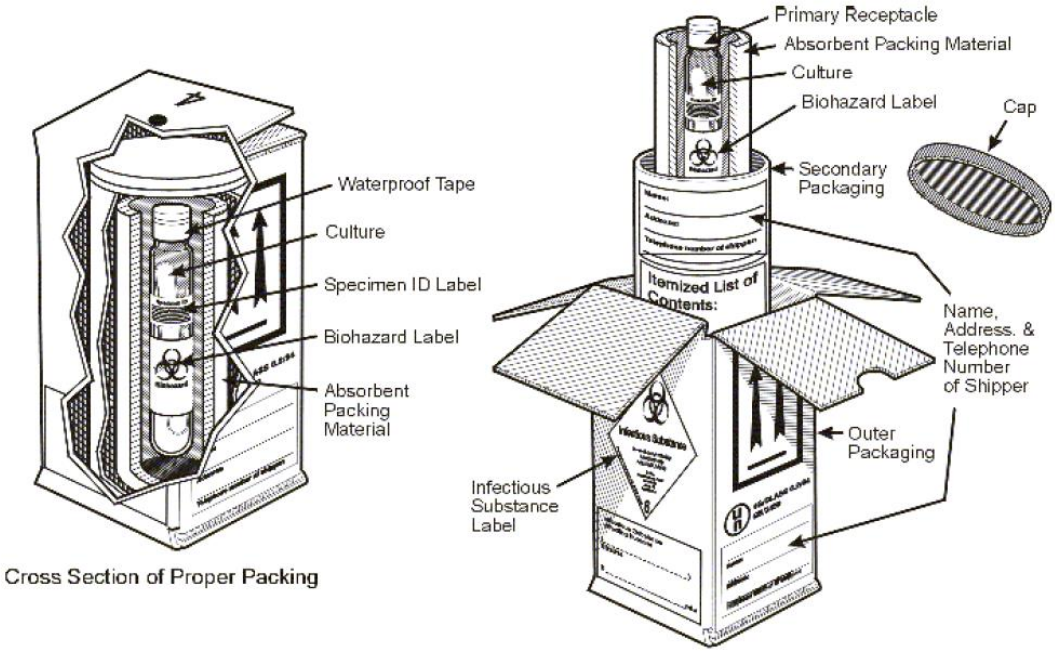

Figure 1: Diagram displaying category A triple layer packaging.

Figure 2: Commercially available category A packaging that will be available to NHLS Laboratories (Courtesy of World Couriers)

4.1 Transport of specimens to NICD

4.1.1 Private pathology laboratories:
As per internal institutional arrangement

4.1.2 National Health Laboratory Service (NHLS):

NHLS: PROTOCOL TRANSPORTING SPECIMENS VIA COURIER

STEP 1: CONTACT THE COURIER COMPANY

Contact World Couriers at: jnbops@worldcourier.co.za or +27 11 394 3880 and arrange the pickup.

If sending request via email, use "*transport of Category A consignment to NICD*" in the subject line.

State the following account number when arranging for the pickup: *10468*

STEP 2: RECEIVE CATEGORY A PACKAGING MATERIAL

World Couriers will supply the appropriate Category A packaging material when picking up the consignment (the packaging material needn't be pre-delivered) (See Figure 2)

STEP 3: PACK THE CONSIGNMENT

See section 4. Complete Appendix 2 if consignment to be transferred via flight.

STEP 4: COURIER TAKES CUSTODY OF THE CONSIGNMENT AND DELIVER TO NICD

Specimens are delivered to the NICD Specimen Reception Office during office hours. **For after - hour** deliveries the specimens are deposited at a designated facility **as directed by security staff** at the main gate of the NICD Campus. It is recommended that the laboratory is forewarned of such deliveries by calling 011 386 6339 or 082 903 9131.

