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**NICD HANDBOOK**

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## LABORATORY TEST INFORMATION HANDBOOK

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**LABORATORY TEST INFORMATION HANDBOOK**

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**Services Available****Purpose:**

The National Institute for Communicable Diseases (NICD) is a communicable disease (medical microbiology/virology) surveillance facility and laboratory and falls within the control of the National Health Service (NHLS).

The NICD has been established to function as a public health oriented, laboratory-based, national facility distinct from and independent of the existing microbiology/virology laboratories attached to academic centres throughout the country. The direction the NICD takes, is that of public health orientation, rather than a patient oriented clinical diagnostic entity and this is reflected in the service commitments and research directions carried out by the organization. The NICD is, to a large extent, modelled on internationally recognized public health laboratories such as the Center for Disease Control & Prevention of the USA and Public Health England (former Health Protection Agency).

**Scope:**

To provide a guide to services offered at the NICD.

**Location of the NICD**

The NICD is a permanent laboratory and is located at: 1 Modderfontein Road, Sandringham, 2192.

**Advice:**

For medical advice contact the consultants from the relevant Centre.

For medical advice on investigation of haemorrhagic fevers contact the Medical Consultant to the **Centre for Emerging Zoonotic and Parasitic diseases** (contact details provided in Table)

## Working Hours:

The laboratories at the NICD operate Monday to Friday from 07h30 to 16h30. For after-hour service, please contact the consultant. Please see Key Contact Staff Table

Special Pathogens Laboratory – for after-hour service, please contact the Medical consultant on call (or NICD **Call/Emergency Phone number**) or the Laboratory directly (contact details provided in Table).

## Results:

Results queries please contact the Results Call Centre

011 386 6404

011 386 6314

011 386 6466

Fax 011 386 6342

## Abbreviations

<b>BAL</b>	Bronchoalveolar lavage
<b>CDC</b>	Center for Disease Control <b>and Prevention</b>
<b>CIF's</b>	Case investigation forms
<b>CMV</b>	Cytomegalovirus
<b>CSF</b>	Cerebrospinal Fluid
<b>ESKAPE</b>	<i>Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumonia, Acinetobacter baumannii, Pseudomonas aeruginosa, E. coli and Enterobacter cloacae.</i>
<b>GERMS-SA</b>	Group for Enteric, Respiratory and Meningeal Surveillance in South Africa
<b>HPV</b>	Human papillomavirus
<b>HSV</b>	Herpes Simplex Virus
<b>LGV</b>	Lymphogranuloma venereum
<b>LIMS</b>	Laboratory Information Management System
<b>ILI</b>	Influenza like Illness
<b>NICD</b>	National Institute for Communicable Diseases
<b>NS</b>	Nasal swab
<b>NPA</b>	Nasopharyngeal aspirate
<b>NPS</b>	Nasopharyngeal swab
<b>OPA</b>	Oropharyngeal aspirate
<b>OPS</b>	Oropharyngeal swab
<b>RSVR</b>	Respiratory PCR test

<b>SADC</b>	Southern African Development Community
<b>TA</b>	Throat Aspirate
<b>TAT</b>	<i>Turnaround Time</i>
<b>TP</b>	<i>Treponema pallidum</i>
<b>TS</b>	<i>Throat swab</i>
<b>TV</b>	<i>Trichomonas vaginalis</i>
<b>UTM</b>	<i>Universal Transport medium</i>
<b>URTI</b>	<i>Upper respiratory Tract Infection</i>
<b>VHF</b>	Viral Hemorrhagic Fever
<b>VTM</b>	Viral transport medium
<b>WHO</b>	World Health Organization

## Help Us to Help You

1. All specimens must be accompanied by the following clearly legible data:
  - a) Patient name and hospital number (or referring laboratory reference number).
  - b) Name and address of requesting clinician.
  - c) Nature of specimen (specimen type)
  - d) Collection date and time (where relevant).
  - e) Tests requested.
  - f) Brief clinical history.
  - g) Case investigation forms (CIFs) to be completed for Polio and Measles surveillance, and VHF and rabies request (available on NICD webpage, A-Z disease list).
  - h) Contact number/email for providing the laboratory report
2. Hard copies of all reports are sent to the requesting clinician by post or electronically for referred samples.
3. Reports can be telefaxed to “safe haven” fax machines on request. Please ensure that where required, this service is clearly requested and that a suitable fax number and contact person is supplied.

## Complaints and Queries

1. Complaints and queries of a minor nature should be addressed to the Laboratory concerned. (See Key Contact Staff Table)
2. Complaints and queries of a serious nature should be addressed to the head of the relevant Laboratory (See Key Contact Staff Table)

**Please note that the TAT (Turnaround Time) quoted in this Handbook is calculated from the sample reception at the NICD until a report is issued.**

## **NOTIFIABLE MEDICAL CONDITION (NMC)**

Notifiable Medical Conditions are diseases that are of public health importance because they pose significant public health risks that can result in disease outbreaks or epidemics with high case fatality rates both nationally and internationally.

## **FOR ANY NMC RELATED QUESTIONS/QUERIES/CONCERNS?**

NMC helpline: 072 621 3805

Email: [NMCsurveillanceReport@nicd.ac.za](mailto:NMCsurveillanceReport@nicd.ac.za)

Fax: 086 639 1638

Website: [www.nicd.ac.za](http://www.nicd.ac.za)

**Tests offered at the NICD**

Pathogen / Test Species Name (disease/ Syndrome)	Pathogen Species Name (disease/ syndrome, ICD-code)	Tests To Request	Department and Contact telephone no's
Arbovirus	Arbovirus: (Chikungunya, Dengue, West Nile, Rift Valley fever, Sindbis)	Arbovirus (Routine arbo screen, include serology for Chikungunya, West Nile, Sindbis, Rift Valley fever) Dengue for patient with travel history. PCR/Isolation for Acute cases only Arbovirus PCR ( <i>specify which arbovirus, for example "Dengue PCR"</i> ) Arbovirus isolation	Arbovirus Reference Laboratory Dr P Jansen van Vuren 011 555 0503 082 908 8045
Adenovirus	Adenovirus Gastroenteritis: Diarrhoea, vomiting, fever	Enteric Adenovirus detection	CED Virology 011 555 0370
Adenovirus	Adenovirus	RSVP	CRDM Virology 011 386 6412/011 555 0488 011 386 6373
Anthrax (ANTHR)	<i>Bacillus anthracis</i> (anthrax)	Anthrax (ANTHR)	Special Bacterial Pathogens Reference Laboratory 011 555 0331 011 555 0306
Arthropods/ Insects	Arthropods/ Insects	Morphological identification, PCR identification and/or ELISA	Vector Control Reference Laboratory 011 386 6483
Astrovirus	Astrovirus Gastroenteritis: Diarrhoea, vomiting, fever	Astrovirus detection	CED Virology 011 555 0370
Atypical pneumonia-causing pathogens	<i>M. pneumoniae</i> , <i>C. pneumoniae</i> , <i>Legionella</i> spp.	Atypical pneumonia pathogens ( <i>M. pneumoniae</i> , <i>C. pneumoniae</i> , <i>Legionella</i> spp.)	CRDM Bacteriology 011 555 0315/011 555 0317
Avian Influenza (H5, H7, H9)	Avian Influenza (H5, H7, H9)	Suspected Avian influenza	CRDM Virology 011 386 6390 /011 386 6412 011 555 0488 /011 386 6373 Hotline-Dr on call:082 883 9920
Bacterial meningitis screen	<i>N. meningitidis</i> , <i>H. influenzae</i> and <i>S. pneumoniae</i> , Group B <i>Streptococcus</i> , <i>L. monocytogenes</i> , <i>S. aureus</i> , <i>E.coli</i>	Phenotypic identification and serotyping/grouping MIC Antigen detection PCR for identification and serotyping/ grouping (S.pn, Nm, Hi)	CRDM Bacteriology 011 555 0315/011 555 0317
<i>Botulinum</i>	<i>Clostridium botulinum</i> (botulism)	Botulinum	Special Bacterial Pathogens Reference Laboratory 011 555 0331/011 555 0306
<i>Campylobacter</i> sps	<i>Campylobacter</i> sps	Enteric surveillance and reference function	CED Bacteriology 011 386 6235/011 555 0348 011 555 0334/011 555 0360
<i>Candida</i> (surveillance)	<i>Candida</i> (surveillance)	<i>Candida</i> surveillance	CHARM Mycology Reference Laboratory 011 555 0325 /011 555 0381
<i>Chlamydia trachomatis</i>	<i>Chlamydia trachomatis</i>	<i>Chlamydia trachomatis</i> / LGV serology / Micro immune fluorescence (MIF) / NAAT ( PCR, TMA), Culture	STI: 011 555 0461 \ 011 555 0468



Pathogen / Test Species Name (disease/ Syndrome)	Pathogen Species Name (disease/ syndrome, ICD-code)	Tests To Request	Department and Contact telephone no's
<i>Cryptococcus (surveillance)</i>	Cryptococcus (surveillance)	Cryptococcal surveillance	CHARM Mycology Reference Laboratory 011 555 0325/011 555 0381
<b>Cryptococcus Meningitis</b>	<b>Identification of Cryptococcal antigen (CrAg)</b>	<b>Identification of Cryptococcal antigen (CrAg)</b>	<b>CHARM: Mycology Reference Laboratory 011 386-6430 /011 386-6431</b>
<b>Diphtheria</b>	<b><i>Corynebacterium diphtheriae</i></b>	<b>Identification (phenotypic), and toxin production (Elek and PCR)</b>	<b>CRDM Bacteriology 011 555 0315/011 555 0317</b>
<i>E. coli</i> characterization	Diarrhoeagenic <i>Escherichia coli</i> Watery or bloody diarrhoea, abdominal cramps, with or without fever	Enteric surveillance and reference function / <i>E. coli</i> characterization	CED Bacteriology 011 386 6235 /011 555 0348 011 555 0334/011 555 0360
<b><i>Enterococcus faecium</i> and <i>faecalis</i></b>	<b><i>Enterococcus faecium</i> and <i>faecalis</i></b>	<b>AMR detection/confirmation</b>	<b>CHARM AMRL-CC 011 555 0344 / 011 555 0342</b>
<b>Enterovirus</b>	<b>Enterovirus</b>	<b>Enterovirus PCR / Enterovirus genotyping</b>	<b>CVI Polio Molecular 011 386 6438</b>
Fungal pathogen from clinical sources which cannot be identified by academic/referral laboratories	Fungal pathogen from clinical sources which cannot be identified by academic/referral laboratories	Identification of fungal pathogen; Antifungal susceptibility testing	CHARM Mycology Reference Laboratory 011 555 0323 /011 555 0325 011 555 0353
Gram-negative organisms (*As per current GERMS-SA case definition)	Gram-negative organisms (*As per current GERMS-SA case definition)	Surveillance	CHARM AMRL-CC 0115550344 0115550342
<b>Group A <i>Streptococcus</i></b>	<b>Group A <i>Streptococcus</i></b>	<b>Group A <i>Streptococcus</i> culture and PCR</b>	<b>CRDM Bacteriology 011 555 0315/011 555 0317</b>
<i>Haemophilus ducreyi</i>	<i>Haemophilus ducreyi</i>	PCR	STI: 011 555 0461 \ 011 555 0468
Hepatitis	Hepatitis For research and surveillance only (Anti-HBs the staff immunity screening request form is completed and must accompany the specimen)	Hepatitis B: Architect System HBsAg, Anti-HBs, Anti-HBc, HBeAg, Anti-HBe, Anti-HBc IgM, HBV Viral load, genotyping Hepatitis C: Architect System Anti-HCV, HCV Viral load, genotyping	CVI hepatitis 011 386 6347
Human Boca virus	Human Boca virus	Human bocaviruses	CRDM Virology Results:011-386 6404 Queries:011 555 0488 011 386 6373 011 386 3690(HOD)
Human Corona viruses (229E, OC43, NL63, HKU1)	Human Corona viruses (229E, OC43, NL63, HKU1)	Human coronaviruses	CRDM Virology Results:011-386 6404 Queries:011 555 0488 011 386 6373 011 386 3690(HOD)
Human Metapneumovirus (hMPV)	Human Metapneumovirus (hMPV)	RSVP	CRDM Virology Results:011-386 6404 Queries:011 555 0488 011 386 6373 011 386 3690(HOD)
<b>Histoplasmosis</b>	<b>Cryptococcal antigen (CrAg)</b>	<b>Identification of Cryptococcal antigen (CrAg)</b>	<b>CHARM :Mycology Reference Laboratory 011 386-6430 / 011 386-6431</b>
HIV	HIV	HIV-1 Pooled Plasma	HIV Sero-Molecular: 011 386 6435 /011

Pathogen / Test Species Name (disease/ Syndrome)	Pathogen Species Name (disease/ syndrome, ICD-code)	Tests To Request	Department and Contact telephone no's
			386 6437 / 011 386 6460
HIV	HIV	CD4	HIV Sero-Molecular: 011 386 6435 /011 386 6437 / 011 386 6460
<b>HIV</b>	<b>HIV</b>	<b>HIV Viral Load</b>	<b>HIV Sero-Molecular: 011 386 6435 /011 386 6437 / 011 386 6460</b>
HIV	HIV	HIV ELISA	HIV Sero-Molecular: 011 386 6435 /011 386 6437 / 011 386 6457
HIV	HIV	HIV-1/2 Antigen-Antibody EIA	HIV Sero-Molecular: 011 386 6435 /011 386 6437 / 011 386 6457
HIV	HIV	HIV-1 or HIV-2 Western Blot	HIV Sero-Molecular: 011 386 6435 /011 386 6437 / 011 386 6457
HIV	HIV	Multispot HIV1/2 Rapid (On Request Only)	HIV Sero-Molecular: 011 386 6435 /011 386 6437 / 011 386 6457
HIV	HIV	HIV Incidence Testing	HIV Sero-Molecular: 011 386 6435 /011 386 6437 / 011 386 6457
HIV-1	HIV-1 (p24)	P24 – Culture Supernatant	Virology Research Laboratory Lab Manager: 011 386 6341
HIV-1	HIV-1	Neutralization assays a) Pseudovirion assay	Virology Research Laboratory Lab Manager: 011 386 6341
HIV-1	HIV-1	Drug resistance testing a) In-House assay	Virology Research Laboratory Lab Manager: 011 386 6341
HIV-1	HIV-1	Gag ELISA	Virology Research Laboratory Lab Manager: 011 386 6341
HIV-1	HIV-1	HIV Virus isolation	Virology Research Laboratory Lab Manager: 011 386 6341
HPV	HPV	PCR –HPV	STI :011 555 0461 \ 011 555 0468
Influenza A and Influenza B virus.	Influenza A and Influenza B virus.	RSVP	CRDM Virology Results;011-386 6404 Queries:011 555 0488/ 011 386 6373 011 386 3690(HOD)
<i>Leptospirosis</i> (LEPTO)	<i>Leptospira spp.</i> (Leptospirosis)	Leptospirosis (LEPTO)	Special Bacterial Pathogens Reference Laboratory 011 555 0331/ 011 555 0306
<i>Lympho granuloma Venereum (LGV)</i> MALDI-TOF identification	<i>Lympho granuloma Venereum (LGV)</i> MALDI-TOF identification	PCR Identification	STI :011 555 0461 \ 011 555 0468 CHARM AMRL-CC 0115550344/0115550342
Measles	Measles	For surveillance only	CVI measles working group 011 386 6343/011 386 6398
<i>Measles</i> <i>Rash-based Surveillance</i>	Measles Rash-based Surveillance	Measles IgM	CVI measles working group 011 386 6398 011 555 0534
MERS-Coronavirus (MERS-CoV)	MERS-Coronavirus (MERS-CoV)	Suspected MERS-Coronavirus (MERS-CoV)	CRDM Virology Results;011-386 6404 Queries:011 555 0488 011 386 6373 011 386 3690(HOD)
<b>Monkeypox</b>		<b>Monkeypox</b>	<b>Special Viral Pathogens Laboratory</b>

