CADHAM PROVINCIAL LABORATORY

GUIDE TO SERVICES 2020

Serving Manitoba since 1897

Manitoba

CADHAM PROVINCIAL LABORATORY

MANITOBA HEALTH, SENIORS AND ACTIVE LIVING

LOCATION:
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RESPONSIBILITIES

Cadham Provincial Laboratory (CPL) is responsible for several province-wide public health, reference and diagnostic services.

It is the central public health microbiology reference laboratory for Manitoba and supports Manitoba Health disease control programs.

CPL is directly linked to Manitoba Health, Seniors and Active Living in surveillance of communicable diseases and is the principal laboratory participant in outbreak investigations.

CPL is also the sole centre for laboratory services in virology, chlamydiology and infectious diseases serology and serves patients, practitioners and public health units in Manitoba, and parts of Nunavut, Northwest Ontario and Saskatchewan.

CPL provides newborn screening and maternal serum screening for Manitoba.

CPL co-ordinates and conducts the evaluation of suspicious packages and substances for biohazardous materials for Manitoba.

CPL also participates in the training of physicians, nurses and graduate students, and conducts research in fields of public health relevance.

SENIOR STAFF

Administration	
Medical Director: P. Van Caeseele, MD FRCPC	204-945-6456
Associate Medical Director: J. Bullard, MD FRCPC	204-945-1306
Executive Director	204-945-6302
Privacy Officer	204-945-6456
Administrative Officer	204-945-6337
Education Co-ordinator	204-945-8336
Outbreak Co-ordinator	204-945-7473
Quality Specialist	204-945-8336
Safety and Compliance Officer	204-945-6845
Clinical Microbiology	
Chief Technologist	204-945-7184
Scientist	204-945-7473
Information Management	
Data Entry Supervisor	204-945-8001
Section Chief	204-945-2417
Newborn Screening and Public Health Chemistry	
Chief Technologist	204-945-7980
Scientist	204-945-8021
Serology and Parasitology	
Chief Technologist	204-945-7582
Scientist	204-945-7545
Technical Support Services	
Chief Technologist	204-945-6230
Virology	
Chief Technologist	204-945-6858
Scientist	204-945-6878

ABBREVIATIONS USED

2 SP CTM =	Chlamydia transport medium
Ab =	antibody
AD =	antigen detection
ADB =	anti-DNAase B
Agg =	agglutination
AIDS =	acquired immunodeficiency syndrome
ALC =	70 per cent alcohol
ASOT =	antistreptolysin O titre
C & S =	culture and sensitivity
CMIA =	Chemiluminescent microparticle immunoassay
CMV =	cytomegalovirus
CONV =	convalescent
COVIA =	Sars-Cov–2virus
CPL =	Cadham Provincial Laboratory
CSF =	cerebrospinal fluid
CT =	cytotoxicity or chlamydia trachomatis
DFA =	direct fluorescent antibody
EDC =	expected date of confinement
EIA =	enzyme immunoassay
EM =	electron microscopy
ESBL =	extended spectrum beta lactamase producing
FAOD =	fatty acid oxidation disorders
FBI =	food-borne illness
FVT =	fecal verotoxin
GC =	gonorrhea
HA =	hemagglutination
HAV =	hepatitis A virus
HBV =	hepatitis B virus
HCV =	hepatitis C virus
HI =	hemagglutination-inhibition
HIV =	human immunodeficiency virus
HSV =	herpes simplex virus
HTLV =	human T-lymphotrophic virus
IA =	immunoassay
ID =	immunodiffusion
IFA =	indirect fluorescent antibody
IHA =	indirect hemagglutination
IMA =	immunochromatographic membrane assay
KOH =	potassium hydroxide
LA =	latex agglutination
LCM =	lymphocytic choriomeningitis
LGV =	lymphogranuloma venereum
MoAb =	monoclonal antibody
MOH =	Medical Officer of Health
MRSA =	methicillin resistant *Staphylococcus aureus*
NAAT =	nucleic acid amplification test
NAD =	nucleic acid detection
NAT =	nucleic acid testing
NML =	National Microbiology Laboratory
NPA =	nasopharyngeal aspirate
NPS =	nasopharyngeal swab
NT =	neutralization
PCR =	polymerase chain reaction
PFGE =	pulsed field gel electrophoresis
PHA =	passive hemagglutination
PHI =	Public Health Inspector
PHIN =	personal health information number
PHN =	Public Health Nurse
QA =	quality assurance
QC =	quality control
RHA =	Regional Health Authority
RDA =	RNA/DNA amplification
RFLP =	restriction fragment length polymorphism
RPHA =	reverse passive hemagglutination
RPR =	rapid plasma reagin assay
SA =	sexual assault
SAF =	sodium acetate acetic acid formalin
SARS =	severe acute respiratory syndrome
SST =	Serum separator tube
STAT =	high priority
STI =	sexually transmitted infection
TB =	tuberculosis
TDG =	transportation of dangerous goods
TDGR =	transportation of dangerous goods regulations
TI =	(1–2%) tincture of Iodine
UTM =	Universal transport medium
VHF =	viral hemorrhagic fever
VISA =	vancomycin-intermediate *Staphylococcus aureus*
VRE =	vancomycin resistant enterococcus
VRSA =	vancomycin resistant *Staphylococcus aureus*
VTM =	viral transport medium
VT =	verotoxin
WB =	Western blot

GENERAL GUIDE TO LABORATORY USE

Services
Cadham Provincial Laboratory provides public health laboratory services that include microbiology, virology, parasitology, serology, newborn screening, public health chemistry and quality assurance. Reference services for identification and typing of microorganisms are available to all medical and veterinary laboratories in the province.