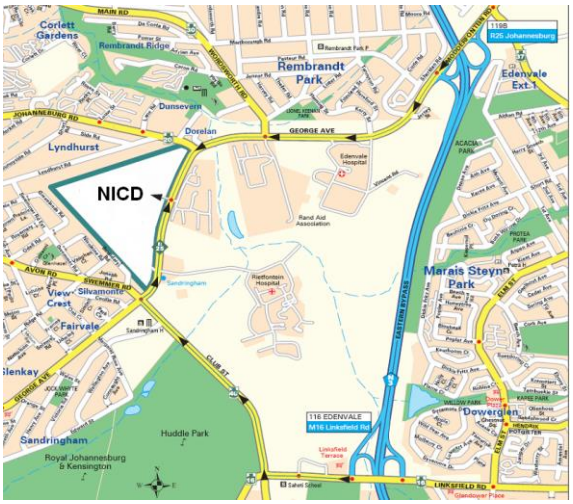

Figure 3: Road map to the NICD Campus in Sandringham

5. SPECIFIC EVD LABORATORY TESTS AVAILABLE AT THE NICD

The NICD offers a full repertoire of laboratory testing for EVD. Test requests need only specify for EVD or VHF investigation. The NICD will provide appropriate testing for each case.

Table 1: Summary of laboratory tests available at the NICD for EVD

Available tests	Turn-around time
Serology: fluorescent antibody test, IgG and IgM	24-48 hrs
Serology: ELISA, IgG and IgM	3-5 days
RT-PCR	24-48 hrs
GeneXpert for Ebola virus Zaire	24-48 hrs

NO SPECIMENS WILL BE PROCESSED WITHOUT A CASE INVESTIGATION FORM (APPENDIX 1)

6. INTERPETATION OF SPECIFIC LABORATORY TESTS FOR EVD

In the acute phase of the disease, cases of EVD are diagnosed by identifying virus antigen or nucleic acid in the specimens, or by isolating (culturing) live virus. Viremia may be undetectably low during the first 72 hours of disease, and thus it is critical that patients that present for testing early have to be reassessed by follow up testing.

In the convalescent phase of the disease, cases of EVD are diagnosed by identifying an antibody response. Anti-Ebola IgM antibody responses may be detectable in some patients as early as 48 hours after onset of clinical disease and may persist for as long as six months post recovery. Anti-Ebola IgG antibodies are typically detectable from day six post-onset.

Sometimes it is necessary to submit a further sample to clarify an ambiguous finding. For example, detection of IgG antibody on its own, without virus or IgM antibody, could indicate past infection not connected to the current illness, but sometimes IgG can appear in circulation slightly before IgM during convalescence.

It is almost equally important to eliminate a possible diagnosis of EVD as it is to confirm a diagnosis rapidly: failure to detect virus or viral nucleic acid in serum during the first 7 days of illness, or to demonstrate antibody two weeks after onset, constitutes a fair indication that one of the known African VHFs is not involved. However, viraemia may be of very short duration or absent. Hence, negative findings on samples taken early in the course of disease should be supported by antibody tests on further specimens taken in convalescence.

In emergencies results are made known telephonically or by fax as soon as possible, with written confirmation following later **remember to include contact details for the person to whom results should be reported when submitting specimens**.

Appendix 1

NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division of the National Health Laboratory Service

Outbreak Response Unit & Emergency Operations Centre
1 Modderfontein Road, Sandringham, 2031
EOC: +27 (0)11 386 2000 **NICD Hotline**: +27 82 883 9920
Practice Number: 5200296

CASE INVESTIGATION FORM: REQUEST FOR EBOLA VIRUS DISEASE TESTING

PATIENT DETAILS

Surname:	Name/s:	
Date of birth:	Age:	Sex: Male Female
Contact telephone number/s:	Occupation:	
Physical home address:		
Next of Kin:	Contact Number:	

ATTENDING HEALTHCARE WORKER AND HEALTHCARE FACILITY DETAILS

Name of clinician:	Contact number/s of clinician:	
Healthcare facility name:	Location of healthcare facility:	
Hospital number:	Date of admission (dd/mm/yyyy):	Ward:

RISK FACTORS/ EXPOSURE HISTORY – during the 3 weeks prior to onset of symptoms

Travelled to a country where EVD cases have occurred during the current outbreak	Yes ☐	No ☐	Unknown ☐
History of contact with blood/body fluids of a patient with suspected/confirmed EVD	Yes ☐	No ☐	Unknown ☐
History of contact with the immediate environment of a patient with suspected/confirmed EVD	Yes ☐	No ☐	Unknown ☐
Handled or slaughtered bats or bush-meat animals in DRC outbreak zone (North Kivu, Ituri, Goma)	Yes ☐	No ☐	Unknown ☐
Handled clinical/laboratory specimens from a patient with suspected/confirmed EVD	Yes ☐	No ☐	Unknown ☐
Involved in the funeral preparations of a patient with suspected/confirmed EVD	Yes ☐	No ☐	Unknown ☐
Had sexual exposure in the last 3 months with a patient with suspected/confirmed EVD	Yes ☐	No ☐	Unknown ☐
Hospitalized or received medical care in DRC (Northern Kivu, Ituri, Goma)	Yes ☐	No ☐	Unknown ☐

CLINICAL INFORMATION

A. **Date of onset of illness (dd/mm/yyyy):**

B. **Clinical features** (Tick appropriate box: yes, no, unknown)

Fever	Yes ☐	No ☐	Unknown ☐
If yes, specify temperature_____°C			
Nausea	Yes ☐	No ☐	Unknown ☐
Vomitting	Yes ☐	No ☐	Unknown ☐
Diarrhoea	Yes ☐	No ☐	Unknown ☐
Headache	Yes ☐	No ☐	Unknown ☐
Muscle pain	Yes ☐	No ☐	Unknown ☐
Joint pain	Yes ☐	No ☐	Unknown ☐
Abdominal pain	Yes ☐	No ☐	Unknown ☐
Sore throat	Yes ☐	No ☐	Unknown ☐
Eschar	Yes ☐	No ☐	Unknown ☐
Jaundice	Yes ☐	No ☐	Unknown ☐
Conjunctivitis	Yes ☐	No ☐	Unknown ☐
Retro-orbital pain	Yes ☐	No ☐	Unknown ☐

Rash	Yes ☐	No ☐	Unknown ☐
If yes, specify			
Distribution of rash:_____			
Type of rash:			
Macular	Yes ☐	No ☐	
Maculopapular	Yes ☐	No ☐	
Vesicular	Yes ☐	No ☐	
Petechial	Yes ☐	No ☐	
Vasculitic	Yes ☐	No ☐	

Chairperson: Prof Eric Buch Acting CEO: Dr Karmani Chetty
Physical Address: 1 Modderfontein Road, Sandringham, Johannesburg, South Africa Postal Address: Private Bag X4, Sandringham, 2131, South Africa
Tel: +27 (0) 11 386 6400 Fax: +27 (0) 11 882 0596 www.nicd.ac.za
Practice number: 5200296

Photophobia Yes ☐ No ☐ Unknown ☐ Bruising Yes ☐ No ☐ Unknown ☐ Bleeding Yes ☐ No ☐ Unknown ☐ Other, specify: _____	Bleeding Yes ☐ No ☐ Unknown ☐ **If yes, specify** Gingival bleeding Yes ☐ No ☐ Bleeding from injection sites Yes ☐ No ☐ Epistaxis Yes ☐ No ☐ Haematuria Yes ☐ No ☐ Ecchymoses Yes ☐ No ☐ Hematemesis Yes ☐ No ☐ Coffee-ground vomitus Yes ☐ No ☐ Melena Yes ☐ No ☐ Vaginal bleeding Yes ☐ No ☐ Other: specify:_____

C. Antimicrobial therapy

Has the patient received any antibiotics therapy during this illness? Yes ☐ No ☐ Unknown ☐

If yes complete the table below

Antibiotic	Route (po/IV /IM)	Date started	Date stopped	Duration (days) of treatment
		D D M M Y Y Y Y	D D M M Y Y Y Y	
		D D M M Y Y Y Y	D D M M Y Y Y Y	
		D D M M Y Y Y Y	D D M M Y Y Y Y	