Pathogen / Test Species Name (disease/ Syndrome)	Pathogen Species Name (disease/ syndrome, ICD-code)	Tests To Request	Department and Contact telephone no's
			Dr J Weyer: 011 386 6376 / 082 903 9131 NICD Hotline
Multi-drug resistant <i>Enterobacteriaceae</i> and other <i>ESKAPE</i> pathogens for surveillance and detection (*As per current GERMS-SA case definition)	Multi-drug resistant <i>Enterobacteriaceae</i> (*As per current GERMS-SA case definition and case report forms)	Cultures on Dorset slopes viable for up to one month at room temperature for surveillance or reference diagnostic	CHARM AMRL-CC 0115550344 /0115550342
<i>Mycobacterium tuberculosis</i>	<i>Mycobacterium tuberculosis</i>	Microscopy for acid-fast bacilli	Centre for TB 011 885 5317/011 885 5316
<i>Mycobacterium tuberculosis</i>	<i>Mycobacterium tuberculosis</i> or Non-tuberculosis mycobacteria	Culture	Centre for TB 011 8855317/011 885 5316
<i>Mycobacterium tuberculosis</i>	<i>Mycobacterium tuberculosis</i>	Phenotypic drug susceptibility testing (Specify drugs to be tested)	Centre for TB 011 885 5317/011 885 5316
<i>Mycobacterium tuberculosis</i>	<i>Mycobacterium tuberculosis</i> or Non-tuberculosis mycobacteria	Line Probe Assay - First line drug susceptibility - Second line drug susceptibility - NTM speciation - MTBcomplex speciation - NTM- drug susceptibility	Centre for TB 011 885 5317/011 885 5316
<i>Mycobacterium tuberculosis</i>	<i>Mycobacterium tuberculosis</i>	Xpert MTB/RIF Assay	Centre for TB 011 885 5217/011 885 5316
<i>Mycobacterium tuberculosis</i>	<i>Mycobacterium tuberculosis</i> or Non-tuberculosis mycobacteria	-Broth Microdilution or MGIT MIC testing. -Extended Panel for TB MIC testing for NTM. -MIC testing for Bedaquiline and / or Delaminid.	Centre for TB 011 885 5317/011 885 5316
<i>Mycoplasma genitalium</i>	<i>Mycoplasma genitalium</i>	Polymerase chain reaction (PCR)	STI: 011 555 0461 /011 555 0468
<i>Mycoplasma pneumoniae</i> , <i>Chlamydia pneumoniae</i> , <i>Legionella</i> spp., <i>Bordetella</i> spp.	<i>Mycoplasma pneumoniae</i> , <i>Chlamydia pneumoniae</i> , <i>Legionella</i> spp., <i>Bordetella</i> spp.	Polymerase chain reaction (PCR) for identification	CRDM Bacteriology 011 555 0315 011 555 0317
<i>Neisseria gonorrhoeae</i>	<i>Neisseria gonorrhoeae</i>	Culture and Antimicrobial susceptibility testing / NAAT (PCR, TMA)/ Typing by PCR / Antimicrobial susceptibility testing by PCR	STI: 011 555 0461 /011 555 0468
Bacterial meningitis screen	<i>N. meningitidis</i> , <i>H. influenzae</i> and <i>S. pneumoniae</i> , Group B <i>Streptococcus</i> , <i>L. monocytogenes</i> , <i>S. aureus</i> , <i>E.coli</i>	Phenotypic identification and serotyping/grouping MIC Antigen detection PCR for identification and serotyping/ grouping	CRDM Bacteriology 011 555 0315/011 555 0317
<i>Norovirus</i>	Norovirus Gastroenteritis: Diarrhoea, vomiting, fever	Norovirus detection	CED Virology 011 555 0370
<i>Parainfluenza virus types 1, 2 and 3</i>	<i>Parainfluenza virus types 1, 2 and 3</i>	RSVP	CRDM Virology Results:011-386 6404 Queries:011 555 0488 011 386 6373 011 386 3690(HOD)
Parasite - <i>Acanthamoeba</i> spp.	Parasite - <i>Acanthamoeba</i> spp. ( <i>Acanthamoeba</i> keratitis)	<i>Acanthamoeba</i> (TrakCare test code: PCULP)	Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite - <i>Babesia</i> species (Babesiosis)	Parasite - <i>Babesia</i> species (Babesiosis)	<i>Babesia</i>	Parasitology Reference Laboratory

Pathogen / Test Species Name (disease/ Syndrome)	Pathogen Species Name (disease/ syndrome, ICD-code)	Tests To Request	Department and Contact telephone no's
		(Trak Care test code: PARAB)	011 555-0304 011 555-0311
Parasite - <i>Borrelia duttoni</i> or <i>B. recurrentis</i> (Relapsing fever)	Parasite - <i>Borrelia duttoni</i> or <i>B. recurrentis</i> (Relapsing fever)	Relapsing fever borrelia (TrakCare test code: PARAB)	Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite - <i>Entamoeba histolytica</i>	Parasite - <i>Entamoeba histolytica</i> (Amoebiasis)	Amoebiasis (TrakCare test code: PARAS)	Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite - <i>Echinococcus</i> species	Parasite - <i>Echinococcus</i> species (Echinococcosis, hydatid disease)	Echinococcus (TrakCare test code: PARAS)	Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite - <i>Enterobius vermicularis</i> (pinworm)	Parasite - <i>Enterobius vermicularis</i> (pinworm)	<i>Enterobius vermicularis</i> / (pinworm) (TrakCare test code: PMIC)	Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite -Human cestodes (tapeworms) including: <i>Taenia saginata</i> , <i>T. solium</i> , <i>H. nana</i> , <i>H. diminuta</i> and <i>D. latum</i>	Parasite -Human cestodes (tapeworms) including: <i>Taenia saginata</i> , <i>T. solium</i> , <i>H. nana</i> , <i>H. diminuta</i> and <i>D. latum</i>	Stool parasites (specify suspected parasite, if applicable) (TrakCare test code: PARAS)	Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite -Human nematodes including: <i>Ascaris lumbricoides</i> (common roundworm), hookworms ( <i>Ancylostoma duodenale</i> / <i>Necator americanus</i> ), <i>Trichuris trichiura</i> (whipworm), <i>Strongyloides stercoralis</i>	Parasite -Human nematodes including: <i>Ascaris lumbricoides</i> (common roundworm), hookworms ( <i>Ancylostoma duodenale</i> / <i>Necator americanus</i> ), <i>Trichuris trichiura</i> (whipworm), <i>Strongyloides stercoralis</i>	Stool parasites (specify suspected parasite, if applicable) (TrakCare test code: PARAS)	Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite -Human protozoa including: <i>Cryptosporidium</i> species, <i>Cystoisosporal belli</i> , <i>Cyclospora cayetanensis</i> , <i>Giardia lamblia</i> , <i>Entamoeba coli</i> , <i>Blastocystis hominis</i>	Parasite -Human protozoa including: <i>Cryptosporidium</i> species, <i>Cystoisosporal belli</i> , <i>Cyclospora cayetanensis</i> , <i>Giardia lamblia</i> , <i>Entamoeba coli</i> , <i>Blastocystis hominis</i>	Stool parasites (specify suspected parasite, if applicable) (TrakCare test code: PARAS, COCC for coccidian parasites only)	Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite -Human trematodes including: <i>Schistosoma mansoni</i> / <i>haematobium</i>	Parasite -Human trematodes including: <i>Schistosoma mansoni</i> / <i>haematobium</i> (Bilharzia, schistosomiasis)	Stool parasites (specify suspected parasite, if applicable) (TrakCare test code: PARAS)	Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite - <i>Leishmania</i> species	Parasite - <i>Leishmania</i> species (Leishmaniasis)	Leishmania investigation (TrakCare test code: PARAB)	Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite - <i>Microfilaria</i> species ( <i>W. bancrofti</i> , <i>L. loa</i> , <i>M. perstans</i> etc)	Parasite - <i>Microfilaria</i> species ( <i>W. bancrofti</i> , <i>L. loa</i> , <i>M. perstans</i> etc)	Microfilaria investigation (TrakCare test code: PARAB)	Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite - <i>Plasmodium falciparum</i>	Parasite - <i>Plasmodium falciparum</i> (Malaria)	Antigen test for <i>Plasmodium falciparum</i> (TrakCare test code: MALRP)	Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite - <i>Plasmodium</i> species	Parasite - <i>Plasmodium</i> species (Malaria)	Malaria investigation (TrakCare test code: MALI)	Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite - <i>Plasmodium</i> species	Parasite - <i>Plasmodium</i> species (Malaria)	Malaria PCR (TrakCare test code: PCRPC)	Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite - <i>Pneumocystis jirovecii</i>	Parasite - <i>Pneumocystis jirovecii</i> ( <i>Pneumocystis</i> pneumonia, PCP)	<i>Pneumocystis jirovecii</i> PCR (TrakCare test code: PCRPR)	Parasitology Reference Laboratory 011 555-0304 011 555-0311

Pathogen / Test Species Name (disease/ Syndrome)	Pathogen Species Name (disease/ syndrome, ICD-code)	Tests To Request	Department and Contact telephone no's
Parasite - <i>Schistosoma haematobium</i>	Parasite - <i>Schistosoma haematobium</i> (Schistosomiasis, bilharzia)	<i>Schistosoma haematobium</i> (TrakCare test code: BILH)	Parasitology Reference Laboratory 011 555-0304      011 555-0311
Parasite - <i>Strongyloides stercoralis</i>	Parasite - <i>Strongyloides stercoralis</i>	<i>Strongyloides stercoralis</i> (TrakCare test code: PARAS)	Parasitology Reference Laboratory 011 555-0304      011 555-0311
Parasite -Tapeworm (adult) identification	Parasite -Tapeworm (adult) identification	Tapeworm identification (TrakCare test code: PMIC)	Parasitology Reference Laboratory 011 555-0304      011 555-0311
Parasite - <i>Trypanosoma species</i>	Parasite - <i>Trypanosoma species</i> (Sleeping sickness or trypanosomiasis)	Trypanosome investigation (TrakCare test code: PARAB)	Parasitology Reference Laboratory 011 555-0304      011 555-0311
Parasite - <i>Wuchereria bancrofti</i>	Parasite - <i>Wuchereria bancrofti</i> (Lymphatic filariasis or elephantiasis)	<i>W. bancrofti</i> antigen test (TrakCare test code: FILAG)	Parasitology Reference Laboratory 011 555-0304      011 555-0311
<b>Pertussis</b>	<b><i>Bordetella pertussis</i></b>	<b><i>B. pertussis</i> culture and/or PCR</b>	<b>CRDM Bacteriology 011 555 0315/011 555 0317</b>
Poliovirus	Poliovirus	Real Time RT-PCR Sequencing	Centre for Vaccines & Immunology: Polio Molecular Laboratory 011 386 6438
Poliovirus isolation. AFP surveillance.	Poliovirus (Acute Flaccid Paralysis (AFP) surveillance)	Poliovirus isolation. AFP surveillance.	Poliovirus Isolation 011 555 0504/011 386 6361 011 386 6358
Poliovirus Serology	Poliovirus Serology	Poliovirus Antibody Neutralization	Poliovirus Serology 011 555 0504/011 386 6361 011 386 6358
Rabies	Rabies (Rabies and rabies-related lyssaviruses) ICD-10 code is A82	Rabies	Special Viral Pathogens Laboratory Dr J Weyer:011 386 6376 082 903 9131 NICD Hotline
Rabies immunity	Rabies	Rabies immunity	Special Viral Pathogens Laboratory Dr J Weyer 011 386 6376/ 082 903 9131
Rhinovirus	Rhinovirus	RSVP	CRDM Virology Results:011-386 6404 Queries:011 555 0488 011 386 6373 011 386 3690(HOD)
Rotavirus	Rotavirus Gastroenteritis: Diarrhoea, vomiting, fever	Rotavirus detection /Rotavirus genotyping	CED Virology 011 555 0370
RSV	RSV	RVPCR	CRDM Virology 011 386 6412 /011 555 0488/ 011386 6373

Pathogen / Test Species Name (disease/ Syndrome)	Pathogen Species Name (disease/ syndrome, ICD-code)	Tests To Request	Department and Contact telephone no's
Rubella (done as a reflex test for Measles )	See measles	See Measles	CVI measles working group 011 386 6398 011 555 0534
Severe fever with thrombocytopenia syndrome (SFTS)	SFTS	SFTS PCR	Special Viral Pathogens Laboratory Dr J Weyer 011 386 6376 082 903 9131 /Contact NICD Hotline
Sapovirus	Sapovirus Gastroenteritis: Diarrhoea, vomiting, fever	Sapovirus detection	CED Virology 011 555 0370
<i>Staphylococcus aureus</i> , <i>Enterococcus faecium</i> , <i>Enterococcus faecalis</i> and other Gram-positive organisms surveillance and detection	<i>Staphylococcus aureus</i> <i>Enterococcus faecium</i> , <i>Enterococcus faecalis</i> and other Gram-positive organisms	AMR detection/confirmation	AMRL-CC 0115550344 /0115550342
<i>Treponema pallidum</i>	<i>Treponema pallidum</i>	RPR/TPPA/ PCR / Typing/ Antimicrobial susceptibility testing by PCR	STI: 011 555 0461\ 011 555 0468
<i>Trichomonas vaginalis</i>	<i>Trichomonas vaginalis</i>	PCR\ Culture	STI: 011 555 0461\ 011 555 0468
<i>Ureaplasma parvum</i>	<i>Ureaplasma parvum</i>	PCR	STI: 011 555 0461\ 011 555 0468
<i>Ureaplasma urealyticum</i>	<i>Ureaplasma urealyticum</i>	PCR	STI: 011 555 0461\ 011 555 0468
Urinary antigen test for identification	<i>S. pneumoniae</i> , <i>Legionella pneumophila</i> serogroup 1	Urinary antigen test for identification	CRDM Bacteriology 011 555 0315/011 555 0317
VHF	Viral haemorrhagic fevers (Crimean-Congo haemorrhagic fever, Ebola, Marburg, Lassa, Hanta and Yellow fever) ICD-10 code for unspecified viral haemorrhagic fever, A99	VHF	Special Viral Pathogens Laboratory Dr J Weyer 011 386 6376 082 903 9131 /Contact NICD Hotline
<i>Yersinia pestis</i> (Plague)	<i>Yersinia pestis</i> (Plague)	Plague (PLAGE) Plague serology (PLAGE) / Plague surveillance (RATS)	Special Bacterial Pathogens Reference Laboratory 011 555 0331/ 011 555 0306

## Centre for Vaccines and Immunology (CVI)

The Centre for Vaccines and Immunology (CVI) has been established to provide laboratory and epidemiological support to viral vaccination programmes within the Expanded Programme on Immunisation – polio, measles and hepatitis, as well as to carry out appropriate research to answer public health questions related to these vaccines and to these vaccine- preventable diseases. In addition to the national and provincial Departments of Health, which are the major stakeholders, the Centre functions as regional reference laboratories for polio, measles and rubella for the WHO.

## Polio:

The polio laboratory supports AFP surveillance for South Africa and for six countries within southern Africa (SADC) for isolation of poliovirus in addition to performing confirmatory testing on samples tested from other WHO AFRO reference labs, parallel testing with countries that do not meet accreditation criteria to determine accuracy of results, as well as providing assistance with routine testing to labs when requested. The support goes further into performing intratypic differentiation of suspected poliovirus isolates and where needed, sequence analysis. The laboratory also performs poliovirus serology for poliovirus serotypes 1 and 3.

## Enterovirus:

The Centre provides enterovirus PCR and genotyping assays as per specific request and to assist with outbreak investigations of enterovirus associated diseases, e.g. hand foot and mouth disease and meningitis

## Measles & Rubella:

The CVI Measles group performs national measles serological surveillance and also supports ten southern African countries with re-testing for WHO EQA purposes. Molecular surveillance is performed for South Africa, the ten southern African countries and for other countries across the WHO African region to track the circulation of strains of Measles virus by means of RT-PCR, sequencing, phylogenetic analysis and genotype determination.

National Rubella surveillance resumed in May 2015. All measles surveillance specimens are now tested for Measles IgM and Rubella IgM. Please note that the Rubella IgM test should not be requested by users of the service as it is not offered as a single test, the Rubella IgM is done as part of the testing for national measles surveillance for the Expanded Programme on Immunization (EPI), every sample that is sent for a suspected measles case will be tested for both measles and rubella IgM

## Hepatitis:

Please note that all other hepatitis tests done at CVI, are not for diagnostic purposes, these are done for research and surveillance purposes only.