Services are available to all registered medical practitioners and midwives, hospitals, health units, medical officers of health, public health inspectors and other recognized health practitioners. There is a charge for laboratory services to patients not insured by Manitoba Health.

Advice is provided by the senior staff on laboratory issues relating to communicable disease and screening programs. Staff members may visit hospitals or places where outbreaks are occurring at the request of appropriate authorities.

Hours of Operation
The regular hours of service are 8 - 4:30 p.m. , Monday to Friday. The laboratory is partially staffed on Saturdays, Sundays and statutory holidays.

Patient Inquiry Services
Results are provided to authorized personnel for all telephone inquiries, Monday to Friday, 8 - 4:30 p.m.; Saturday and Sunday, 8 - 4 p.m. (urgent requests outside of the regular operating hours will be responded to by the medical staff on-call).

STAT Testing:
Please ask yourself these questions before making a STAT request:
1. Why is test required "STAT"? Could this wait till the next regular shift in the Laboratory?
2. Will doing this test after hours "STAT" alter the management of the patient?

STAT testing is available 24 hours a day as follows:
Monday through Friday:

- STAT testing must be arranged through the appropriate Section of CPL prior to shipment.
- A requisition with the appropriate information and clearly marked STAT (a colored sticker is optimum) must accompany the specimen.
- Prior approval from CPL's on-call medical staff must be obtained for STAT viral testing.
- Prior approval must be obtained from CPL's medical staff for all remaining STAT testing, except for organ donor emergencies.

After 4:30 p.m., and on Weekends and Holidays (call back):
Call 204–945–6655 and the on-site Security Guard will refer the call to the medical staff on call. Clinicians may also page directly by calling 204–787–2071 and asking for the Cadham Lab physician on-call.

Specimen Delivery
Specimens may be delivered at any time, but may not be processed until the next business day if delivered after 4 p.m.

Specimen Hazards
Specimens that break or leak during transport pose a serious physical and infection risk to staff that transport, receive or process them. All specimens sent to the laboratory must be properly packaged and transported. Refer to Packaging and Transport of Specimens (see section 1.3). If the shipper's location and/or the patient specimen can be identified without peril to staff, CPL will notify the sender.

Reporting Procedure
Positive results of clinical or public health importance or which are likely to be required with urgency by the physician are telephoned with hard copy reports to follow. Reports may also be issued via electronic means to approved electronic medical record systems.

Reports issued are for the information of medical or public health staff primarily.

Practitioners requiring further interpretation of CPL results may contact the physician on-call at 204–945–6123 or after hours at 204–945–6655 or through HSC paging at 204–787–2071. Referral of patients directly to CPL for interpretation is not recommended.

Alert/Critical Results Call Practice
Preamble: Listed results will be telephoned and/or reported via fax/electronically to the physician or other clinical personnel responsible for the patient's care.

1.0 Virology:
- All STAT Results

2.0 Clinical Microbiology:
- *Legionella*
- *Bordetella pertussis* and *parapertussis*
- Corynebacterium diphtheriae, toxigenic
- From all sterile fluids and sterile sites (i.e.. CSF, pleural fluid, etc.):
  all positive direct smears
  all isolates - preliminary and final

- Salmonella typhi or paratyphi
- Shigella recovered from stool culture
- Any pathogen isolated from an Outbreak stool culture
  EXCEPTION - multiple simultaneous samples on the same patient.
- Salmonella typhi or paratyphi
- *Clostridium difficile* toxin positive results
- Positive STX (NAAT)
- Stools that are NAAT STX positive
- Verotoxin positive results
- Any unusual or high profile isolates, i.e. a suspected risk level 3 organism.
- Any results specifically requested to be phoned or 'STAT' results.

3.0 Serology:

- Needle stick on request
- Organ donor results
- Positive results for:
  Measles or Rubella
  IgM
  Serology or PCR
  Hantavirus IgM
  Malaria (microscopy and PCR) and Trypanosoma brucei
- Any positive Viral Hemorrhagic Fever (VHF) result

4.0 Perinatal Chemistry

- Newborn Screening
  All samples exceeding critical limits are referred to the appropriate pediatric specialist group.

BIOHAZARD RESPONSE TEAM

Cadham Provincial Laboratory and the Office of the Chief Provincial Public Health Officer coordinate and conduct the evaluation of suspicious packages and substances for biohazardous materials for Manitoba.

Any spill or suspicious package/substance response first requires triage of the event through the regional or on-call Medical Officer of Health (MOH). **CPL only responds to requests from MOHs or Environmental Health Officers in this regard**. The MOH may be reached at the regional public health office or after hours at 204–788–8666.

The Manitoba team members for Health Canada's Emergency Response Assistance Plan for biosafety level 4 material are located at CPL and may also be reached at 204–788–8666.

OUTBREAK RESPONSE SUPPORT

Cadham Provincial Laboratory provides laboratory support to Public Health and health care facilities in the investigation of outbreaks.

Note: When submitting specimens for outbreaks, include any history available and transport immediately and directly to CPL. Utilize CPL expertise to ensure appropriate specimens are collected.