Has the patient received any antimalarial therapy during this illness? Yes ☐ No ☐ Unknown ☐

If yes complete the table below

Antimalarial	Route (po/IV/ IM)	Date started	Date stopped	Duration (days) of treatment
		D D M M Y Y Y Y	D D M M Y Y Y Y	
		D D M M Y Y Y Y	D D M M Y Y Y Y	

D. Supportive management (Tick appropriate box: yes, no, unknown)

Patient requiring intensive care support Yes ☐ No ☐ Unknown ☐ Mechanical ventilation Yes ☐ No ☐ Unknown ☐ Dialysis Yes ☐ No ☐ Unknown ☐	Blood/blood product transfusion: Yes ☐ No ☐ Unknown ☐ Other: specify _____-

LABORATORY INVESTIGATION RESULTS

FBC	RESULT	DATE		RESULT	DATE
Haemoglobin:	_____	____/____/_____	**Coagulation profile:**		
Platelet count:	_____	____/____/_____	INR:	_____	____/____/_____
White cell count:	_____	____/____/_____	PTT :	_____	____/____/_____
Liver function tests			D-dimers:	_____	____/____/_____
Total bilirubin:	_____	____/____/_____			

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Direct bilirubin: _____ _____/_____/_____ AST: _____ _____/_____/_____ ALT: _____ _____/_____/_____ ALP: _____ _____/_____/_____ GGT: _____ _____/_____/_____ **U & E:** Urea: _____ _____/_____/_____ Creatinine: _____ _____/_____/_____	**Malaria tests:** Malaria smear: Pos ☐ Neg ☐ Malaria antigen: Pos ☐ Neg ☐ **Blood culture:** Date collected: _____/_____/_____ Status: **Other relevant tests and results (specify)**

PAST MEDICAL AND TRAVEL HISTORY

Underlying illness : Yes ☐ No ☐ Unknown ☐

If yes, give details:

Travel outside of South Africa in the 21 days prior to onset of illness? Yes ☐ No ☐ Unknown ☐

If yes, details:

Country visited	Location/s visited within country:	Date of arrival (dd/mm/yyyy):	Date of departure (dd/mm/yyyy):

Reason for travel (e.g. business, tourist, visiting friends/family), specify: _____

Activities (e.g. hiking, walking, hunting), specify: _____

Yellow fever vaccine received: Yes ☐ No ☐ Unknown ☐

Antimalarial chemoprophylaxis received: Yes ☐ No ☐ Unknown ☐

Ebola vaccine received Yes ☐ No ☐ Unknown ☐

DIFFERENTIAL DIAGNOSES

List current differential diagnoses considered:

1. _____
2. _____
3. _____
4. _____
5. _____

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APPENDIX 2

World Courier
AmerisourceBergen

Declaration of Compliance for 6.2 Infectious Substances

I hereby declare that this shipment of 6.2 Infectious Substances has been packed in compliance with IATA Packing Instruction 620 and consists of triple layer packaging which includes 1) primary leak-proof receptacle 2) secondary leak-proof rigid packaging and 3) rigid outer packaging.

I further declare that I am properly trained and certified to prepare a shipment of 6.2 infectious substances for air transport.

_____ _____
Shipper's Signature Date

World Courier House Waybill Number _____

AmerisourceBergen

APPENDIX 3

USEFUL CONTACT NUMBERS

REQUIREMENT	CONTACT NUMBER	CONTACT PERSON/S
Reporting of suspected case	082 883 9920	NICD Pathologist on call
Clinical advice regarding suspected cases	082 883 9920	NICD Pathologist on call
Queries regarding laboratory testing	011 386 6339/6376 011 386 6338 jacquelinew@nicd.ac.za	Dr Jacqueline Weyer
Queries regarding laboratory results	011 386 6339/6376 011 386 6338 jacquelinew@nicd.ac.za	Dr Jacqueline Weyer
Arrangement for pickup of Category A consignments (NHLS only)	jnbops@worldcourier.co.za or +27 11 394 3880	World Couriers