Pathogen Species Name (disease/syndrome)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<p>Poliovirus</p> <p>(Acute Flaccid Paralysis (AFP) surveillance)</p> <p><b>Note:</b> For purposes of AFP surveillance, the Poliovirus Isolation Laboratory at NICD is the only laboratory in South Africa accredited by World Health Organization to perform this testing.</p>	<p>Two stool samples (adult thumb size) collected in universal sample containers, 24-48 hours apart and within 14 days of onset of paralysis. In the event a stool sample cannot be obtained, please forward a rectal swab as an alternative.</p>	<p>Maintenance of cold chain (2-8°C) from collection to receipt at NICD. Samples to reach laboratory within 3 days of collection.</p> <p><b>Note:</b> These are guidelines met to comply with WHO requirements; however samples will be subjected to processing and testing even if these criteria are not met with relevant details captured accordingly.</p>	<p>Poliovirus isolation. AFP surveillance.</p>	<p>Virus Isolation</p>	<p>EPI Notification 14 days (80% of all results to be reported within 14 days of receipt in lab). Issue of LIMS report: 21 days of receipt in lab.</p>	<p>The following information is required for capture on the AFP database and should be completed on specific AFP case investigation forms:</p> <ul style="list-style-type: none"> <li>• Epid number – unique number for epidemiology purposes</li> <li>• Name</li> <li>• Date of onset of paralysis</li> <li>• Date of stool collection</li> <li>• Immunization history</li> <li>• Province</li> <li>• District</li> <li>• Case or contact</li> <li>• Specimen number</li> <li>• Date sent from field to National Level – where applicable</li> <li>• Date received at National Level – where applicable</li> <li>• Date sent to NICD</li> <li>• Testing requested and clinical diagnosis to be clearly stated to prevent incorrect / unnecessary tests being performed</li> </ul>	<p>Poliovirus Isolation 011 555 0504 011 386 6361 011 386 6358</p>



Pathogen Species Name (disease/syndrome)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
Poliovirus	Virus isolate from stool or environmental sample, minimum 1ml.  FTA Card inoculated with virus isolate	Transport frozen or at 4°C. Specimen must reach the laboratory within 3 days of dispatch.  Transport at ambient temperature. Specimen must reach the laboratory within 3 days of dispatch.	Real Time RT-PCR  Sequencing	Real Time ITD RT-PCR  Real Time VDPV Screening RT-PCR  Sequencing of VP1 Region	7 days  7 days	AFP Investigation Form with at least the following information: • Epid Number • Patient Name • Date of onset of paralysis • District • Case or contact • Specimen Number • Referring Laboratory specimen number • Date sent to NICD • Cell Line (L-Arm or R-Arm) Real Time PCR Results (if requesting Sequencing)	Centre for Vaccines & Immunology: Polio Molecular Laboratory  011 386 6438
Poliovirus Serology	Clotted Blood - 5ml, Sera - 0.5ml	Maintenance of cold chain (2-8°C)	Poliovirus Antibody Neutralization	Neutralization Test	21 days NB: Samples are batched for testing. This may result in TATs being exceeded if not stated as urgent.	Testing requested and clinical diagnosis to be clearly stated on request forms to prevent incorrect / unnecessary tests being performed	Poliovirus Serology 011 555 0504 011 386 6361 011 386 6358
Enterovirus	Hand foot and mouth disease: Dextran swab of vesicle/rash fluid with a stool sample  Meningitis/encephalitis: CSF with a stool sample  Respiratory disease: throat swab/lavage with a stool sample  Gastroenteritis/diarrhoea: Stool sample/rectal swab	Transport frozen or at 4°C. Specimen must reach the laboratory within 3 days of dispatch.	Enterovirus PCR  Enterovirus genotyping	Real-time PCR  Sequencing of VP1 region	7 Days  14 days	Cold chain essential for the storage and transport of samples	Centre for Vaccines & Immunology: Polio Molecular Laboratory  011 386 6438

Pathogen Species Name (disease/syndrome)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
Measles (Rash-based Surveillance)	5 ml Clotted Blood or EDTA Blood (red top or yellow SST tube or EDTA/heparin Blood or Serum	The blood/serum samples can be transported at room temperature to NICD, Samples should reach the lab within three days of sample collection (If transportation is delayed the samples should be refrigerated	Measles IgM	Anti-Measles IgM antibody (EIA)	7 working days	A Measles Case Investigation Form (CIF) must be completed in full and must accompany specimens. Please ensure that the following information is captured on the CIF: <ul style="list-style-type: none"> <li>Name, age, DOB, address of patient</li> <li>Name and contact number of clinician</li> <li>Symptoms marked in tick boxes</li> <li>Complications marked in tick boxes</li> <li>Date of onset of rash</li> <li>Date seen at health facility</li> <li>Date specimen collected</li> <li>Medical history including measles vaccination history, number of doses and date of last measles vaccination</li> </ul> Date of notification and response to case	CVI measles working group 011 386 6398 011 555 0534
Rubella (Rash based surveillance)	5 ml Clotted Blood or EDTA Blood (red top or yellow SST tube or EDTA/heparin Blood or Serum	Same as for measles	See note on page 16 under Measles & Rubella	Anti-Rubella IgM antibody (EIA)	7 working days	Same as for Measles	CVI measles working group 011 386 6398 011 555 0534

Pathogen Species Name (disease/syndrome)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
Measles	<p>Throat swab  <b>Please note</b> Once a measles outbreak is identified (a cluster of IgM-positive cases) please collect 5-10 throat swab specimens from other suspected cases in the area and place in VTM tube (Viral Transport Medium)                      The instruction to collect throat swabs will be issued by the CDCs.                      Throat swabs should not be collected from sporadic suspected cases.</p> <p>Serology: 5 ml Clotted Blood or EDTA Blood (red top or yellow SST tube or EDTA Blood or Serum)</p>	Transport at 2°C-8°C Sample should reach laboratory within 3 days	For surveillance only	RT-PCR Sequencing Virus isolation	14 days 14 days 1 month	Surveillance only. Case Investigation Forms (CIF) must be completed in full and must accompany specimens.	CVI measles working group 011 386 6343 011 386 6398
Hepatitis	Molecular: 5ml EDTA blood	Transport at 2°C-8°C Sample should reach laboratory within 3 days	For research and surveillance only (Anti-HBs for staff immunity screening)	Hepatitis B: Architect System HBsAg, Anti-HBs, Anti-HBc, HBeAg, Anti-HBe, Anti-HBc IgM, HBV Viral load, genotyping Hepatitis C: Architect System Anti-HCV, HCV Viral load, genotyping	Serology: 14 days Molecular: 21 days	For research and surveillance only (Anti-HBs the staff immunity screening request form is completed and must accompany the specimen)	CVI hepatitis working group 011 386 6347

## Centre for Tuberculosis

In line with mandate of the National Institute for Communicable Diseases (NICD), the Centre for Tuberculosis (CTB) conducts laboratory laboratory-based public health surveillance of TB in South Africa, serves as a national TB reference laboratory (NTBRL) and participates in microbiology and epidemiology-oriented training programmes. It furthermore advises and works closely with the Department of Health (DoH) on strategic planning and assists with policy and guideline formulation concerning the diagnosis and treatment of TB in South Africa. Global policies and guidelines are initiated through the World Health Organization (WHO) and their formulation has included representation from the CTB which assisted in developing these strategic documents.

The activities of the Centre are focusing on the following areas;

### 1. Surveillance and Diagnostic Services

The CTB uses an integrated approach, combining public health surveillance and reference laboratory functions to provide enhanced and strategic information to guide TB control activities of South Africa. National surveillance covers new cases of laboratory-confirmed TB as well as new drug-resistant TB, including rifampicin-resistant (RR), multidrug-resistant (MDR) and extensively drug-resistant (XDR) cases identified by NHLS laboratories which serve over 80% of the population. Surveillance findings are regularly analysed and reported to the National TB Programme (NTP) and have assisted in monitoring the 90:90:90 strategic targets of the DoH. Information on drug resistance prevalence determined through a national survey has been analysed and will guide the NTP in pursuit of the Sustainable Development Goals, providing direction in terms of human and financial resources for areas of need.

New specialised molecular techniques for *Mycobacterium tuberculosis* detection have now been integrated into the surveillance system to better define drug resistance mutation profile and clonal strains, using whole genome sequencing (WGS), restriction fragment length polymorphism (RFLP) typing, spoligotyping and mycobacterial interspersed repetitive unit (MIRU) typing, all of which have become well established and are producing important findings. In addition, the centre is playing a leading role globally in the development and application of methods for drug resistance determination for new anti-mycobacterial agents, particularly bedaquiline.

### 2. Supporting NTBRLs and surveys in Africa – Supra-National TB Reference Laboratory

The CTB is a Supra-National Reference Laboratory of the WHO on the African continent. As part of this function, it provides technical support to two national reference laboratories in Africa, namely those in Malawi and Namibia. Activities include; improving quality management system for laboratory testing, as well as programming initiatives toward TB surveillance activities, locally and selected countries. An expanded approach, aiming to assess the proficiency of nine of the 22 highest burden TB national reference laboratories in Africa on culture identification and DST, has been recently initiated through WHO-AFRO. These developments have been important and have shown the great value of the support functions conducted by CTB.

Pathogen Species Name (disease/ syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<i>Mycobacterium tuberculosis</i>	Sputum or other human sample	Cool ambient temperature Specimens should be collected in clean leak proof containers free from paraffin and other waxes or oils. Specimens should be kept cool during transportation but should not be frozen. If there is a delay in transport, the specimen should be refrigerated (2-8°C)  An adequate sample should be about 5-10ml sputum.	Microscopy for acid-fast bacilli	Microscopy for acid-fast bacilli	90% within 48-72hours	Test limited for surveillance and projects	Centre for TB 011 885 5323 011 885 5316
<i>Mycobacterium tuberculosis</i> or Non-tuberculous mycobacteria	Sputum or other human samples type	Specimens should be collected in clean leak proof containers free of oils. Study specific containers may be used. Sputum should be from deep cough avoiding saliva and secretions from nasopharynx. Specimens should be kept cool during transportation but should not be frozen. If there is a delay in transport, the specimen should be refrigerated (2-8°C) An adequate sample should be about 5-10ml sputum.	Culture	Culture	Project dependant		Centre for TB 011 8855323 011 885 5316

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<i>Mycobacterium tuberculosis</i> Non-tuberculous mycobacteria	Isolate in MGIT tubes (or other liquid media) and on solid media	Isolates should be packaged as a biohazard category A (triple packaging)	Drug susceptibility testing (Specify drugs to be tested)	Drug susceptibility testing (MGIT 960)	3-8 weeks from pure positive sub-culture or Project dependant	For Bedaquiline Surveillance a special request form should be completed Contact laboratory manager for form.  Extended TB DST should be requested via email to the pathologist.	Centre for TB 011 885 5323 011 885 5316

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<i>Mycobacterium Tuberculosis</i> Non-tuberculous mycobacteria	Sputum (or other samples type) and/or culture (liquid/solid)	Cool ambient temperature Specimens should be collected in clean leak proof containers free from paraffin and other waxes or oils. Specimens should be kept cool during transportation but should not be frozen. If there is a delay in transport, the specimen should be refrigerated (2-8°C) An adequate sample should be about 5-10ml sputum. For isolates these should be packaged as biohazard category A (triple packaging)	Line Probe Assay First line drug susceptibility Second line drug susceptibility <ul style="list-style-type: none"> <li>- NTM speciation</li> <li>- MTB complex speciation</li> <li>- NTM- drug susceptibility</li> </ul>	Molecular testing methods  GenoType MTBDRplus, GenoType MTBDRsl, , GenoType CM GenoType MTBC GenoType NTM DR	2-7 days specimen or AFB positive culture or Project dependant	Culture isolates these should be packaged as a biohazard category A (triple packaging)	Centre for TB 011 885 5323 011 885 5316

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<i>Mycobacterium tuberculosis</i>	Sputum or other specimen or decontaminated sediment	Cool ambient temperature Specimens should be collected in clean leak proof containers free from paraffin and other waxes or oils. Specimens should be kept cool during transportation but should not be frozen. If there is a delay in transport, the specimen should be refrigerated (2-8°C) An adequate sample should be about 5-10ml sputum.	Xpert MTB/RIF Assay	Molecular testing methods	48-72 hours or Project dependant		Centre for TB 011 885 5217 011 885 5316
<i>Mycobacterium tuberculosis</i> or Non-tuberculosis mycobacteria	Isolate in MGIT tubes ( or other liquid media) and on solid media	Isolates should be packaged as a biohazard category A (triple packaging)	-Broth Microdilution or agar proportion or MGIT MIC testing. -Extended Panel for MTB -MIC testing for Bedaquiline and / or Delaminid. MIC testing for NTM.	Advanced DST Methods  Bedaquiline MIC testing  Delamamid MIC testing  Extended TB DST  Sensitire: <ul style="list-style-type: none"> <li>• MYCOTB (MTB)</li> <li>• Rapid grower NTM</li> <li>• Slow grower NTM</li> </ul>	3-8 weeks from pure positive sub-culture or Project dependant	For Delaminid and Bedaquiline Surveillance, a special request form should be completed.  Contact the Lab Manager for the forms.	Centre for TB 011 885 5323 011 885 5316



## **Centre for HIV and STI**

The Centre for HIV & Sexually Transmitted Infections (CHIVSTI) aims to be a resource of knowledge and expertise in HIV and other regionally relevant STIs to the South African Government, to SADC countries and to the African continent at large, in order to assist in the planning of policies and programmes related to the control and effective management of HIV/STIs. The Centre also aims to be a place of academic excellence in terms of both research and teaching/training. The Centre has a strong track record in the research disciplines of HIV virology, HIV immunology, HIV/STI epidemiology, HIV/STI diagnostics and HIV-STI interactions, as well as in successful supervision of MSc and PhD students.

### **Sexually Transmitted Infections Sections**

The STI section is responsible for providing intelligence on the aetiology of major STI syndromes, as well as antimicrobial resistance data related to gonococcal infections. Findings are communicated annually to the national and relevant provincial health departments in South Africa. The STI section also undertakes teaching and training activities, assisting with training of medical scientists, doctors, nurses and other healthcare staff. The STI section undertakes operational research relevant to public health and to that end it has established several international links with STI researchers overseas.

### **HIV Research Section**

The HIV Research Section conducts research projects primarily on the virology and immunology of HIV.. It also conducts validated end point assays for HIV vaccine trials.

### **Cell Biology Section**

The Cell Biology section focuses on **studies** of maternal-infant HIV-1 transmission as a model for understanding protective immunity to HIV-1. Studying the immune responses and other characteristics of both mothers and their infants allows the team to address questions of protective immunity of disease progression in the HIV-1 infected mothers, and of acute infection in infants who become infected.

### **HIV Serology and Molecular Section**

The HIV Molecular subsection supports, research, surveillance and training. Tests undertaken include CD4 immunophenotyping, HIV PCR for early infant diagnosis, HIV viral load monitoring including the use of pooling strategies as part of research and surveillance activities **and HIV drug resistance**. The HIV Serology subsection has various 3<sup>rd</sup> and 4<sup>th</sup> generation HIV-1 ELISA platforms, Western blotting methods, HIV rapid tests in place to support various surveillance activities including HIV incidence testing.

Testing for HIV can be performed on various matrices including dried blood spots where methods have been validated. The types of projects undertaken include HIV-1 vaccine endpoint studies, HIV-1 prevalence and incidence surveillance, trial intervention studies.