An outbreak is the occurrence in a defined area of cases of an illness with a frequency clearly in excess of normal expectancy. The number of cases indicating presence of an outbreak will vary according to the infectious agent, size or type of population exposed to the disease, previous experience or lack of exposure to the disease, and time and place of occurrence. Therefore, the status of an outbreak is relative to the usual frequency of the disease in the same area among the same population, at the same season of the year.1 Commonly, outbreaks involve gastrointestinal illness, with or without a food-borne component, respiratory illness or parasitic infestation. Antimicrobial-resistant organisms, primarily as colonization, may also be investigated as an outbreak.

Knowledge of circulating pathogens and early detection of new or re-emerging organisms is paramount to disease prevention and control. CPL contributes to this general surveillance by electronic reporting of reportable diseases, to Manitoba Health, Seniors and Active Living by informal reports at Infectious Disease reviews, by surveillance programs and through consultations with section staff.

Reports of suspected or actual outbreaks come to CPL from a variety of individuals who may include infection control practitioners, public health nurses, medical officers of health (MOH), public health inspectors (in the case of food-borne illness) and occasionally concerned citizens. Response to this information will vary depending on the nature of the outbreak:

1) Additional or rapid testing may be done on specimens after discussion between laboratory and public health care facility staff.

2) When an outbreak involves or is anticipated to involve numerous individuals, the MOH or designate may request an outbreak code to be applied to all outbreak samples. This code enables samples to be traced more easily and provides phone reports of positives, where appropriate, and written reports of negatives and positives on a daily basis to the MOH. To obtain a code, the MOH or designate contacts the CPL Outbreak Coordinator (204–945–7473) with a summary of the

outbreak and the type of testing desired i.e., virology, bacteriology, toxin detection, serology, or parasitology. Advice regarding appropriate investigations and specimens is available from CPL medical staff or section chief technologists. The MOH or designate then requests the facility, public health nurse or inspector to add the code to all requisitions related to the outbreak.

3) During an outbreak, clear communication amongst disciplines is essential. CPL may refer the health care facility/individual to Public Health, may call Public Health directly or may do both. Effort is made to expedite delivery of specimens and to attempt to have laboratory results available to the Public Health Outbreak Co-ordinator at the earliest opportunity. Diseases that are reportable by provincial regulation are reported electronically to the CDC Branch of Manitoba Health, Seniors and Active Living on a daily basis. In food-borne illness outbreaks, liaison between CPL and an environmental testing laboratory may occur when both environmental and human specimens are being tested.

Outbreak investigation often involves testing approximately six affected individuals and not more than ten. Specimens should be taken from appropriate sites and placed in appropriate containers and transport medium when applicable (see sections 2, 3, 4 or 7). They should be sent as soon as possible to CPL in appropriate transport containers and under appropriate conditions (see Section 1). Specimens which leak, are damaged or lack appropriate identification (two unique identifiers such as name and PHIN) cannot be processed. Requisitions must be filled out completely and where applicable, clearly indicate the outbreak code. Adding “outbreak” or “food-borne illness” if applicable is also helpful.

Supplies for collection and transportation of specimens may be obtained from CPL (see Section 1.5).

Outbreaks involving antimicrobial-resistant organisms i.e., MRSA, VRE, are usually managed by the infection control practitioner(s) of the health care facility. Arrangements may be made for tracking of specimens and reporting of results as well as molecular epidemiologic investigation. Guidelines for the prevention and control of antibiotic resistant organisms (AROs) can be found online at ***www.manitoba.ca/health/publichealth/cdc/docs/fpc/aro.pdf***.

In outbreaks where the Manitoba Provincial Outbreak Response Plan (ORP) is activated, CPL will usually be a participant on the team.

Details of pathogen specific outbreak response protocols may be found in the Manitoba Health Communicable Disease Management Protocol Manual, available online at ***www.manitoba.ca/health/publichealth/cdc/protocol/***.

1. Heymann, David L. (Editor). *Control of Communicable Diseases Manual, 20th Edition*. American Public Health Association, Washington DC, December 2014.

SEXUAL ASSAULT PROTOCOL

CPL is the laboratory-coordinating site for the investigation of infectious diseases transmitted during sexual assault.

Consult with local/regional protocols for detailed procedures.

The following infectious agents may be considered in the investigation of sexual assault:

HIV
HBV
HCV
Syphilis
Chlamydia
Gonorrhea
HSV
HAV
(others, depending on circumstances)

In all cases, investigating practitioners must take precautions to definitively label each requisition and patient specimen container with the patient name, PHIN, date and site of collection. Requisitions must also be labeled:

SEXUAL ASSAULT

Specimens/requisitions not labeled as above may be rejected or discarded within two months of testing, limiting evidence available to establish transmission of infection.

Requisitions may be folded to protect the patient's identity and privacy.

Delivery should follow a chain-of-custody protocol.

NOTE: The abbreviations 'S.A.' or 'SAP' are not acceptable.

NEEDLESTICK INJURY PROTOCOL

Please see the Manitoba Health, Seniors and Active Living's Integrated Post-Exposure Protocol located at ***www.manitoba.ca/health/publichealth/cdc/protocol/hiv_postexp.pdf***.

There is a small window of time available to exposed individuals to optimize their chances of preventing HIV or HBV transmission after needlestick injury. HIV, HBV and HCV related testing can be conducted on a STAT basis if required. This requires co-ordination with CPL.

Weekdays - tests performed on specimens received before 2:30 p.m.