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
Bacterial vaginosis	Vaginal smear	Transport at ambient temperature		Gram stain		Only available for surveillance and research purposes	STI 011 555 0461 011 555 0468
<i>Candida</i> species	Vaginal smear	Transport at ambient temperature		Gram stain		Only available for surveillance and research purposes	STI 011 555 0461 011 555 0468
Herpes Simplex Type 2	Clotted Blood EDTA Blood Serum Plasma	Transport on ice		HSV2 IgG EIA	Project Dependant	Only available for Surveillance purposes and research projects	STI 011 555 0461 011 555 0468
Herpes Simplex Virus Type 1 and 2	Ulcer swab (Dacron)	Transport on ice or frozen	HSV PCR	PCR	10 days	Only available for Surveillance purposes and research project  Special cases: persistent/recurrent genital ulcer disease (require prior consultation with STI Section staff & completion of specific request form)	STI 011 555 0461 011 555 0468
Genital Ulcer Disease	Ulcer swab (Dacron)	Transport on ice or frozen	Multiplex PCR for genital ulcer pathogens  Organism-specific PCR available for confirmation of HSV and LGV		10 days	Available for Surveillance purposes and research projects  Special cases: persistent/recurrent genital ulcer disease (require prior consultation with STI Section staff & completion of specific request form)	STI 011 555 0461 011 555 0468

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
Genital Discharge	Urethral swab Vaginal swab Other samples as indicated by clinical presentation Endocervical swab Rectal swab Pharyngeal swab  (Dacron swabs)	Transport on ice or frozen	Multiplex PCR for genital discharge pathogens  Organism specific PCR available for confirmation of <i>Neisseria gonorrhoeae</i> <i>Chlamydia trachomatis</i> <i>Trichomonas vaginalis</i>		10 days	Available for Surveillance purposes and research projects  Special cases: persistent/ recurrent genital discharge or suspected treatment failure for gonorrhoea: *sexual abuse/ assault (require prior consultation with STI Section staff & completion of specific request form)	STI 011 555 0461 011 555 0468
<i>Neisseria gonorrhoeae</i> culture isolate	Viable culture isolate on sealed agar plate or Dorset agar slope		Identification  Antimicrobial Susceptibility Testing		7 days	Sexual abuse/ assault case <ul style="list-style-type: none"> <li>Two different phenotypic confirmatory methods should be performed on culture isolate at the local NHLS laboratory</li> <li>*Refer swab specimen for multiplex PCR for genital discharge pathogens, if required (see above)</li> </ul> Suspected treatment failure for gonorrhoea or extended-spectrum cephalosporin resistance (require prior consultation with STI Section staff & completion of specific request form)	STI 011 555 0461 011 555 0468
HIV	Plasma in EDTA or ACD tube	Frozen 1ml Plasma (-20°C) or Whole blood to be separated within 24 hours of collection	HIV-1 Pooled Plasma	Roche HIV-1 Viral Load	4 weeks		HIV Sero-Molecular Laboratory 011 386 6330 011 386 6439
HIV	Whole blood (EDTA or ACD Tube)	4°C to room temperature Minimum 2ml whole blood DO NOT FREEZE	HIV DNA PCR	HIV-1 DNA PCR (Whole blood)	5 days		HIV Sero-Molecular Laboratory 011 386 6330 011 386 6439

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
HIV	Dried Blood Spots collected on 903 Specimen Whatman collection paper	Sealed in plastic bags with desiccant and indicator to prevent moisture Minimum of three (3) full spots per card must be sent	HIV DNA PCR	HIV-1 DNA PCR (DBS)	5 days		HIV Sero-Molecular Laboratory 011 386 6330 011 386 6439
HIV	Whole blood (EDTA or ACD Tube)	Whole blood at room temperature	CD4	CD4 (TCell lymphocyte subset)	24 – 48 hours	No cold chain transport, transport at ambient temperature	HIV Sero-Molecular Laboratory 011 386 6330 011 386 6439
HIV	5 ml/10ml Clotted Blood or EDTA Blood and Dried Blood Samples (DBS) collected on Whatman 903 Cards - minimum of 3 full circles of whole blood, preferably fill all 5 circles	Transport blood samples at 2°C-8°C Maintenance of cold chain is required from collection to receipt at NICD. DBS samples can be transported at RT°C (stable at RT°C for 14 days)	HIV ELISA	HIV-1/2 Antibody EIA	5 -7 working days or project dependent	Project/Survey requirements must be provided in writing by Requestor and discussed with NICD prior to testing.	HIV Sero-Molecular 011 386 6435 011 386 6437  011 386 6457
HIV	5 ml/10ml Clotted Blood or EDTA Blood and Dried Blood Samples (DBS) collected on Whatman 903 Cards – minimum of 3 full circles of whole blood, preferably fill all 5 circles	Transport blood samples at 2°C-8°C Maintenance of cold chain is required from collection to receipt at NICD  DBS samples can be transported at RT°C (stable at RT°C for 14 days)	HIV ELISA	HIV-1/2 Antigen-Antibody EIA	5 -7 working days or project dependent	Project/Survey requirements must be provided in writing by Requestor and discussed with NICD prior to testing.	HIV Sero-Molecular 011 386 6435  011 386 6437  011 386 6457

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
HIV	5 ml/10ml Clotted Blood or EDTA Blood and Dried Blood Samples (DBS) collected on Whatman 903 Cards – minimum of 3 full circles of whole blood, preferably fill all 5 circles	Transport blood samples at 2°C-8°C Maintenance of cold chain is required from collection to receipt at NICD. DBS samples can be transported at RT°C (stable at RT°C for 14 days)	HIV-1 or HIV-2 Western Blot	HIV-1 Western Blot HIV-2 Western Blot  Geenius HIV ½ Confirmatory Rapid Assay (Serum, Plasma or Whole blood only)	5 -7 working days or project dependent	Project/Survey requirements must be provided in writing by Requestor and discussed with NICD prior to testing.	HIV  Sero-Molecular 011 386 6435 011 386 6437  011 386 6457
HIV	5 ml/10ml Clotted Blood or EDTA Blood and Dried Blood Samples (DBS) collected on Whatman 903 Cards – minimum of 3 full circles of whole blood, preferably fill all 5 circles	Transport blood samples at 2-8°C Maintenance of cold chain is required from collection to receipt at NICD DBS samples can be transported at Room Temperature for (stable for 14 days at RT°C after collection)	HIV Incidence Testing	Sedia HIV-1 BED Incidence EIA (Serum/Plasma only)  Sedia HIV-1 LAg Avidity Incidence EIA (Serum/Plasma)  Maximum HIV-1 LAg Avidity Incidence EIA (Serum/Plasma/DBS)  (Research Purposes Only)	14 - 21 working days for up to 1000 samples or project dependent	Project/Survey requirements must be provided in writing by Requestor and discussed with NICD prior to testing.	HIV Serol-Molecular 011 3866475  011 386 6437
HIV-1	p24	Store at -70°C		Culture supernatants	2 months	All these tests are done for Research/Project purposes only.	Virology Research Laboratory Lab Manager L Nxumalo 011 386 6341

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
HIV-1	Neutralization assays a) Pseudovirion assay	Store at -70°C		Serum	2 months	Whole blood received for testing to be stored at ambient temperature only	Virology Research Laboratory Lab Manager L Nxumalo 011 386 6341
HIV-1	Drug resistance testing a) In-House assay	Store at -70°C		Plasma from EDTA blood	2 months	Can be used for diagnostic purposes in special circumstances.	Virology Research Laboratory Lab Manager L Nxumalo 011 386 6341
HIV-1	Gag ELISA	Store at -20°C		Serum	2 months	All these tests are done for Research/Project purposes only.	Virology Research Laboratory Lab Manager L Nxumalo 011 386 6341
HIV-1	HIV Virus isolation	LN storage		PBMC's	2 months	Whole blood received for testing to be stored at ambient temperature only	Virology Research Laboratory Lab Manager L Nxumalo 011 386 6341
HIV-1	5ml/10ml Clotted blood or EDTA blood and Dried blood samples (DBS) collected on Whatman 903 Cards – minimum of 3 full circles of whole blood, preferably fill all 5 circles or frozen plasma	Transport blood samples at 2-8°C DBS samples can be transported at room temperature(stable for 14 days at RT°C after collection) Transport can be on Dry Ice and stored at -70°C	Drug resistance testing In-house assay	Plasma from EDTA blood DBS	2 Months or project dependant	Project/Survey requirements must be provided in writing by Requestor and discussed with NICD prior to testing	Virology Research Laboratory Lab Manager L Nxumalo 011 386 6341
HIV-1	Mycoalert Mycoplasma	Store at -20°C		Cell supernatants	1 month		Virology Research Laboratory Lab Manager L Nxumalo 011 386 6341
<i>Treponema pallidum</i>	Clotted blood or EDTA Serum Plasma	Transport on ice		RPR	Project dependant	Only available for Surveillance purposes and research projects	STI 011 555 0461 011 555 0468

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<i>Treponema pallidum</i>	Clotted blood or EDTA Serum Plasma	Transport on ice		TPPA	Project dependant	Only available for Surveillance purposes and research projects	STI 011 555 0461 011 555 0468
<i>Treponema pallidum</i>	Ulcer swab (Dacron)	Transport on ice or frozen	Syphilis/ <i>Treponema pallidum</i> PCR	PCR	10 days	Only available for Surveillance purposes and research projects And special cases (see above)	STI 011 555 0461 011 555 0468
<i>Treponema pallidum</i>	Ulcer swab (Dacron)	Transport on ice or frozen		Typing	Project dependant	Only available for Surveillance purposes and research projects	STI 011 555 0461 011 555 0468
<i>Treponema pallidum</i>	Ulcer swab (Dacron)	Transport on ice or frozen		Antimicrobial susceptibility testing by PCR	Project dependant	Only available for Surveillance purposes and research projects	STI 011 555 0461 011 555 0468
<i>Lympho granuloma Venereum (LGV)</i>	Ulcer swab Genital swab (Dacron)	Transport on ice or frozen Transport on ice or frozen		PCR	10 days	Only available for Surveillance purposes and research projects And special cases (see above)	STI 011 555 0461 011 555 0468
HPV	Genital swab	Transport on ice or frozen		PCR	Project dependent	Only available for Surveillance purposes and research project	STI 011 555 0461 011 555 0468
<i>Chlamydia trachomatis</i>	Urine Urethral Swab Vaginal swab Endocervical swab Oropharyngeal swab Rectal swab (Dacron swabs)	Transport on ice or frozen		NAAT ( PCR, TMA)	10 days	Only available for Surveillance purposes and research project And special cases (see above)	STI 011 555 0461 011 555 0468
<i>Chlamydia trachomatis</i>	Vaginal swab Urethral Swab Endocervical swab Ulcer swab (Dacron swabs)	Use special transport media. Transport on ice or frozen		Culture	Project dependant	Only available for research purposes And special cases (see above)	STI 011 555 0461 011 555 0468

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<i>Haemophilus ducreyi</i>	Ulcer swab (Dacron swabs)	Transport on ice or frozen		PCR	10 days	Only available for Surveillance purposes and research project And special cases (see above)	STI 011 555 0461 011 555 0468
<i>Mycoplasma genitalium</i>	Urine Urethral swab Vaginal swab Endocervical swab (Dacron swabs)	Transport on ice or frozen		PCR	10 days	Only available for Surveillance purposes and research project And special cases (see above)	STI 011 555 0461 011 555 0468
<i>Neisseria gonorrhoeae</i>	Urethral swab Vaginal swab Other samples as indicated by clinical presentation Endocervical swab Rectal swab Pharyngeal swab Cultured strains (Dacron or nylon flocked swabs)	Use special transport media (Amies Stuarts). Transport at 4°C to reach lab within 48 hours.		Culture and Antimicrobial susceptibility testing	7 days	Only available for Surveillance purposes and research project And special cases (see above)	STI 011 555 0461 011 555 0468
<i>Neisseria gonorrhoeae</i>	Urine Urethral swab Vaginal swab Endocervical swab Penile swab Rectal swab Pharyngeal swab (Dacron or nylon flocked swabs)	Transport on ice or frozen		NAAT (PCR, TMA)	10 days	Only available for Surveillance purposes and research project And special cases (see above)	STI 011 555 0461 011 555 0468
<i>Neisseria gonorrhoeae</i>	Urethral swab Vaginal swab Other samples as indicated by clinical presentation Endocervical swab Rectal swab Pharyngeal swab (Dacron or nylon flocked swabs) Cultured strains	Transport on ice or frozen Except for cultured strains at ambient temperature		Typing by PCR	Project dependent	Only available for Surveillance purposes and research project And special cases e.g. extensively-drug resistant strains  (see above)	STI 011 555 0461 011 555 0468



Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<i>Neisseria gonorrhoeae</i>	Urethral swab Vaginal swab Other samples as indicated by clinical presentation Endocervical swab Rectal swab Pharyngeal swab (Dacron or nylon flocked swabs) Cultured strains	Transport on ice or frozen Except for cultured strains at ambient temperature		Antimicrobial susceptibility testing by PCR	Project dependent	Only available for Surveillance purposes and research project. And special cases e.g. extensively-drug resistant strains (see above)	STI 011 555 0461 011 555 0468
<i>Trichomonas vaginalis</i>	Urine Urethral swab Vaginal swab Endocervical swab	Transport on ice or frozen		PCR	10 days	Only available for Surveillance purposes and research project And special cases (see above)	STI 011 555 0461 011 555 0468
<i>Trichomonas vaginalis</i>	Urethral swab Vaginal swab	Use special transport media. Transport at ambient temperature to reach lab within 24 hrs		Culture and antimicrobial susceptibility testing		Only available for research purposes And special cases (see above)	STI 011 555 0461 011 555 0468

## Centre for Emerging Zoonotic and Parasitic Diseases

New zoonoses (pathogens derived from animals) are emerging and known zoonoses are re-emerging in animal and human populations at alarming rates throughout the world. These pathogens represent a serious concern for medical and veterinary public health authorities, as well as for the authorities concerned with regulating biosafety and biosecurity at national and international levels.

The Centre for Emerging Zoonotic and Parasitic Diseases (CEZPD) aims to be a national and international centre of excellence for emerging and re-emerging zoonotic diseases. CEZPD aims to function as a resource for knowledge and expertise to the South African government, the SADC countries and the African continent, in order to assist in the planning of relevant policies and programmes and to harness innovation in science and technology to support surveillance, detection and outbreak response systems. In observing this goal the CEZPD supports South Africa's commitment to the International Health Regulations.

For outbreak, clinical advice or public health queries:

**NICD Clinical Advice Hotline +27 82 883 9920**

### Special Viral Pathogens Laboratory

The Special Viral Pathogens Laboratory (SVPL) is the only referral laboratory in South Africa for investigation of suspected VHF (Ebola, Marburg, CCHF, Hanta, Lassa and other arenaviral disease and Yellow fever). In addition the laboratory provides the only diagnostic capacity in South Africa for investigation of suspected human rabies cases

### Electron Microscope Laboratory

Diagnostic screening of any sample type for viral pathogens is done using negative staining. This is not a primary diagnostic service. Identification is possible to the Family level, infrequently to the Sub-family level. Biopsy and autopsy tissues/fluids can also be processed for resin-embedding and the ultrathin sections examined for the presence of pathogens, though the ultrastructure of the pathogen dictates the specificity of the identification. All samples to be refrigerated but not frozen. If possible, tissues should be fixed immediately in 2.5% buffered glutaraldehyde before transportation. For non-viral pathogens, particularly microsporidia, it is also possible to process wax-embedded tissues and sections on glass slides.

For further information, contact the Electron Microscopy Laboratory. Samples should be marked "attention: Electron Microscopy Laboratory" and submitted to the Special Viral Pathogens Reference Laboratory, CEZPD.

### Parasitology Reference Laboratory

The group provides a specialised parasitology reference service for routine diagnostic medical laboratories. Specialised parasitological diagnostic and confirmatory tests are offered by the laboratory. In addition, certain important pathogens form the focus of its surveillance, research and teaching

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activities. Estimating the burden of parasites in children less than 5 years of age presenting with diarrhoea is the aim of a surveillance project carried out at sentinel sites in South Africa. Surveillance of drug-resistant malaria in South Africa is underway. Research and development of new identification techniques for human parasites is on-going and currently includes projects on opportunistic diseases such as microsporidiosis, toxoplasmosis, and free-living amoeba infections.

## Vector Control Reference Laboratory

The Vector Control Reference Laboratory (VCRL) was originally established in 1924 to investigate vector borne diseases affecting gold mine workers. The current and primary focus of the VCRL is *Anopheles* spp. identification, malaria vector incrimination, taxonomy, biology, surveillance and vector control although this laboratory is also actively involved in surveillance of other medically important mosquito species in South Africa, particularly the arbovirus vector *Aedes aegypti*. The most important current research themes include assessments of the effectiveness of novel forms of malaria vector control; understanding population structuring, insecticide resistance and other important phenotypes of epidemiological significance in malaria vectors of the southern African region; understanding malaria transmission dynamics using field-based vector surveillance techniques; and the detection and characterisation of insecticide resistance in *Ae. aegypti* populations from various localities within South Africa. Many of these projects are enabled by the maintenance of live cultures of the five primary malaria vector species of sub-Saharan Africa, in most cases sub-divided into insecticide resistant and susceptible strains, and two cultures of *Ae. aegypti*. In addition, the VCRL provides a service for the identification of all medically important arthropods and houses the largest museum collection of medically important arthropods in Africa

Services and Courses:

### **Malaria vector Diagnostics service for the DoH**

The VCRL provides an identification of malaria vector mosquitos on behalf of the Department of Health.

### **Forensic Entomology**

The VCRL has been involved in assisting the South African Police Service with identifications of insects found on corpses and at the sites where corpses have been discovered. Results have correlated well with forensic pathology estimates of post-mortem intervals.

### **Other Diagnostic Services**

The VCRL provides an identification service of medically important arthropods for entomologists, medical practitioners and health workers.

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
Arbovirus  (Chikungunya, Dengue, West Nile, Rift Valley fever, Sindbis, Zika)  ICD-10 code for unspecified arthropod borne viral fever, A94	Clotted blood or serum, minimum of 1.0 ml  Highly recommended to submit repeat specimens, preferably acute and convalescent specimens	Tubes in sealed in plastic bags. Label clearly as biohazardous. Adhere to national and international regulations for transportation of hazardous biological goods as required.  Address to Center for Emerging and Zoonotic Diseases, Arbovirus Reference Laboratory, cold transport on ice packs Contact Laboratory or NICD Hotline for consult on urgent cases	Arbovirus  (Routine arbo screen, include serology for Chikungunya, West Nile, Sindbis, Rift Valley fever)  Dengue and Zika for patient with travel history.  Zika virus neutralization test  PCR/Isolation for Acute cases only	<u>Serology:</u> (HAI is performed as initial screen; any positive results are followed up with IgM ELISA or IFA to confirm recent infection. Testing of acute and convalescent specimens to indicate seroconversion by four fold rise in IgG titre is highly recommended or IgM seroconversion) <i>Zika virus neutralization test is performed for confirmation of ELISA positive results.</i>	HAI: 5 days  HAI + IgM ELISA/IFA: 7 days  IgM ELISA/IFA: 2-4 days  Zika virus neutralization test: 21 days	Rash or arthralgia syndromes with fever which may be linked to travel history, insect bites. Some cases develop encephalitis.  Refer to Arbovirus Diagnostic Guide or Outbreak specific guidelines available from <a href="http://www.nicd.ac.za">www.nicd.ac.za</a> Highly recommended to submit repeat specimens, preferably acute and convalescent specimens. Submit Case investigation form	Arbovirus Reference Laboratory Dr P Jansen van Vuren 011 555 0503 082 908 8045  NICD Hotline
	Alternative/additional specimens for PCR and isolation:  CSF <i>(for encephalitic cases only, requires at least 500 µl)</i>  Liver biopsies <i>(for post mortem confirmation only, contact Laboratory)</i>	See above	Arbovirus PCR  <i>(specify which arbovirus, for example "Dengue PCR")</i>  Arbovirus isolation	RT-PCR  Virus isolation	24-48 hours  18 days	See above. Should be requested in addition to the Arbovirus routine screen only. Only useful for specimens collected within 7 days of onset of illness or acutely ill patients.  See above. Should be requested in addition to the Arbovirus routine screen only. Only useful for specimens collected within 7 days of onset of illness or acutely ill patients	See above

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<i>Bacillus anthracis</i> (anthrax)	<p><u>Cutaneous Vesicular stage:</u> Soak 2x sterile dry swabs in vesicular fluid from a previously unopened vesicle.</p> <p><u>Eschar stage:</u> Rotate 2x sterile dry swabs for 2-3s beneath the edge of eschar without removing it.</p> <p><u>Biopsy of lesion:</u> Fresh Tissue in PBS/saline <i>Please note:</i> Do not send preserved tissue</p>	Transport at room temperature	Anthrax (ANTHR)	Microscopy, culture and special identification	5 days	<p>Safety precautions should be taken when handling/collecting samples</p> <p>Samples should be taken <b>prior to antibiotic treatment</b> and should reach laboratory as quickly as possible</p> <p><u>Important</u> Please notify laboratory prior to sending specimens</p>	Special Bacterial Pathogens Reference Laboratory 011 555 0331 011 555 0306
	<p><u>Inhalation</u> Pleural fluid or sputum (&gt;1 ml) collected in sterile container</p> <p>Blood culture <u>plus</u> 1 tube clotted blood and 1 tube whole blood (EDTA tube)</p>	Transport at 2-8°C					
	<p><u>Gastrointestinal</u> Stool or rectal swab</p> <p>Blood culture <u>plus</u> 1 tube clotted blood and 1 tube whole blood (EDTA tube)</p>	Transport at 2-8°C					
	<p><u>Meningitis</u> CSF in sterile container</p> <p>Blood culture <u>plus</u> 1 tube clotted blood and 1 tube whole blood (EDTA tube)</p>	Transport at 2-8°C					

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<i>Clostridium botulinum</i> (botulism)	20 to 30 ml clotted blood or 10 to 15 ml serum 25 to 50 g of stool Gastric washing Vomit Suspected food	Transport at 2-8°C	Botulinum	Mouse neutralization assay, Anaerobic culture and confirmation	4 weeks	<b>Important</b> Please notify laboratory prior to sending specimens. Samples should be taken as soon as possible after onset of illness.	Special Bacterial Pathogens Reference Laboratory 011 555 0331 011 555 0306
Monkeypox	<b>Prodromal phase:</b> tonsillar tissue swab, nasopharyngeal swab, clotted blood, serum or whole blood. Minimum of 0.5ml serum  <b>Rash/lesion phase:</b> Biopsy, lesion fluid, scab, clotted blood, serum or whole blood. Minimum of 0.5ml serum	Specimen containers must be sealed in plastic bags.  Adhere to national and international transportation of biological goods. Address to Centre for Emerging and Zoonotic Diseases, Special Viral Pathogens, cold transport on ice packs	Monkeypox	Monkeypox PCR	24-48 hrs	Fever, headache, muscle aches, backache, chills, exhaustion, lymphadenopathy, lesions. Travel history to central and western Africa or other exposure events (i.e. contact with exotic pets)	Special Viral Pathogens Laboratory Dr J Weyer 011 386 6376 082 903 9131  NICD Hotline
Rabies	Clotted blood or serum, minimum of 0.5 ml	Specimen containers must be sealed in plastic bags.  Adhere to national and international transportation of biological goods. Address to Centre for Emerging and Zoonotic Diseases, Special Viral Pathogens, cold transport on ice packs.	Rabies immunity	Serology: Rabies IgG	24-48 hours	Only for post vaccinal immunity screening. Usually for high risk occupational groups such as veterinarians or animal handlers or laboratory workers in laboratories that handle rabies virus	Special Viral Pathogens Laboratory Dr J Weyer 011 386 6376 082 903 9131

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
Rabies  (Rabies and rabies-related lyssaviruses)  ICD-10 code is A82.9	Antemortem: Saliva, minimum of 0.5 ml CSF, minimum of 0.5 ml Nuchal biopsies, single biopsy collected with dermatological punch from nape of neck <i>Post mortem:</i> Brain. Brainstem is most sensitive specimen. Whole, half or cubes of representative regions of brain submitted in 50 % glycerol saline in plastic screw top containers. Brain biopsies collected via the supraorbital fissure (contact laboratory for instructions). Do not submit in formalin. If no saline available freeze fresh.	Specimen containers must be sealed in plastic bags. Labelled as biohazardous and suspected rabies.  Adhere to national and international regulations for transportation of hazardous biological goods as required.  Address to Center for Emerging and Zoonotic Diseases, Arbovirus, cold transport on ice packs  Contact Laboratory or NICD Hotline for consult on urgent cases	Rabies	<i>Antemortem:</i> RT-PCR (performed on saliva, CSF and biopsy)  Serology (Rabies IgG/IgM) (performed on CSF and blood/serum)  <i>Post mortem:</i> Rabies fluorescent antibody test (DFA or FAT)	24-48 hrs  24-48 hours  24-48 hours	For antemortem investigation of suspected rabies cases. Encephalitis with rapid progression, hydrophobia, dementia, hallucinations, lucid periods usually present. Suggested that all specimens should be co-submitted for rule out of rabies. At least 3 consecutively collected salivas (on different days if possible) should be submitted. Post mortem investigation is most conclusive. Contact Laboratory/NICD Hotline for advice	Special Viral Pathogens Laboratory  Dr J Weyer 011 386 6376 082 903 9131  NICD Hotline
Severe fever with thrombocytopenia syndrome (SFTS)	Clotted blood or serum, minimum of 0.5 ml	Specimen containers must be sealed in plastic bags.  Adhere to national and international transportation of biological goods. Address to Centre for Emerging and Zoonotic Diseases, Special Viral Pathogens, cold transport on ice packs  Contact Laboratory or NICD Hotline	SFTS	SFTS PCR	24-48 hrs	High fever, thrombocytopenia, leukocytopenia and gastrointestinal disorders. Travel history to endemic areas or other exposure events	Special Viral Pathogens Laboratory  Dr J Weyer 011 386 6376 082 903 9131  NICD Hotline

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<i>Leptospira spp.</i> (Leptospirosis)	1 Tube of clotted blood or serum  <i>Please note:</i> Tests not done on urine, plasma, haemolysed, icteric or lipoemic blood.	Transport at 2-8°C Sample should reach laboratory within 3 days.	Leptospirosis (LEPTO)	Serology: IgM ELISA	4 days		Special Bacterial Pathogens Reference Laboratory 011 555 0331 011 555 0306
Viral haemorrhagic fevers  (Crimean-Congo haemorrhagic fever, Ebola, Marburg, Lassa, Hanta and Yellow fever)  ICD-10 code for unspecified viral haemorrhagic fever, A99	Clotted blood or serum, minimum of 1.0 ml	Tubes in sealed in plastic bags. Label clearly as biohazardous and suspected VHF. Adhere to national and international regulations for transportation of hazardous biological goods as required.  Address to Center for Emerging and Zoonotic Diseases, Special pathogens, cold transport on ice packs  Contact Laboratory and/or NICD Hotline	VHF	Serology (Fluorescent antibody test: IgG and IgM ELISA: IgG and IgM)  RT-PCR  Virus isolation	24-48 hrs  24-48 hrs  21 days	Fever, Rash Headache, Arthralgia, Myalgia, Haemorrhagic manifestations, Gastrointestinal symptoms, Pathology indicators, Travel history or other exposure events  Contact Laboratory and/or NICD Hotline  Submission of repeat specimen critical to confirm or exclude VHF  Full battery of tests (serology, PCR and isolation) recommended for most conclusive testing)	Special Viral Pathogens Laboratory Dr J Weyer 011 386 6376 082 903 9131  Contact NICD Hotline
<i>Yersinia pestis</i> (Plague)	<u><i>Bubonic</i></u> Bubo aspirate in PBS in sterile container <u>plus</u> 2x swabs (absorb a few drops of sample on a sterile swab and place into Cary Blair transport medium)  <u><i>Pneumonic</i></u> Sputum in sterile container <u>plus</u> 2x swabs (rotate swab in sputum sample and place into Cary Blair transport medium)	Transport at 2-8°C or room temperature.  Transport at 2-8°C or room temperature.	Plague (PLAGE)	Microscopy (Gram, Wayson & DFA), culture and confirmation	5 days	Safety precautions should be taken when handling/collecting samples  Samples should be taken <b>prior to antibiotic treatment</b> and should reach laboratory as quickly as possible  <u>Important</u> Please notify laboratory prior to sending	Special Bacterial Pathogens Reference Laboratory 011 555 0331 011 555 0306



Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
	<u>Septicemic</u> Blood culture bottle	Transport at room temperature				specimens	
	1 tube clotted blood or serum <i>Please note:</i> Paired serum taken 2-3 weeks apart is required for confirmation	Transport at 2-8°C	Plague serology (PLAGE)	Serology: ELISA	2 days		
	<u>Surveillance</u> Clotted animal blood e.g. rodent, dog	Transport at 2-8°C	Plague surveillance (RATS)	Serology	4 weeks		
<b>Parasitology</b>							
<u>Parasite -Borrelia duttoni</u> or <u>B. recurrentis</u> (Relapsing fever)	Unclogged, EDTA blood or blood films. <i>Clotted blood is unsuitable.</i>	Transport at ambient temperature <b>or on ice</b> .	Relapsing fever borrelia (TrakCare test code: PARAB)	Staining and microscopy	1 day		Parasitology Reference Laboratory 011 555-0304 011 555-0311
<u>Parasite -Babesia</u> species (Babesiosis)	Unclogged, EDTA blood or blood films. <i>Clotted blood is unsuitable.</i>	Transport at ambient temperature <b>or on ice</b> .	Babesia (Trak Care test code: PARAB)	Staining and microscopy	1 day		Parasitology Reference Laboratory 011 555-0304 011 555-0311
<u>Parasite -Plasmodium</u> species (Malaria)	Unclogged, EDTA blood or blood films. <i>Clotted blood is unsuitable.</i>	Transport at ambient temperature <b>or on ice</b> .	Malaria investigation (TrakCare test code: MALI)	Staining and microscopy	1 day		Parasitology Reference Laboratory 011 555-0304 011 555-0311

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<u>Parasite -Plasmodium</u> species (Malaria)	Unclotted, EDTA blood. Blood spots or blood films may be used in exceptional circumstances. <i>Clotted blood is unsuitable.</i>	Transport at ambient temperature <b>or on ice</b> . Blood should be transported to the laboratory as quickly as possible.	Malaria PCR (TrakCare test code: PCRPC)	Malaria PCR	2 days	Only request PCR test when: <ul style="list-style-type: none"> <li>■ the malaria microscopy and RDT (rapid diagnostic test) results do not correlate</li> <li>■ the malaria microscopy and/or RDT results are negative and malaria is still suspected</li> <li>■ malaria species confirmation is needed</li> <li>■ the patient has already been treated for malaria but routine tests are either not done or negative</li> </ul>	Parasitology Reference Laboratory 011 555-0304 011 555-0311
<u>Parasite -Plasmodium falciparum</u> (Malaria)	Unclotted, EDTA blood. <i>Clotted blood is unsuitable.</i>	Transport at ambient temperature <b>or on ice</b> .	Antigen test for <i>Plasmodium falciparum</i> (TrakCare test code: MALRP)	Antigen test for <i>Plasmodium falciparum</i>	1 day		Parasitology Reference Laboratory 011 555-0304 011 555-0311
<u>Parasite -Microfilaria</u> species ( <i>W. bancrofti</i> , <i>L. loa</i> , <i>M. perstans</i> etc)	Unclotted, EDTA blood or blood films. Blood sampling should be performed at the correct times depending on the suspected filarial species.*	Transport at ambient temperature <b>or on ice</b> .	Microfilaria investigation (TrakCare test code: PARAB)	Staining and microscopy	1 day	*For <i>W. bancrofti</i> sample after 8pm, for <i>L. loa</i> at ~12pm and others at any time.	Parasitology Reference Laboratory 011 555-0304 011 555-0311
<u>Parasite -Wuchereria bancrofti</u> (Lymphatic filariasis or elephantiasis)	EDTA Blood or serum.	Transport at ambient temperature <b>or on ice</b> .	<i>W. bancrofti</i> antigen test (TrakCare test code: FILAG)	Antigen test for <i>Wuchereria bancrofti</i>	1 day		Parasitology Reference Laboratory 011 555-0304 011 555-0311

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<u>Parasite -</u> <i>Trypanosoma</i> species (Sleeping sickness or trypanosomiasis)	Unclogged, EDTA blood, blood films or fresh CSF (1ml). <i>Clotted blood is unsuitable.</i>	Transport at ambient temperature <b>or on ice</b> . Ideally CSF specimens must reach laboratory within 30 minutes of sampling.	Trypanosome investigation (TrakCare test code: PARAB)	Staining and microscopy	1 day		Parasitology Reference Laboratory 011 555-0304 011 555-0311
<u>Parasite -</u> Human protozoa including: <i>Cryptosporidium</i> species, <i>Cystoisospora belli</i> , <i>Cyclospora cayetanensis</i> , <i>Giardia lamblia</i> , <i>Entamoeba coli</i> , <i>Blastocystis hominis</i>	Stool or duodenal aspirate/string test. Specimens, that may take longer than a day to reach the laboratory, should ideally be preserved in an equal quantity of 10% formalin.	Transport at ambient temperature <b>or on ice</b> .	Stool parasites (specify suspected parasite, if applicable) (TrakCare test code: PARAS, COCC for coccidian parasites only)	Microscopic identification of all human protozoa	1 day		Parasitology Reference Laboratory 011 555-0304 011 555-0311
<u>Parasite -</u> <i>Entamoeba histolytica</i> (Amoebiasis)	Stool, liver abscess fluid or cyst fluid. Minimum volume is 1ml.	Transport at ambient temperature <b>or on ice</b> . Don't add preservative. Ideally specimen must reach laboratory within 30 minutes of sampling.	Amoebiasis (TrakCare test code: PARAS)	Microscopy	1 day		Parasitology Reference Laboratory 011 555-0304 011 555-0311
<u>Parasite -</u> Human nematodes including: <i>Ascaris lumbricoides</i> (common roundworm), hookworms ( <i>Ancylostoma duodenale</i> / <i>Necator americanus</i> ), <i>Trichuris trichiura</i> (whipworm), <i>Strongyloides stercoralis</i>	Stool or worm/s. Specimens that may take longer than a day to reach the laboratory should ideally be preserved in an equal quantity of 10% formalin.	Transport at ambient temperature <b>or on ice</b> .	Stool parasites (specify suspected parasite, if applicable) (TrakCare test code: PARAS)	Macroscopic and/or microscopic identification.	1 day		Parasitology Reference Laboratory 011 555-0304 011 555-0311
<u>Parasite -</u> <i>Enterobius vermicularis</i> (pinworm)	Early morning sticky tape swab is the optimal specimen.	Transport at ambient temperature <b>or on ice</b> .	<i>Enterobius vermicularis</i> / (pinworm) (TrakCare test code: PMIC)	Microscopy	1 day	Eggs may be infective – handle with care.	Parasitology Reference Laboratory 011 555-0304 011 555-0311