Same-day testing - advise source laboratory to transport specimen to CPL STAT to ensure sample arrives at CPL before 2:30 p.m.. It is best to consult with CPL to ensure the specimen is recognized and processed in a timely fashion.

Weekend or after hours testing - if required, call CPL Security at 204–945–6655 to page physician on-call, or through HSC paging at 204–787–2071.

Calling for results - provide patient name, and one other unique identifier, i.e., PHIN.
- for non-nominal HIV Ab results, provide HIV requisition number and patient code.

Note: A requisition with the appropriate information and clearly marked STAT (a coloured sticker is **mandatory**) must accompany the specimen.

1.0 TECHNICAL SUPPORT SERVICES

The Technical Support Services Section is responsible for:

- coordinating CPL's accreditation program and Proficiency Testing Programs
- receiving and processing, and shipping of specimens, sterilizing waste, and reprocessing glassware.
- administering the autoclave verification program for Body Modification establishments and dental offices.

1.1 SPECIMEN SUBMISSION REQUIREMENTS

Specimens collected and transported to CPL require the following information:

1.1.1 Requisition Requirements

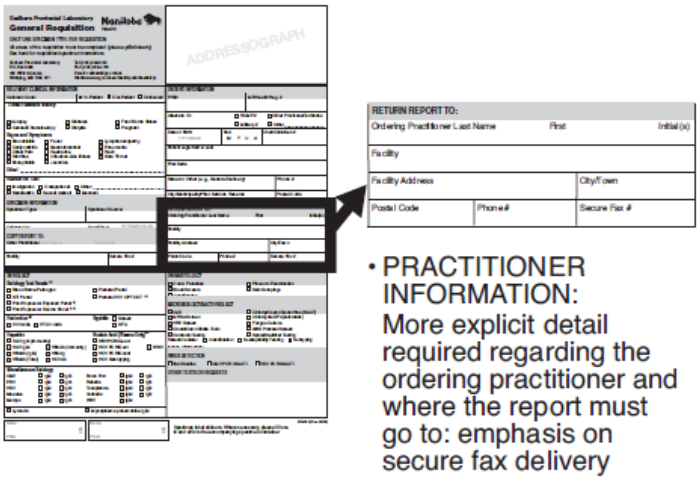
Each submitted specimen must be accompanied by the appropriate CPL requisition filled completely by requestor.
Submit one requisition for each source and specimen type.

Patient Information (**Mandatory**)

1. Patient surname, given name
2. Patient address (street and number), city/town, postal code
3. Personal Health Identification Number (PHIN); if no PHIN use unique organizational identifier verifiable by the patient (eg: other Provincial Health number, driver's license, passport number, military number, RCMP number)
4. Date of birth

Ordering Practitioner's Information (**Mandatory**)

6. Ordering practitioner's last name, first name or first initial (full name preferred). This identifier must be on the requisition
7. Ordering practitioner's reporting address (street and number, where the report will be sent to), city/town, postal code.
8. Ordering practitioner's phone number
9. Secure fax number



Specimen Information

10. The source and type of specimen (**mandatory**)
11. Requested test(s) or procedure(s) (**mandatory**)
12. Specimen collection date and time
13. Facility where specimen collected
14. Medical/Clinical information (symptoms, history, diagnosis, risk factors, etc.)
15. For referral isolates, suspected organism identification and previous identification test results are required.

1.1.2 Specimen Labeling Requirements (Specified on the Container) (Mandatory)

- Patient's surname and given name
- One other unique identifier verifiable by the patient/guardian, e.g, PHIN, DOB; PHIN is preferred
- Collection date and time (where appropriate)
- For non-nominal HIV or Retrovirus specimens, use the patient code and requisition number as the two unique identifiers.

If specimens are received at CPL that are inappropriately labeled or packaged, the sender will be notified by report. Repeated submission errors may result in non-processing of specimens.

1.1.3 Newborn Screening and Maternal Serum Screening Requirements

1.1.3.1 Newborn Screening Specimen requirements: Specimen collection instructions are provided on the back of the collection card, preferably collected at 24to 48 hours of age for first collection.

Newborn Screening requires a blood spot card which must contain the following information:

- Mother's name and PHIN
- Infant's gender
- Date and time of birth
- Birth weight and
- Collection date and time, (use 24–hour clock i.e. 4:00 p.m. = 16:00 hr.).
  For proper collection see Section 5.1.

1.1.3.2 Maternal Serum Screening Specimen Requirements: A minimum of 0.5 mL of serum is required optimally collected at 16 to18 weeks of gestation. See section 5.2.
An 8 to 9 mL serum separator tube is required.

Maternal Serum Screening information required for accurate interpretation of results:

- Gestational age (ultrasound information most accurate)
- Ethnicity (race)
- Patient weight at time of phlebotomy
- Insulin dependant diabetes mellitus, (IDDM) status
- Multiple gestation of current pregnancy.
- Smoker or non smoker
- DOB
- IVF/egg donor pregnancy

1.1.4 Transport of Specimens

- Must comply with Transport of Dangerous Goods (TDG) Regulations for ground transport and the International Air Transport Association (IATA) Regulations for air transport. (see Section 1.3).
- When required, serum must be separated from the clot in properly processed serum separator tubes. * Do not aliquot maternal screening samples.
- Check transport box or cooler instructions included in Section 8 of this Guide.
- For priority processing: clearly mark "STAT" on the outside of the package and on the requisition.

The CPL physician on call must be consulted regarding after hour or weekend requests for STAT testing. Call 204-945-6655 or 204-787-2071 after hours to reach the on-call CPL physician.

1.2 SPECIMEN REJECTION POLICY

Specimens received at CPL will be rejected for analysis for the following reasons:

1. Specimens that cannot be safely processed:
    - specimens with needle attached
    - leaking specimens

2. Improperly Collected or Transported Specimens:
    - specimen type or source is inappropriate for analysis
    - specimen collected in incorrect container(s) or preservative(s)
    - specimen(s) transported at incorrect temperature requirements (e.g. room temperature vs. frozen)
    - specimens collected in expired specimen collection containers

3. Unlabeled/Improperly Labeled Specimens:
    - identifiers on requisition do not match those on the specimen container
    - missing/insufficient ordering practitioner information on requisition
    - missing or illegible patient information on requisition or specimen
      * A laboratory requisition is a legal form. Please note that the modification of any CPL requisition is generally not acceptable and as such, any specimen received on a modified or edited version of a CPL requisition may be rejected.

4. Insufficient Unique Identifiers:
    - Two unique identifiers are not available on specimen (i.e. name and PHIN)
        - **Acceptable**: PHIN and name or one of PHIN/Name with one or more of the following:
            - DOB
            - Passport #
            - Driver's Licence #
            - Military #
            - RCMP #
            - Out-of-province PHINs or personal health numbers

          NOTE: (1) A six-digit Manitoba Health number or provincial equivalent is not a unique identifier as more than one family member can have the same number and same name (father and son may have the same name). (2) Chart number, hospital number or lab number are not considered identifiers.

5. Insufficient ordering practitioners information:
    - residents or medical students are not able to order tests
    - abbreviated names or acronyms of facilities are insufficient

1.3 PACKAGING AND TRANSPORT OF SPECIMENS

All specimens submitted to the laboratory for testing must be packaged in such a manner as to prevent the spillage, breakage, or damage to the specimen itself, and/or to accompanying specimens. The safety of the environment, and the safety of all persons involved in the shipping, handling and receiving of these specimens must be ensured by preventing exposure to the contents of the shipment at any time.

In Canada, the Transport of Dangerous Goods Act regulates how dangerous goods, (including Class 6.2 Infectious Substances) may be transported.

Infectious substances are substances which are known or are reasonably expected to contain pathogens. Pathogens are viable micro-organisms, including but not limited to bacterium, virus, rickettsia, parasites or fungus, or a recombinant, hybrid or mutant thereof, that are known or reasonably believed to cause disease in humans or animals. These substances fall into two categories:

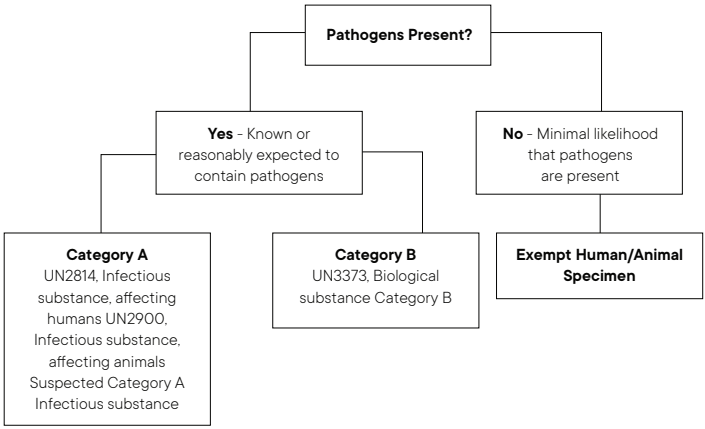
- Category A
- Category B

Category A specimens are assigned to two classes: UN 2814 Infectious Substances (*affecting humans*) or *UN 2900 Infectious Substances* (*affecting animals*). To be classified as a Category A specimen, the infectious substance is in a form that when exposure to it occurs, is capable of causing permanent disability, life-threatening or fatal disease in otherwise healthy humans or animals.

Category B specimens are generally classified as an infectious substance which does not meet the criteria for inclusion in Category A. Specimens are assigned to *UN 3373, Biological Substances, Category B*.

Exempt Human Specimen designation refers to patient specimens with a minimal likelihood of having pathogens present. This exemption does not include any patient specimens being tested for pathogens. Most specimens sent to Cadham Laboratory should not be shipped under this category.

1) Classification Flow Chart



Refer to Transport Box or Cooler Directions and consult the International Air Transport Association (IATA) for the air list of infectious substances and the Canadian Transportation of Dangerous Goods Act and Regulations for the road list.

1.4 TRANSPORTING SPECIMENS TO CPL

Refer to Transport Box or Cooler Directions in Section 8.0.

- All specimens should be shipped by bus, courier or air, whichever is the fastest.
- Only where bus or other transport is not available should diagnostic specimens be sent via Priority Post. **Specimens must never be sent through the regular mail**.
- All specimens must be clearly labeled and the requisition completely and appropriately filled out.
- Frozen specimen packing should contain sufficient dry ice or frozen gel packs for package contents and distance traveled to maintain specimen integrity.
- Cold, not frozen, gel packs should be used on top or between specimen bags for refrigerated specimens.
- Because of possible contamination, gel packs will be discarded if not received in press and seal bag.
- Ship specimens with similar temperature requirements in the same shipping container.
- If a specimen needs to be shipped after hours or on the weekend or holidays, please follow the call back procedure under General Guide to Laboratory Use section of this Guide.
- Probable Level III and Level IV organisms require the shipper to notify CPL before delivery at 204-945-6805, or after hours at 204-945-6655, and request the on-call physician
- Level III and Level IV organisms that are required to be submitted after hours or on weekends require prior consultation with the on-call physician.