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
Parasite - <i>Strongyloides stercoralis</i>	Sputum, urine or CSF. Minimum volume is 1ml. Larvae may be infective – handle with care.	Transport at ambient temperature <b>or on ice</b> .	<i>Strongyloides stercoralis</i> (TrakCare test code: PARAS)	Microscopy <b>and/or culture</b> for larvae of <i>Strongyloides stercoralis</i> .	1 day	For disseminated infections.	Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite -Human trematodes including: <i>Schistosoma mansoni/ haematobium</i> (Bilharzia, schistosomiasis)	Stool. Specimens, that may take longer than a day to reach the laboratory, should ideally be preserved in an equal quantity of 10% formalin.	Transport at ambient temperature <b>or on ice</b> .	Stool parasites (specify suspected parasite, if applicable) (TrakCare test code: PARAS)	Microscopic identification of all human trematodes.	1 day		Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite - <i>Schistosoma haematobium</i> (Schistosomiasis, bilharzia)	Urine, minimum volume is 5ml.	Transport at ambient temperature <b>or on ice</b>	<i>Schistosoma haematobium</i> (TrakCare test code: BILH)	Microscopy	1 day		Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite -Human cestodes (tapeworms) including: <i>Taenia saginata, T. solium, H. nana, H. diminuta</i> and <i>D. latum</i>	Stool. Specimens, that may take longer than a day to reach the laboratory, should ideally be preserved in an equal quantity of 10% formalin.	Transport at ambient temperature <b>or on ice</b> .	Stool parasites (specify suspected parasite, if applicable) (TrakCare test code: PARAS)	Microscopic identification of all human cestodes/ tapeworms.	1 day		Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite -Tapeworm (adult) identification	Worm or proglottid (tapeworm segment). Submit proglottids in saline.	Transport at ambient temperature <b>or on ice</b>	Tapeworm identification (TrakCare test code: PMIC)	Macroscopic and/or microscopic identification.	1-2 days	Proglottids may be infective – handle with care.	Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite - <i>Echinococcus</i> species (Echinococcosis, hydatid disease)	Cyst tissue, cyst fluid or sputum, minimum volume is 1ml.	Transport at ambient temperature <b>or on ice</b> , if transport is expected to take longer than 2 days it is best to transport at 4°C.	<i>Echinococcus</i> (TrakCare test code: PARAS)	Microscopic examination for hydatid hooklets and scolices of <i>Echinococcus</i> species.	1 day	May be infective – handle with care.	Parasitology Reference Laboratory 011 555-0304 011 555-0311

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
Parasite - <i>Acanthamoeba</i> spp. ( <i>Acanthamoeba</i> keratitis)	Corneal scrapings or biopsy, or contact lenses, cases and solutions. Send tissue in saline.	Transport at ambient temperature . <b>or on ice</b>	Acanthamoeba (TrakCare test code: PCULP)	Culture, Staining	2 weeks (Prov. result sent day 2)		Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite - <i>Leishmania</i> species (Leishmaniasis)	Bone marrow, liver biopsy, skin biopsy/impression smears. Submit skin biopsy in saline.	Transport at ambient temperature . <b>or on ice</b>	Leishmania investigation (TrakCare test code: PARAB)	Staining and microscopy	1 day		Parasitology Reference Laboratory 011 555-0304 011 555-0311
Parasite - <i>Pneumocystis jirovecii</i> ( <i>Pneumocystis</i> pneumonia, PCP)	Respiratory specimens including: induced sputum, tracheal aspirates, bronchial washings, bronchoalveolar lavage (BAL) or gastric wash. Random sputum is not an optimal specimen. Minimum volume is 1ml.	Transport at ambient temperature <b>or on ice.</b>	<i>Pneumocystis jirovecii</i> PCR (TrakCare test code: PCRPR)	PCR	2 days	Please send a respiratory specimen (induced or expectorated sputum, BAL etc.) for this test when PCP is suspected clinically/ radiologically, but the routine lab test (IFA) is negative.	Parasitology Reference Laboratory 011 555-0304 011 555-0311

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<b>Vector Control Reference Laboratory</b>							
Arthropods/ Insects	<p>Adult mosquitos must be undamaged and preserved on silica. A piece of paper must separate the specimen from the silica crystals. There must be only 1 mosquito per silica tube.</p> <p>Mosquito larvae should preferentially be reared to adults and preserved on silica tubes as described above.</p> <p>Identifying larvae by PCR is not recommended; However, if rearing of the larvae is not possible, larvae must be preserved in 70% ethanol with 1 larva per tube.</p>	Transport at ambient temperature. Estimated time of arrival: 1 week	Morphological identification, PCR identification and/or ELISA where indicated	Morphological identification; PCR identification: <i>An. gambiae</i> and <i>An. funestus</i> identification, MS PCR and <i>kdr</i> PCR and/or ELISA	<p>1 Month for morphologica l and PCR identification.</p> <p>Samples for ELIZA testing are done in a batch, unless ELISA testing of samples is urgent. This will result in extension of the TAT (up to 6 month) for the ELISA results.</p>	<p>Please send undamaged samples and all information relating to each sample</p> <p>Samples must be clearly labelled on the individual tube caps. The labels must match the information sheet.</p> <p>GPS coordinates for all locations must be provided.</p>	<p>Vector Control Reference Laboratory</p> <p>011 386 6483</p>

## Centre for Enteric Diseases

The Centre for Enteric Diseases (CED) aims to provide specialized diagnostics, relevant data and expertise in diarrhoeal diseases

### Bacteriology Division

The bacteriology division was established in 1997 and is the reference centre in South Africa for human infections involving bacterial enteric pathogens including diarrhoeagenic *Escherichia coli*, *Salmonella* species, *Shigella* Campylobacter species and *Vibrio cholerae*. The division participates in national laboratory-based surveillance for enteric bacterial pathogens. Isolates are voluntarily submitted to the bacterial division from ~200 clinical microbiology laboratories and data is collected on patients presenting throughout South Africa with both invasive and non-invasive disease. In order to make these data representative and reflective of disease burden in each province, all diagnostic laboratories are actively motivated to voluntarily submit limited demographic details and isolates. Cumulative stats of commonly circulating serotypes including limited antimicrobial susceptibility results are compiled and circulated to participating laboratories. Data is also published in the annual NICD report. . The division routinely performs genotypic characterization (DNA fingerprinting) on all outbreak/epidemic-prone pathogens including *Salmonella* Typhi, *Shigella dysenteriae* type 1, *V. cholerae* O1 and Shiga-toxin producing *E. coli* (including the enterohaemorrhagic *E. coli*). In addition the division assist in outbreak investigations and performs genotyping and strain characterization of any enteric bacterial pathogens involved.

### Virology Division

The virology division was established in May 2006 to expand the range of diarrhoeal pathogens under investigation to include viruses associated with gastroenteritis. The division participates in a sentinel surveillance program around South Africa to monitor rotavirus epidemiology, genotype distribution and the impact of the rotavirus vaccine introduced into the expanded program on immunization (EPI) in August 2009. The division is also involved in investigating methods to improve vaccine safety and efficacy in developing countries. Furthermore, the division monitors the incidence, seasonality and molecular character of additional enteric viruses including, but not limited to, norovirus, sapovirus, adenovirus and astrovirus, in children less than five years of age. The division also provides diagnostic support to the outbreak investigation unit.

Pathogen Species Name (disease/ syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<b><i>Campylobacter</i> sps</b>	Laboratory- confirmed isolate from any body site	Inoculated Dorset slopes incubated at 37°C overnight at source laboratory, prior to submission to CED- Bacteriology.  Transwabs /Dorset slope to be kept at room temperature upon receipt at NICD.	Enteric surveillance and reference function	<b>Phenotypic:</b> Identification  <b>Genotypic:</b> Real time PCR for detection of <i>Campylobacter jejuni</i> and <i>Campylobacter coli</i>	7 Working days  3 days	Copy of laboratory report including patient details	CED Bacteriology 011 386 6235 011 555 0348 011 555 0334 011 555 0360



Pathogen Species Name (disease/ syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<b>Diarrhoeagenic Escherichia coli</b>  Watery or bloody diarrhoea, abdominal cramps, with or without fever	Laboratory- confirmed isolate from stool or rectal swab only.  Laboratory confirmed isolate from all body sites for suspect EHEC/ <i>E. coli</i> O157.  Environmental isolates in water or food-borne disease outbreaks only.	Inoculated Dorset slopes incubated at 37°C overnight at source laboratory, prior to submission to CED- Bacteriology. Dorset slope to be kept at room temperature upon receipt at NICD.	Enteric surveillance and reference function / <i>E. coli</i> characterization	<b>Phenotypic:</b> Identification  Serotyping O-antigen     <b>Genotypic:</b> Virulence gene detection by multiplex-PCR.  DNA fingerprinting of strains by PFGE analysis	<b>*3 months</b> 3 Working days  7 days    3 days  4 days	<b>*Batch testing for surveillance isolates.</b>  Attach stool isolate form obtainable from CED- Bacteriology or copy of laboratory report including patient details.	CED Bacteriology 011 386 6235 011 555 0348 011 555 0334 011 555 0360

Pathogen Species Name (disease/ syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<b><i>Vibrio cholerae</i> O1 and non-O1</b> (non-cholera <i>Vibrio</i> species)  Acute watery diarrhoea	Laboratory-confirmed cultured isolate from all body sites.  Environmental isolates in water or food-borne disease outbreaks only.	Bacterial isolates sub-cultured onto Dorset transport medium.  Inoculated dorsets incubated at 37°C overnight at source laboratory, prior to submission to CED Bacteriology.  Dorset slope to be kept at room temperature upon receipt at NICD.	Enteric surveillance and reference function / <i>Vibrio</i> species characterization	<b>Phenotypic:</b>  Identification  Serotyping   Antimicrobial susceptibility testing. Screening of ESBL  <b>Genotypic:</b> Cholera enterotoxin detection by real-time PCR.  DNA fingerprinting of strains by PFGE analysis	<b>#1 month</b>  3 days  3 days   4 days  1 day  4 days	<b>#Batch testing for surveillance isolates.</b>  Attach stool isolate form obtainable from CED-Bacteriology or copy of laboratory report including patient details.	CED Bacteriology 011 386 6235 011 555 0348 011 555 0334 011 555 0360

Pathogen Species Name (disease/ syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<p><i>Salmonella</i> Typhi and non-typhoidal <i>Salmonella</i> species</p> <p><i>Shigella</i> species</p> <p>Diarrhoea, fever, cramps, dysentery</p>	<p>Laboratory-confirmed cultured isolates from all body sites.</p> <p>Environmental isolates in water or food-borne disease outbreaks only.</p>	<p>Bacterial isolates sub-cultured onto Dorset transport medium.</p> <p>Inoculated dorsets incubated at 37°C overnight at source laboratory, prior to submission to CED Bacteriology.</p> <p>Dorset slope to be kept at room temperature upon receipt at NICD</p> <p>Inoculated dorsets incubated at 37°C overnight at source laboratory, prior to submission to CED Bacteriology</p>	<p>Enteric surveillance and reference function / <i>Salmonella</i> species characterization</p> <p>Enteric surveillance and reference function / <i>Shigella</i> species characterization</p>	<p><b>Phenotypic:</b> Serotyping:</p> <p><i>Salmonella</i></p> <p><i>Shigella</i></p> <p>Antimicrobial susceptibility testing. Screening of ESBL</p> <p><b>Genotypic:</b> PFGE analysis: MLVA analysis:</p>	<p><b>*3 months</b></p> <p>12 Working days</p> <p>5 days</p> <p>4 days</p> <p>4 days</p> <p>3 days</p> <p>4 Working days</p> <p>2 weeks</p>	<p>*Batch testing for surveillance isolates. Attach stool isolate form, obtainable from CED-Bacteriology or a copy of laboratory report including patient details.</p>	<p>CED Bacteriology 011 386 6235 011 555 0348 011 555 0334 011 555 0360</p>
<p>Listeria monocytogenes</p>	<p>Laboratory-confirmed isolate from any body site</p>		<p>Enteric surveillance and reference function</p>	<p><b>Phenotypic:</b> Identification</p> <p><b>Genotypic:</b> Whole-genome sequence (WGS) analysis</p>	<p>4 Working days</p> <p>2 weeks</p>		
<p><b>Adenovirus</b> Gastroenteritis: Diarrhoea, vomiting, fever</p>	<p><b>Specimen:</b> Stool <b>Unsuitable Specimen:</b> Rectal swab in VTM</p>	<p>Maintenance of cold chain from collection to receipt at NICD. Store and transport at 4°C.</p>	<p>Enteric Adenovirus detection</p>	<p>Real-time PCR (Enteric adenovirus)</p>	<p>5 days</p>	<p>Specimen containers closed tightly and sealed in plastic bag accompanied with date of specimen collection and date of birth</p>	<p>CED Virology 011 555 0370</p>
<p><b>Astrovirus</b> Gastroenteritis: Diarrhoea, vomiting, fever</p>	<p><b>Specimen:</b> Stool <b>Unsuitable Specimen:</b> Rectal swab in VTM</p>	<p>Maintenance of cold chain from collection to receipt at NICD. Store and transport at 4°C.</p>	<p>Astrovirus detection</p>	<p>Real-time PCR</p>	<p>5 days</p>	<p>Specimen containers closed tightly and sealed in plastic bag accompanied with date of specimen collection and date of birth</p>	<p>CED Virology 011 555 0370</p>

Pathogen Species Name (disease/ syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<b>Sapovirus</b> Gastroenteritis: Diarrhoea, vomiting, fever	<b>Specimen:</b> Stool <b>Unsuitable</b> <b>Specimen:</b> Rectal swab in VTM	Maintenance of cold chain from collection to receipt at NICD. Store and transport at 4°C.	Sapovirus detection	Real-time PCR	5 days	Specimen containers closed tightly and sealed in plastic bag accompanied with date of specimen collection and date of birth	CED Virology 011 555 0370
<b>Norovirus</b> Gastroenteritis: Diarrhoea, vomiting, fever	<b>Specimen:</b> Stool <b>Unsuitable</b> <b>Specimen:</b> Rectal swab in VTM	Maintenance of cold chain from collection to receipt at NICD. Store and transport at 4°C.	Norovirus detection	Real-time PCR	5 days	Specimen containers closed tightly and sealed in plastic bag accompanied with date of specimen collection and date of birth	CED Virology 011 555 0370
<b>Rotavirus</b> Gastroenteritis: Diarrhoea, vomiting, fever	<b>Specimen:</b> Stool <b>Unsuitable</b> <b>Specimen:</b> Rectal swab in VTM	Maintenance of cold chain from collection to receipt at NICD. Store and transport at 4°C.	Rotavirus detection	ELISA	5 days	Specimen containers closed tightly and sealed in plastic bag accompanied with date of specimen collection and date of birth as well as vaccination history (where possible)	CED Virology 011 555 0370
			Rotavirus genotyping	RT-PCR genotyping			

## Centre for Healthcare-Associated Infections, Antimicrobial Resistance and Mycoses

The Centre for Healthcare-Associated Infections, Antimicrobial Resistance and Mycoses (CHARM) aims to prevent and control opportunistic, healthcare-associated infections, to combat AMR (including antifungal and antibacterial resistance) and to provide expertise in mycology in South Africa by providing:

- Strategic information obtained through surveillance and research to the Department of Health and other major stakeholders including WHO
- Technical support for public health programmes such as the AMR surveillance and the cryptococcal antigen screening programme
- Reference laboratory services in the fields of mycology and bacteriology
- Laboratory support for outbreak response
- Training for clinical, laboratory and public health personnel to ensure optimal diagnosis and control of diseases

### Mycology

The mycology group focuses on surveillance of fungal diseases of public health importance in South Africa: cryptococcal meningitis, candidaemia and other systemic fungal infections. In collaboration with the Department of Health and other partners, the group also monitors the national reflex laboratory Cryptococcal antigen screening programme which aims to reduce deaths associated with cryptococcal meningitis. Development of clinical guidelines for management of fungal infections is an important activity – members of the group participate in development of South African and WHO guidelines. A specialised mycology reference service is provided to routine diagnostic medical laboratories – including phenotypic and DNA sequence-based identification of unusual or difficult-to-identify fungi and antifungal susceptibility testing. Research activities are focused on developing and validating new diagnostic assays and defining risk factors for fungal disease and antifungal drug resistance. The reference laboratory also holds a large collection of pathogenic fungi.

### Antimicrobial Resistance Laboratory and Culture Collection

This group offers a reference service to routine diagnostic laboratories and is also responsible for laboratory-based surveillance of nosocomial infections caused by ESKAPE-organisms (*Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa* and other *Enterobacteriaceae*). The laboratory confirms phenotypic characteristics and the presence or absence of resistance genes and/or mechanisms on organisms sent from diagnostic medical laboratories.

Surveillance for antimicrobial resistance is a fundamental component for antimicrobial stewardship programs in healthcare facilities.