The following is a list of possible Risk Group Level III and Level IV organisms, that once identified or is presumed to be in a laboratory specimen, must require the use of special precautions and must be shipped Category A.

Risk Group III

Bacteria, Chlamydia, Rickettsia (RG3)

Bacillus anthracis
Brucella: all species
Burkholderia mallei; B. pseudomallei
Chlamydophila psittaci: avian strains only
Coxiella burnetti
Francisella tularensis, type A (biovar tularensis)
Mycobacterium tuberculosis
Mycobacterium bovis (non-BCG strains)
Pasteurella multocida, type B
Rickettsia: all species
Yersinia pestis

Fungi (RG3)

Blastomyces dermatitidis
Coccidioides immitis
Histoplasma capsulatum
Paracoccidioides brasiliensis

Viruses (RG3)
Anthropod-borne viruses are identified with an asterisk

Arenaviridae
    Lymphocytic choriomeningitis virus, neurotropic strains
Bunyaviridae
    Unclassified Bunyavirus
    Hantaan, Korean haemorrhagic fever and epdemic nephrosis viruses including virus responsible for Hantavirus pulmonary syndrome
Coronavirus
    SARS virus
    MERS-COoV
    SARS-COV–1 Virus
    SARS-COV–2 Virus (COVID–19)
Rift Valley fever virus

Flaviviridae
- Yellow fever virus (Wild type)
- St. Louis encephalitis virus
- Japanese encephalitis virus
- Murray Valley encephalitis virus
- Powassan
- West Nile Virus

Herpesviridae
- Gammaherpesvirinae
- Genus Rhadinovirus: Herpesvirus ateles; Herpesvirus saimiri

Retroviridae
- Oncovirinae
  - Genus Oncornavirus C
    - Human T-cell leukemia/lymphoma virus‡
  - Genus Oncornavirus D
    - Mason-Pfizer monkey virus, Viruses from non-human primates
- Lentivirinae
  - Human immunodeficiency viruses (HIV all isolates)‡

Rhabdoviridae
- Genus Vesiculovirus
- (wild type strains)
- Genus Lyssavirus
  - Rabies virus (Street virus)

Togaviridae
- Genus Alphavirus
  - Eastern equine encephalitis virus
  - Chikungunya
  - Venezuelan equine encephalitis (except Strain TC–83)
  - Western equine encephalitis

Unclassified Viruses
- Chronic infectious neuropathic agents (CHINAs): Kuru, Creutzfeldt-Jakob agent (level of precautions depends on the nature of the manipulations and the amount of sera, bio/necropsy materials handled).

Risk Group IV

Viruses (RG4)

Arenaviridae
- Lassa, Junin, Machupo viruses, Sabia, Guanarito

Bunyaviridae
- Genus Nairovirus Crimean-Congo hemorrhagic fever

Filoviridae
- Marburg virus, Ebola virus

Flaviviridae
- Tick-borne encephalitis complex, including Russian Spring-Summer Encephalitis
- Kyasanur forest virus, Omsk hemorrhagic fever virus

Herpesviridae
- Alphaherpesvirinae
  - Genus Simplexvirus: Cercopithecine leppes B. Virus (Monkey virus)

Poxviridae
- Variola, Monkeypox

Further information on pathogens can also be found in the Pathogen Safety Data Sheets at the Public Health Agency of Canada's website by following the link below: ***www.phac-aspc.gc.ca/lab-bio/res/psds-ftss/***

1.5 TRANSPORT SUPPLIES

CPL will provide the following routine kits/supplies for the collection and transportation of specimens. Orders for supplies are to be sent to CPL via fax at 204–948–2124. Supply order forms are available on our website at www.manitoba.ca/health/publichealth/cpl/forms. Only in emergency situations should this request be telephoned. Alternate supplies are available for special situations.

DESCRIPTION	UNIT OF ISSUE
Forms	
CPL General requisition	Each
HIV Requisition – Non-nominal	Pkg. of 25
Retrovirus Nucleic Acid Testing Requisition – Viral Load, for specialists or HIV caregivers only	Pkg. of 25
Newborn Screening Specimen Collection Card	Each
Newborn Information Pamphlet	Each
Reagents	
UTM/UVT	2–3 mL vial
Swabs/Kits	
Chlamydia/GC GenProbe Aptima:	
Unisex Swab Collection Kit	Box of 50 or each
Urine Collection Kit	Box of 50 or each
Flocked Swabs (adult or pediatric)	Each
Polyester Tipped Swabs with Ultrafine Aluminum Shaft	Each
Guide to Services	Each

Most other general lab supplies are available from Materials Distribution Agency – 204–945–1118; ***www.mda.manitoba.ca*** (check under MDA Products, Medial catalogue). Specifically:

- Amies Charcoal Transport Media – SAP #057351
- Rayon swab – SAP #057706
- Stool Container – SAP #036995`
- O&P Container – SAP #017419
- 9 mL SST – SAP #455010
- Quikheel Lancets – SAP #049891
- Urine Container – SAP #57766

1.6 TRANSPORT MEDIA (TM)

MEDIA	APPEARANCE	USE	STORAGE
Amies Charcoal TM (with swab)	Black	General TM suitable for routine bacterial cultures and sensitivities, especially good for sensitive pathogens (*B. pertussis, N. gonnorrhoeae*). Substitute nasopharyngeal swab for included swab where necessary (e.g.. pertussis)	Store at room temperature. Do not freeze. Observe expiry date on package.
STI collection Kits for Chlamydia and gonorrhea	Clear Diluent	A rapid NAAT for detection of *N. Gonorrhoeae* and *Chlamydia trachomatis* from endocervical, urethral and urine specimens and for Chlamydia from select non-genital sites.	Store at 2°C–30°C until expiration date on the kit. After specimen collection store at 2°C–30°C. Do not discard swab or buffer.
Sodium Acetate, Acetic Acid, Formalin **(SAF)** (Parasitology)	Clear no precipitate	2 parts SAF and 1 part stool – thoroughly emulsified at time of collection	Store at room temperature
Universal Transport Media **(UTM) Viral Transport Medium (VTM)**	Clear, pink color	UTM for swabs, suspended in saline in sterile container and aspirates requiring viral culture. Not suitable for blood, CSF, urine or stool.	Store at 12–20°C. After collection of specimen, transport to CPL ASAP at 4°C with a cold pack.

1.7 TRANS-SHIPPING OF SPECIMENS BY CPL

In order for CPL to ensure specimens are trans-shipped and received at the appropriate testing site, the appropriate requisition must be completed accurately with the result reporting information (name and location where report is to be sent) clearly visible.

Referrals to the National Microbiology Laboratory (NML) or other National Microbiology Reference Centres must be processed through CPL.

2.0 CLINICAL MICROBIOLOGY

Clinical Microbiology services involve the detection, isolation and characterization of bacterial pathogens from clinical specimens. These activities support the diagnosis, treatment, and epidemiological surveillance of infectious diseases.

Procedures include, but are not limited to:

- antimicrobial susceptibility testing
- toxin testing

The Clinical Microbiological sub-sections include:

- miscellaneous bacteriology – isolation and identification of pathogens from a variety of clinical specimens and referred-in isolates
- enteric bacteriology – detection of enteric pathogens (e.g.. e. coli, salmonella, listeria) and enhanced testing for investigation of foodborne illness.
- sexually transmitted infections – detection of chlamydia trachomatis, neisseria gonorrhoeae, and other sexually transmitted microorganisms
- respiratory bacteriology – detection of bordetella pertussis, legionella spp., corynebacterium diphtheriae, and other respiratory pathogens
- toxins – detection of verotoxins and clostridium difficile toxins
- emerging antimicrobial resistance – screening, detection and characterization of current and emerging antibiotic resistance
- miscellaneous bacteriology – isolation and identification of pathogens from a variety of clinical specimens and referred-in isolates
- molecular – molecular and whole genome typing of bacterial pathogens
- quality control for CPL
- media preparation

Please note – Comprehensive Mycology services are no longer available at CPL. Specimens for fungal culture only should be submitted to DSM, HSC Microbiology.

Service Hours:
Clinical Microbiology provides seven day service, with some limited service on weekends and statutory holidays. Emergency on-call service is by special arrangement only and must be authorized by the director or designate.

Referred out services

- Acts as a triage centre for referring of isolates or specimens to the National Microbiology Laboratory, National Reference Centres, or other appropriate referral and reference laboratories.

Public Health Microbiology Programs:

These include, but are not limited to:

- Enteric program including
  - enteropathogenic Escherichia coli
  - provincial screening for verotoxins
  - salmonella serotyping
  - PulseNet Investigations
- provincial public health reference service
- provincial screening for STIs, including chlamydia and gonorrhea.
- provincial outbreak investigations.
- the Canadian foodborne illness response protocol (FIORP).
- pulsenet - Canada's national surveillance program for enteric pathogens
- the Canadian integrated program for antimicrobial resistance surveillance (CIPARS)
- provincial public health reference service
- laboratory-based surveillance

Other services

- Development of and participation in externally and internally funded public health microbiology research projects.
- Participation in University of Manitoba under-graduate and graduate medical education programs.
- In-services for Medical Laboratory Technology students, Cadham Provincial Laboratory staff, and public health nurses.
- Participation provincially and nationally on issues of public health laboratory and program importance.
- Education and research.

Note: This is a general description of services and not meant to be exclusive.

2.1 SPECIMEN COLLECTION

The following is a review of the steps necessary to secure the optimal sample for culture.

Note: Sterile gloves should be worn whenever specimens are collected.

Standard Skin Antisepsis (best method) for obtaining blood and body fluid specimens:

- After palpation, scrub the site with 70 per cent ALC for a minimum of 30 seconds.
- Apply TI to the area, allowing contact for at least two minutes. Let air dry (do not blow).
- Remove the TI with ALC using increasing outward circular movement (two minutes).
- For superficial lesions such as abscesses and bullae, a gentle disinfection with ALC, allowed to dry, is sufficient.

2.1.1 Abscesses

1. Prepare the surface as per Standard Skin Antisepsis.
2. Aspirate at least 0.5 mL and preferably 1.0 mL of purulent material.
3. Swabs of pus must be placed into transport medium, because of the tendency to dry.
4. Send the specimen immediately to the laboratory. If delay in transportation is anticipated, inject 1.0 mL or more of pus into blood culture medium.
5. Do not freeze. Keep swabs and fluids at room temperature (25° C or 4°C).
6. Submitting the contents in a syringe is not recommended. If absolutely unavoidable, **remove the needle and cap and replace with the sterile cap provided**. Tape the plunger to avoid spillage.