**MALDI-TOF**

The Centre is equipped with a Matrix Assisted, Laser Desorption, Ionisation-time of flight (MALDI-TOF) instrument. NHLS laboratories that cannot identify bacterial or fungal isolates in their laboratories using conventional or other automated methods can send the isolates to the NICD for processing on the MALDI-TOF. Unusual isolates or isolates of specific interest will be added the NSCC. **The Matrix Assisted, Laser Desorption, Ionisation-time of flight mass spectrometry assay can also be used to determine strain relatedness as a quick outbreak analysis tool.**

**Pulsed-Field Gel Electrophoresis (PFGE)**

**The Centre is equipped with PFGE equipment for the analysis of strain relatedness for outbreak investigations.**

**The National Stock Culture Collection (NSCC)**

The efficient and appropriate management of a culture collection within the NHLS is an essential and integral part of quality assuring the diagnostic services of the NHLS. The National Stock Culture Collection (NSCC) can be viewed as a resource to laboratories within the NHLS, which may at no charge draw upon cultures within the collection. **Consequently,** the purpose of the NSCC is to provide NHLS and NICD laboratories with control strains necessary to perform required procedures and maintain a collection of appropriate organism that are used for teaching and research purposes.

At this point in time the scope of the NSCC includes mainly bacterial organisms. The NSCC also keeps some specific reference cultures used by units within the NHLS/NICD viz. mycobacteria, yeast and moulds.

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<b>CHARM - Mycology</b>							

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
Fungal pathogen from clinical sources which cannot be identified by academic/ referral laboratories	Unidentified fungal pathogen from clinical source should be inoculated into an agar slope (screwtop) bottle such as Dorset transport medium or potato dextrose medium	Room temperature; inform Mycology Reference Laboratory if suspected dimorphic fungus which needs to be processed in a BSL-3 facility	Identification of fungal pathogen; Antifungal susceptibility testing	Phenotypic and genotypic identification (where required) of unidentified fungal pathogens from clinical sources; Antifungal susceptibility testing	10 days (unless very slow-growing organism)	Complete case report form (can be obtained from the Mycology Reference Laboratory)	CHARM Mycology Reference Laboratory 011 555 0323 011 555 0325 011 555 0353
Moulds and dimorphic fungi from normally-sterile sites (surveillance)	Inoculated into an agar slope (screwtop) bottle such as Dorset transport medium or potato dextrose medium	Room temperature; inform Mycology Reference Laboratory if suspected dimorphic fungus which needs to be processed in a BSL-3 facility	Identification of fungal pathogen; antifungal susceptibility testing; genotyping	Phenotypic and genotypic identification (where required) of unidentified fungal pathogens from clinical sources; Antifungal susceptibility testing	10 days (unless very slow-growing organism)	Laboratory report	CHARM Mycology Reference Laboratory 011 555 0323 011 555 0325 011 555 0353
Cryptococcus (surveillance)	Cryptococcal isolate should be inoculated into an agar slope (screwtop) bottle such as Dorset transport medium	Room temperature	Cryptococcal surveillance	Identification by phenotypic and genotypic methods; antifungal susceptibility testing	N/A	Complete GERMS case report or attach final lab report; Submission requested from GERMS-SA enhanced surveillance sites; private labs and NHLS labs in KZN	CHARM Mycology Reference Laboratory 011 555 0325 011 555 0381
Cryptococcus Meningitis	Whole blood , serum and CSF	Transport in cooler box with ice packs	Identification of Cryptococcal antigen (CrAg)	CrAg Lateral Flow Assay (LFA) CrAg Enzyme Immunoassay (EIA)	72hrs- 1 week	Laboratory Report	CHARM Mycology Reference Laboratory 011 386-6430 011 386-6431

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
Candida (surveillance)	Candida isolate should be inoculated into an agar slope (screwtop) bottle such as Dorset transport medium	Room temperature	Candida surveillance	Identification by phenotypic and genotypic methods; antifungal susceptibility testing	N/A	Complete GERMS case report or attach final lab report; Submission requested from participating GERMS-SA labs	CHARM Mycology Reference Laboratory 011 555 0325 011 555 0381
Histoplasmosis	Whole blood , serum and CSF	Transport in cooler box with ice packs	Identification of Cryptococcal antigen (CrAg)	CrAg Lateral Flow Assay (LFA) CrAg Enzyme Immunoassay (EIA)	72hrs- 1 week	Laboratory Report	CHARM Mycology Reference Laboratory 011 386-6430 011 386-6431
<b>CHARM Antimicrobial Resistance Laboratory and Culture Collection (AMRL-CC)</b>							
<i>Staphylococcus aureus</i>	Blood culture isolates, pus aspirate, sputum and other significant isolates sub-cultured on Dorset slopes	Transport at ambient temperature	AMR and virulence factor detection/confirmation	ID, MIC and molecular characterization of resistance mechanisms <i>mecA</i> and <i>mecC</i> ; <i>cfr-linezolid</i> resistant gene, Virulence factor <i>-pvl</i> ; vancomycin AST	14 days from receipt of culture	Referral isolate case Report forms	CHARM AMRL-CC 011 555 0344 011 555 0342



Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
Gram-negative organisms <b>ESKAPE</b> organisms (Carbapenem resistant enterobacteriaceae and <i>Acinetobacter baumannii</i> )	Blood culture isolates, sub-cultured on Dorset slopes	Transport at ambient temperature Cultures on Dorset slopes viable for up to one month at room temperature	Surveillance	ID, MIC and molecular characterization of resistance mechanisms	30-60 days from receipt of culture	Complete GERMS case report or attach final lab report; Submission requested from participating GERMS-SA labs *	CHARM AMRL-CC 0115550344 0115550342
Multi-drug resistant (MDROs) Enterobacteriaceae and other organisms  (*As per current GERMS-SA case definition)	Cultures on Dorset slopes or other suitable media to sustain viability during transport	Transport at ambient temperature	AMR –CPE; colistin and others detection/	ID, MIC and molecular characterization of resistance mechanisms	2 weeks from receipt of culture	*Case Report forms  Highly resistant nosocomial infections	CHARM AMRL-CC 0115550344 0115550342
<i>Enterococcus faecium</i> and <i>faecalis</i>	Cultures on Dorset slopes or other suitable media to sustain viability during transport	Transport at ambient temperature Cultures on Dorset slopes viable for up to one month at room temperature	AMR detection/confirmation	Van A,B and C genes	14 days from receipt of culture	Referral isolate case Report forms	CHARM AMRL-CC 011 555 0344 011 555 0342
MALDI-TOF identification	Cultures on Dorset slopes or other suitable media to sustain viability during transport	Transport at ambient temperature	Identification	Identification on MALDI-TOF	1 week (organism dependent)	Submit isolates with final lab report and/or lab working card	CHARM AMRL-CC 0115550344 0115550342

## Centre for Respiratory Diseases and Meningitis

The Centre for Respiratory Diseases and Meningitis (CRDM) is a resource of surveillance, diagnostics, expertise and research in the field of communicable respiratory diseases and meningitis for South Africa and the African continent. The centre generates data and provides expertise related to respiratory diseases and meningitis of public health importance to the South African National Department of Health, health care providers, regional and international collaborators, to assist with the planning of public health policies and programmes and response to respiratory disease and meningitis outbreaks. The CRDM is also a source of capacity building and formal training within South Africa and the African region.

For abbreviations used please see abbreviation table at beginning of this document

Pathogen Species Name (disease/ syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
Adenovirus	Any respiratory sample (e.g. <b>Nasopharyngeal</b> or tracheal aspirates, nasal, nasopharyngeal and/or oropharyngeal swabs, sputum, biopsies, autopsies etc.)  *Flocked swabs are recommended, alternatively dacron or rayon swabs.	Swabs should be placed in universal / viral transport medium (UTM/VTM).  Nasopharyngeal- and oropharyngeal swabs can be combined in same UTM/VTM.  Transport in cooler box with ice packs. Sample should reach laboratory within 72hrs	RSVP  <b>Please note</b> that this will only be done as part of comprehensive diagnosis to investigate cause of severe respiratory illness or outbreaks of unknown cause	Real-Time PCR  <b>Note:</b> routine diagnostic testing available at NHLS or private pathology laboratories	<b>3 working days</b>	Respiratory Infection; URTI; ILI	CRDM Virology  Results; 011-386 6404  Queries; 011 555 0488 011 386 6373  (HOD): 011 386 3690
Influenza A [H1N1 <b>pdm09</b> & H3N2] and Influenza B virus.	Any respiratory sample (e.g. <b>Nasopharyngeal or</b> tracheal aspirates, nasal, nasopharyngeal and/or oropharyngeal swabs, sputum, biopsies, autopsies etc.)  Flocked swabs are recommended. <b>Alternatively,</b> dacron or rayon swabs	Swabs should be placed in universal / viral transport medium (UTM/VTM).  Nasopharyngeal- and oropharyngeal swabs can be combined in same UTM/VTM  Transport in cooler box with ice packs. at 4°C Sample should reach laboratory within 72hrs	RSVP  <b>Please note</b> that this will only be done as part of comprehensive diagnosis to investigate cause of severe respiratory illness or outbreaks of unknown cause	Real-Time PCR  <b>Note:</b> routine diagnostic testing available at NHLS or private pathology laboratories	<b>3 working days</b>	Respiratory Infection; URTI; ILI	CRDM Virology  Results; 011-386 6404  Queries; 011 555 0488 011 386 6373  (HOD): 011 386 3690

Pathogen Species Name (disease/ syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<p>Avian Influenza (H5, H7, H9)</p>	<p>Any respiratory sample (e.g. <b>Nasopharyngeal or</b> tracheal aspirates, nasal, nasopharyngeal and/or oropharyngeal swabs, sputum, biopsies, autopsies etc.)</p> <p>Flocked swabs are recommended. <b>Alternatively,</b> dacron or rayon swabs</p>	<p>Swabs should be placed in universal / viral transport medium (UTM/VTM).</p> <p>Nasopharyngeal- and oropharyngeal swabs can be combined in same UTM/VTM</p> <p>Transport in cooler box with ice packs. Sample should reach laboratory within 72hrs transported as Infectious substance (packaging instruction 602 of IATA).</p> <p>Ship to: Centre for Respiratory Diseases and Meningitis, <b>NICD/NHLS</b> <b>1 Modderfontein Road Sandringham 2131</b> <b>North-Upper building (opposite canteen)</b></p>	<p>Contact NICD hotline on 082 883 9920 for all suspected avian influenza requests <b>before submitting samples</b></p>	<p>Real-Time PCR</p>	<p>24 <b>hours</b></p>	<p>Clinical features consistent with <b>Avian Influenza</b> infection PLUS meets epidemiological criteria as outlined in AI Case Investigation Document (Contact Epidemiologist)</p>	<p><b>Hotline-Dr on call:</b> <b>082 883 9920</b> CRDM Virology 011 386 6390</p> <p>011 555 0488 011 386 6373</p>

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
Parainfluenza virus types 1, 2 and 3	Any respiratory sample (e.g. <b>Nasopharyngeal or</b> tracheal aspirates, nasal, nasopharyngeal and/or oropharyngeal swabs, sputum, biopsies, autopsies etc.)  Flocked swabs are recommended. <b>Alternatively,</b> dacron or rayon swabs	Swabs should be placed in universal / viral transport medium (UTM/VTM).  Nasopharyngeal- and oropharyngeal swabs can be combined in same UTM/VTM  Transport in cooler box with ice packs. Sample should reach laboratory within 72hrs	RSVP  <b>Please note</b> that this will only be done as part of comprehensive diagnosis to investigate cause of severe respiratory illness or outbreaks of unknown cause	Real-Time PCR  <b>Note:</b> routine diagnostic testing available at NHLS or private pathology laboratories	<b>3 working days</b>	Respiratory Infection; URTI; ILI	NICD Hotline <b>082-883-9920</b>  CRDM Virology Results; 011-386 6404 Queries; 011 555 0488 011 386 6373 (HOD); 011 386 3690
Rhinovirus	Any respiratory sample (e.g. <b>Nasopharyngeal or</b> tracheal aspirates, nasal, nasopharyngeal and/or oropharyngeal swabs, sputum, biopsies, autopsies etc.)  Flocked swabs are recommended. <b>Alternatively,</b> dacron or rayon swabs	Swabs should be placed in universal / viral transport medium (UTM/VTM).  Nasopharyngeal- and oropharyngeal swabs can be combined in same UTM/VTM  Transport in cooler box with ice packs. Sample should reach laboratory within 72hrs	RSVP  <b>Please note</b> that this will only be done as part of comprehensive diagnosis to investigate cause of severe respiratory illness or outbreaks of unknown cause	Real-Time PCR  <b>Note:</b> routine diagnostic testing available at NHLS or private pathology laboratories	<b>3 working days</b>	Respiratory Infection; URTI; ILI	NICD Hotline <b>082-883-9920</b>  CRDM Virology Results; 011-386 6404 Queries; 011 555 0488 011 386 6373 (HOD); 011 386 3690
Human Metapneumovirus (hMPV)	Any respiratory sample (e.g. <b>Nasopharyngeal or</b> tracheal aspirates, nasal, nasopharyngeal and/or oropharyngeal swabs, sputum, biopsies, autopsies etc.)  Flocked swabs are recommended. <b>Alternatively,</b> dacron or rayon swabs	Swabs should be placed in universal / viral transport medium (UTM/VTM).  Nasopharyngeal- and oropharyngeal swabs can be combined in same UTM/VTM  Transport in cooler box with ice packs. Sample should reach laboratory within	RSVP  <b>Please note</b> that this will only be done as part of comprehensive diagnosis to investigate cause of severe respiratory illness or outbreaks of unknown cause	Real-Time PCR  <b>Note:</b> routine diagnostic testing available at NHLS or private pathology laboratories	<b>3 working days</b>	Respiratory Infection; URTI; ILI	NICD Hotline

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
RSV Respiratory Syncytial Virus (RSV)	<p>Any respiratory sample (e.g. <b>Nasopharyngeal</b> or tracheal aspirates, nasal, nasopharyngeal and/or oropharyngeal swabs, sputum, biopsies, autopsies etc.)</p> <p>Flocked swabs are recommended. <b>Alternatively,</b> dacron or rayon swabs</p>	<p>Swabs should be placed in universal / viral transport medium (UTM/VTM).</p> <p>Nasopharyngeal- and oropharyngeal swabs can be combined in same UTM/VTM</p> <p>Transport in cooler box with ice packs. Sample should reach laboratory within 72hrs</p>	<p>RSVP</p> <p><b>Please note</b> that this will only be done as part of comprehensive diagnosis to investigate cause of severe respiratory illness or outbreaks of unknown cause</p>	<p>Real-Time PCR</p> <p><b>Note:</b> routine diagnostic testing available at NHLS or private pathology laboratories</p>	<b>3 working days</b>	Respiratory Infection; URTI; ILI	<p><b>082-883-9920</b></p> <p><b>CRDM Virology</b> Results; 011-386 6404 Queries; 011 555 0488</p>

Pathogen Species Name (disease/ syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
Human Corona viruses (229E, OC43, NL63, HKU1)	<p>Any respiratory sample (e.g. Nasopharyngeal aspirates, oropharyngeal aspirates, throat swabs, nasal swabs, nasopharyngeal swabs, oropharyngeal swabs, tracheal aspirates, sputum, biopsies, autopsies etc.) Swabs should be placed in UTM/VTM. nasopharyngeal- and oropharyngeal swabs can be combined in same UTM/VTM. Any respiratory sample (e.g. NPA, OPA, TS, NS, NPS, OPS, TA, Sputum, Biopsies, autopsies etc.) Swabs should be placed in UTM/VTM. Samples can be combined in same UTM/VTM.</p> <p>Flocked swabs are recommended. Alternatively dacron or rayon swabs</p>	<p>Swabs should be placed in universal / viral transport medium (UTM/VTM).</p> <p>Nasopharyngeal- and oropharyngeal swabs can be combined in same UTM/VTM</p> <p>Transport in cooler box with ice packs. Sample should reach laboratory within 72hrs</p>	<p>Human coronaviruses</p> <p><b>Please note</b> that this will only be done as part of comprehensive diagnosis to investigate cause of severe respiratory illness or outbreaks of unknown cause</p>	<p>Real-Time PCR</p> <p><b>Note:</b> routine diagnostic testing available at NHLS or private pathology laboratoriesReal-Time PCR</p>	<p>3 working days 72 hrs72 hrs</p>	<p>Respiratory Infection; URTI;</p>	<p>011 386 6373 (HOD); 011 386 3690</p> <p>CRDM Virology Results; 011-386 6404 Queries; 011 555 0488 011 386 6373 (HOD); 011 386 3690</p>

Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
MERS-Coronavirus (MERS-CoV) Human Corona viruses (229E, OC43, NL63, HKU1)	<p>Induced sputum, lung aspirates, combined nasopharyngeal and oropharyngeal or swabs or nasopharyngeal aspirates in UTM/VTM, BAL and Biopsies of respiratory tract tissues.</p> <p>Other samples - to be discussed with Dr. on call.</p> <p>Flocked swabs are recommended. Alternatively, dacron or rayon swabs</p>	<p>Swabs should be placed in universal / viral transport medium (UTM/VTM).</p> <p>Nasopharyngeal- and oropharyngeal swabs can be combined in same UTM/VTM</p> <p>Transport in cooler box with ice packs. Sample should reach laboratory within 72hrs</p> <p>Transported as infectious substance (packaging instruction 602 of IATA).</p>	<p>Contact NICD hotline on 082 883 9920 for all suspected MERS corona virus requests</p> <p>Suspected MERS corona virus Human coronaviruses</p> <p><b>Please note</b> that this will only be done as part of comprehensive diagnosis to investigate cause of severe respiratory illness or outbreaks of unknown cause</p>	<p>Real-Time PCR</p> <p><b>Note:</b> routine diagnostic testing available at NHLS or private pathology laboratories</p>	24 hours	<p>Clinical features consistent with SARI infection</p> <p>PLUS meets epidemiological criteria as outlined by WHO (Contact Epidemiologist) Respiratory Infection; URTI; ILI</p>	<p>NICD Hotline 082 883 9920;</p> <p>CRDM Virology Results; 011-386 6404 Queries; 011 555 0488 011 386 6373 (HOD); 011 386 3690</p>
Severe respiratory illness of unknown cause	<p>Any respiratory sample (e.g. Nasopharyngeal or tracheal aspirates, nasal, nasopharyngeal and/or oropharyngeal swabs, sputum, biopsies, autopsies etc.)</p> <p>Flocked swabs are recommended. Alternatively, dacron or rayon swabs</p>	<p>Swabs should be placed in universal / viral transport medium (UTM/VTM).</p> <p>Nasopharyngeal- and oropharyngeal swabs can be combined in same UTM/VTM</p> <p>Transport in cooler box with ice packs. Sample should reach laboratory within 72hrs</p>	<p>Contact NICD hotline on 082 883 9920</p>	Real-time	24 hours	<p>Clinical features consistent with SARI infection</p> <p>PLUS meets epidemiological criteria as outlined by WHO (Contact Epidemiologist)</p>	

Pathogen Species Name (disease/ syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
Human Boca virus	<p>Any respiratory sample (e.g. <b>Nasopharyngeal aspirates</b>, oropharyngeal aspirates, throat swabs, nasal swabs, nasopharyngeal swabs, oropharyngeal swabs, tracheal aspirates, sputum, biopsies,</p> <p>Flocked swabs are recommended. Alternatively dacron or rayon swabs</p>	<p>Swabs should be placed in universal / viral transport medium (UTM/VTM).</p> <p>Nasopharyngeal- and oropharyngeal swabs can be combined in same UTM/VTM</p> <p>Transport in cooler box with ice packs. Sample should reach laboratory within 72hrs</p>	<p>Human bocaviruses</p> <p><b>Please note</b> that this will only be done as part of comprehensive diagnosis to investigate cause of severe respiratory illness or outbreaks of unknown cause Contact NICD hotline on 082 883 9920</p>	<p>Real-Time PCR</p> <p><b>Note:</b> routine diagnostic testing available at NHLS or private pathology laboratories Real-time PCR</p>	<b>3 working days</b>	Respiratory Infection; URTI; ILI	<p><b>NICD Hotline</b> 082 883 9920;</p> <p><b>CRDM Virology</b> Results; 011-386 6404 Queries; 011 555 0488 011 386 6373 (HOD): 011 386 3690</p>



Pathogen Species Name (disease/syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<p><i>Neisseria</i> species, <i>Haemophilus</i> species and <i>Streptococcus</i> species (GERMS surveillance)</p> <p><b>Bacterial meningitis screen - diagnostic</b> (<i>N. meningitidis</i>, <i>H. influenzae</i>, <i>S. pneumoniae</i> Group B <i>Streptococcus</i>, <i>E. coli</i>, <i>S. aureus</i>, <i>L. monocytogenes</i>)</p>	<p>Normally sterile site specimen (blood or cerebrospinal fluid [CSF] or other fluids e.g. pleural, peritoneal, synovial)</p> <p>Isolates inoculated onto Dorset transport medium and incubated overnight at 37°C in 5% CO<sub>2</sub></p> <p><b>Clinical samples:</b> minimum volume of 200µl, <b>EDTA blood</b></p>	<p>Submit isolates on Dorset transport media after overnight incubation. Do not refrigerate. Do not batch for longer than 1 week as isolates will lose viability.</p> <p>Inoculate as per NIC0184.</p> <p>Clinical specimens at cool ambient temperature (e.g. in a cooler box)</p>	<p>Identification of <i>Neisseria</i> species, <i>Haemophilus</i> species or <i>Streptococcus</i> species for GERMS surveillance (GERMS-SA)</p> <p><b>Bacterial meningitis screen (PCR and culture)</b></p>	<p>PCR identification of <i>S. pneumoniae</i>, <i>N. meningitidis</i>, <i>H. influenzae</i> Group B <i>Streptococcus</i>, <i>E. coli</i>, <i>S. aureus</i>, <i>L. monocytogenes</i></p> <p>Serotyping/ Serogrouping of <i>S. pn</i>, Nm, Hi (phenotypic and molecular)</p> <p>Antimicrobial susceptibility testing (disc and minimum inhibitory concentration - MIC)</p>	<p><b>PCR urgent</b> 1-2 days</p> <p>Surveillance 1-2 months</p>	<p>Isolates submitted to NICD for national surveillance (GERMS-SA). Submit with sterile isolate form or LIS report.</p>	<p>NICD Hotline <b>082-883-9920</b></p> <p><b>CRDM Bacteriology</b> 011 555 0315 011 555 0317</p> <p><b>HOD</b> 011 555 0316</p>
<p>Atypical pneumonia-causing pathogens (<i>Mycoplasma pneumoniae</i>, <i>Chlamydia pneumoniae</i>, <i>Legionella</i> spp., <i>Bordetella</i> spp.)</p>	<p>Sputum (expectorated or induced) in a sterile container, and/or nasopharyngeal- oropharyngeal aspirate or combined flocked swabs preferably in universal transport medium (UTM) or Primestore.</p> <p>For <i>Bordetella pertussis</i> culture, swabs should be placed in Regan Lowe (RL)</p> <p>Urine (for <i>L. pneumophila</i> serogroup 1). Minimum volume 5ml in a sterile leak-proof container</p>	<p>All samples (with the exception of UTM) to be transported at cool ambient temperature e.g. in a cooler box</p> <p>Sputum to be frozen immediately and transported on dry ice</p> <p>UTM to be stored and transported refrigerated. <b>Primestore – ambient temperature</b></p> <p>RL to be stored and transported at room temperature</p>	<p>PCR for identification</p>	<p>PCR for identification of atypical pneumonia-causing bacteria (<i>M. pneumoniae</i>, <i>C. pneumoniae</i>, and <i>Legionella</i> spp.)</p> <p><b>PCR for <i>B. pertussis</i> and other <i>Bordetella</i> spp.</b></p> <p>Culture for <i>Legionella</i> spp., <i>B. pertussis</i> and <i>Bordetella</i> spp.</p> <p>Binax NOW for <i>Legionella pneumophila</i> (serogroup 1)</p>	<p>PCR urgent 1 day/24 hours</p> <p>Non-urgent 2-4 days</p> <p>Culture 7-10 days</p>	<p>.</p>	<p>CRDM Bacteriology 011 555 0315 011 555 0317</p> <p>HOD 011 555 0316</p>

Pathogen Species Name (disease/ syndrome, ICD-code)	Samples Collection (E.g. Sample source, type amount, specimen container, transport medium, type of swab)	Specimen Transportation Requirements (Temperature requirements, Stability, Minimum time to reach laboratory)	Tests To Request	Available Tests (Methodology)	Turn-around time	Special Instructions (Case investigations forms to be completed, guidelines, other relevant info)	Department and Contact telephone no's
<i>Corynebacterium diphtheriae</i> (Diphtheria)	Respiratory: Throat or nasopharyngeal swab, pseudomembrane scraping or tissue  Cutaneous: skin scrapings/lesions	Isolates on Hoyles or Dorset transport medium for identification  Clinical samples (swabs) in Amies transport medium (for culture).  Stored and transported at cool ambient temperature.	<i>Corynebacterium diphtheriae</i> identification  Elek and PCR for toxin production	Phenotypic identification (MALDI-ToF)  Elek and PCR for toxin production and presence of toxin gene, respectively	PCR urgent 1 day/24 hours  Non-urgent 2-4 days  Culture 7-10 days		CRDM Bacteriology 011 555 0315 011 555 0317  HOD 011 555 0316

## Public Health, Surveillance and Response

The Public Health Surveillance and Response Division includes the Outbreak Unit, the GERMS-SA surveillance programme, Travel Health. The division facilitates communication and data sharing between the national and provincial health departments and the NICD and the public and provides epidemiological input to other NICD units through collaborative projects and support of surveillance and epidemiological activities and outbreak responses.

### Outbreak Response Unit

The Outbreak Response Unit (ORU) provides technical support for all aspects of communicable disease outbreaks and control in South Africa. Through close collaboration with provincial and national health departments and other stakeholders, together with systems for early detection and improved reporting of epidemic-prone communicable diseases, the ORU functions as a source of intelligence for outbreak detection and facilitates comprehensive outbreak response activities. In addition, close partnerships with NHLS diagnostic laboratories and NICD centres provide appropriate laboratory diagnostic services during outbreaks and specialised diagnostic testing as required.

#### Public Health Services

The ORU's role in outbreaks may include, but is not limited to, the following: outbreak detection and reporting, field investigation, development of clinical and laboratory guidelines, management of laboratory data and interpretation of results, and recommendations for prevention and control.

#### Contact Details

Dr Kerrigan Mc Carthy	+27 11 555 0542	079 8717278
24/7 Doctor on call/Outbreak Hotline	082 883 9920	

Please refer to the NICD website for further contact information:

<http://www.nicd.ac.za/index.php/centres/division-of-public-health-surveillance-and-response/>

## GERMS-SA

### Surveillance/Diagnostic Services

The GERMS-SA laboratory-based surveillance programme for diseases of public health importance is co-ordinated by a core team within the Division of Public Health Surveillance and Response and spans most of the centres at the NICD. Laboratory work is done through the respective Centre. The laboratory surveillance pathogens routinely include: *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Neisseria meningitidis*, *Salmonella* Typhi, *Salmonella enterica* serotype Paratyphi (A, B and C) and *Vibrio cholerae*, *Cryptococcus* spp., carbapenem-resistant Enterobacteriaceae (CRE) and for outbreak-related *Salmonella* non-Typhi, *Shigella* spp, non-cholera *Vibrio*, *Campylobacter* spp, Diarrheoagenic *E.coli* and *Listeria* spp. GERMS-SA is an active surveillance programme and relies not only on participating laboratories to submit isolates, but also makes use of the NHLS Corporate Data Warehouse to ensure that all cases that meet the case definition are included in the database.

The aim of GERMS-SA is to use the data to inform and guide public health policymakers in their decisions. The objectives include estimating the burden of both community- and hospital-acquired infectious diseases under surveillance; monitoring antimicrobial susceptibility trends; monitoring HIV-associated opportunistic infections; and evaluating the impact of vaccines included in the Expanded Programme on Immunisation (EPI). GERMS-SA's work is funded through the NICD/DoH.

### **GERMS-SA clinic-based surveillance (STI, HIV and TB)**

GERMS-SA has expanded to include clinic-based surveillance. Sites have been initiated in all provinces. Clinic-based surveillance includes TB and HIV surveillance to describe the epidemiology of drug resistance among HIV-infected persons initiating ART and/or TB treatment at the selected sites, as well as undertake STI surveillance. The STI component includes surveillance of STI syndrome aetiologies, gonococcal antimicrobial resistance and HPV genotypes among patients attending the clinic's STI.

The Acute Febrile Illness Surveillance Project continues to be incorporated into clinic-based syndromic surveillance at one clinic site in rural Mpumalanga. This surveillance is a One-Health project and takes place in collaboration with veterinary practitioners and researchers from the University of Pretoria Veterinary Faculty. The aim is to describe the prevalence of zoonotic infections in adult patients presenting with acute febrile illness and for whom the clinic sisters would do a malaria test. Laboratory testing includes PCR and serology for brucellosis, bartonella infections, leptospirosis, Q-fever, tick bite fever, West Nile virus, Sindbis, Rift Valley fever and chikungunya virus infections.

### **Travel Health:**

Travel Health was established in 2008 with the aim of being a centre for travel health-related activities and consulting on international health matters. This working group provides pre- and post-travel health advice and consultations for travel health practitioners, as well as for staff of the NHLS and NICD for work related field activities. Regular expert consultations are provided both locally and internationally to international focal points, institutes and health practitioners for South African travellers presenting with infectious diseases after travel within southern Africa and further abroad. These include diseases in travellers such as trypanosomiasis, severe malaria and rickettsial disease (tick bite fever). Consultation is also provided for the elimination of malaria in South Africa and other countries within southern Africa.

### **NICD Sequencing Core Facility**

The NICD Sequencing Core Facility was established in January 2016 to promote and expedite research and surveillance activities at the NICD aimed at providing accurate, high quality and cost-effective next generation sequencing (NGS) solutions. The Sequencing Core Facility currently supports all centres at the NICD in terms of NGS and bioinformatics needs, thus acts as an extension of every centre with regards to NGS capacity. Since its inception, the core facility has continually engaged in several projects from design to completion.

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Some key focus areas involve whole genome sequencing (de novo and re-sequencing), custom amplicon sequencing and metagenomics (viral and bacterial). The NICD Sequencing Core Facility currently supports three Illumina MiSeq sequencers. In addition to NGS, the core facility has a dedicated server (genomics server) for data analysis. The genomics server offers secure, powerful, and flexible bioinformatic computing accessible to all NICD scientists. CLC Genomics Server Core aims to provide a unique and stable software architecture core that makes it possible to apply a range of bioinformatics analysis-solutions on high-throughput sequencing data.

### **Important Considerations:**

**Sample Requirements:** For NGS, accepted sample types include genomic DNA (gDNA), complementary DNA (cDNA), PCR products and amplicons. No original clinical specimens (e.g. swabs, blood, urine, stools, etc.) are accepted. Nucleic acid material (DNA or RNA) can be prepared from any sample source. DNA must be eluted in Tris-Cl buffer, pH 8.5 (not Tris-EDTA buffer). RNA must be eluted in nuclease-free ultra-pure water (not Tris-EDTA buffer) followed by conversion into cDNA. PCR products and cDNA preparations must be purified (recommended) using Agencourt® AMPure® beads or Zymo DNA Clean & Concentrator™-5 kit. **DNA Input Recommendations:** > 100 ng of DNA, non-degraded and free of particulate matter, double-stranded DNA > 70 bp; OD<sub>260/280</sub> > 1.8, minimum concentration 10 ng/μL in 10mM Tris-Cl, pH 8.5. **RNA Input Recommendations:** 1-4 μg of total RNA, minimum concentration 20 ng/μL in nuclease-free ultra-pure water (do not exceed 50 μL) non-degraded with a Bioanalyzer RIN value of 8. When submitting samples, a Sample Request Form needs to be completed in full and emailed to the laboratory.

**Sample Packaging and Transportation:** Samples should be submitted to the laboratory in sterile tubes or reaction plates, and sample leak during transportation should be avoided. It is recommended that the cold chain be maintained during sample shipment in order to ensure that nucleic acid integrity is not compromised. Samples should be dispatched in a sealed container and marked appropriately. Courier service must be employed for sample shipment. Dispatching of samples on Fridays and weekends should be avoided so as to keep transportation time to the absolute minimum.

**Expected Turnaround Time:** Samples have an expected turnaround time of up to two weeks (project-dependent), and this is calculated from sample reception in the laboratory until the sequencing data is sent to the client. Urgent samples (i.e. samples from suspected outbreak cases) are prioritized, and will therefore have a shortened turnaround time. It is imperative that the laboratory is notified of priority samples before they are dispatched.

**NGS Applications:** The core facility engages in various NGS projects from design to completion, and the key focus areas include whole genome sequencing (de novo and re-sequencing), custom amplicon sequencing, whole transcriptome sequencing, RNA sequencing and metagenomics (viral and bacterial).

**Sample Rejection Criteria:** All incoming samples are recorded in the Sample Receiving Log Sheet and verification is done to ensure that each sample meets all acceptance criteria. Samples are rejected if they fall in any of the following rejection criteria: unlabelled samples; leaking samples; incorrect sample type (e.g. blood, sputum, urine, swab, etc.); samples not properly labelled; information on sample tube and Sample Request Form not corresponding; insufficient sample volume; samples with very low concentrations; samples received without completed Sample Request Form; sample tubes with illegible handwriting; and samples submitted for tests not performed in the laboratory.

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