2.1.2 Blood for Culture

Blood culturing is no longer available and samples should be sent directly to laboratories providing this service.

Special blood culture medium is required for the isolation of mycobacteria. Contact the TB Laboratory at DSM, Health Sciences Centre. Telephone: 204– 787–1273.

2.1.3 Body Fluids (Except Urine and Cerebrospinal Fluid)

1. Prepare the surface as per Standard Skin Antisepsis (See Section 2.1).
2. Use sterile needle and syringe.
3. Handle all specimens so as to ensure viability of potential anaerobic pathogens, i.e., collection into blood culture bottle or an anaerobic transport vial.
4. Send 5 to 10 ml to the laboratory. It is best to transport such specimens immediately to the laboratory, not only to maximize appropriate processing, but to ensure prompt results from immediately available laboratory procedures.

5. Where a delay in processing is anticipated, inject 1 mL into a blood culture bottle and make a smear by spreading one drop of fluid in the center of a clean microscope slide. The smear should be allowed to dry in air and then be fixed over heat. Any remaining fluid should be submitted in a sterile, screw capped container, along with the smear and the inoculated blood culture bottle (25°C).
6. When clotting is anticipated, dilute the sample with sterile saline.
7. Do NOT refrigerate or freeze samples, keep them at room temperature (25°C).

2.1.4 Bullae, Cellulitis, Petechiae, Vesicles

1. Prepare the surface as per Standard Skin Antisepsis (See Section 2.1). In the case of bullae and vesicles, care is exercised to avoid lesion rupture.
2. A sterile needle and syringe are used.
3. As much material as feasible is aspirated, and placed in appropriate transport media (bacterial or viral).
4. If no aspirate is available, non-bacteriostatic sterile saline may be injected and aspirated. It is best to attempt this at lesion edges.
5. Petechiae pose special problems, and some prefer excoriation of the skin with a needle tip after vigorous cleansing. In this event, TI should be removed with ALC prior to this exercise. A swab is then used to immediately inoculate chocolate agar plates at the bedside or to put material on a slide for Gram stain.
6. One half of 1 mL of sterile saline may be injected into the advancing edge of a cellulitis and subsequently aspirated. The aspirate may then be injected into a blood culture medium.
7. Collect at least 0.5 mL, preferably 1.0 mL or more.
8. Do NOT freeze, keep at 4°C.

2.1.5 Cerebrospinal Fluid

1. The physician wears sterile gloves, a gown, and a mask.
2. Prepare the surface as per Standard Skin Antisepsis (See Section 2.1).
3. Drape the surrounding skin with sterile linen.
4. In adults, a needle insertion is ideally followed by collection of more than 2 mL of cerebrospinal fluid (CSF) into a sterile container for which a leakproof cap is available.
5. Ideally separate tubes are used to collect specimens for a cell count and biochemical analysis.
6. Transport the specimen immediately to the laboratory, as the organisms likely to be isolated are fastidious.

7. Where a delay in processing is anticipated, inject 1 mL into a blood culture bottle and make a smear by spreading one drop of fluid in the centre of a clean microscope slide. The smear should be allowed to dry in air. Any remaining fluid should be submitted along with the smear and the blood culture bottle.
8. Store at 35°C or at room temperature (25°C).

2.1.6 Cervix and Endometrium

1. The patient is placed in the lithotomy position.
2. A speculum is inserted and the cervix is visualized. Excess mucus is removed with a cotton ball or a swab, before the specimen is collected.
3. For cervical cultures, the swab is inserted in the distal portion of the cervical os, and allowed to remain for 10 to 30 seconds. Specimens for chlamydial studies are taken as above, but require rotation of the swab to obtain the superficial layer of cells required for testing.
4. Endometrial cultures should be approached either by needle aspiration or by a double lumen catheter through the cervical os. A slight cut has been previously made in the advancing end of the catheter to allow egress of a number 8 infant feeding tube, which is fed through the lumen of the Foley catheter to obviate normal flora contamination.
5. Place swab in charcoal transport medium for C&S; place chlamydial/GC swab in Aptima container (see section 2.2).
6. Do NOT freeze or refrigerate.
7. Store at room temperature (25°C).
8. Send as quickly as possible (within 48 hours for C&S).

Note: Only aspirated material is considered to be useful for anaerobic culture. Additional information on other collection kits is provided under the STI Bacteriology and Virology entries, see index.

2.1.7 Conjunctiva

1. Premoisten sterile swab with sterile saline and obtain secretions from inner aspect of eyelid.
2. Transport in charcoal transport medium.
3. For Chlamydia testing, see section 2.2.

2.1.8 Nasopharynx

1. The patient is comfortably seated, preferably with the head tilted back.
2. A nasal speculum is gently inserted.
3. A nasopharyngeal swab, on a malleable wire with a Teflon coated non-toxic tip, is inserted parallel to the palate through the speculum into the nasopharyngeal area.
4. The swab is rotated gently and allowed to remain for 20 to 30 seconds. The swab is then removed and placed in transport medium.
5. It is important to stress the use of charcoal transport medium with these specimens because the swab tip is small and vulnerable to drying and the organisms likely to be present are rather fastidious.
6. The specimens should be transported promptly to the laboratory.
7. Store at room temperature (25°C).
8. Do NOT freeze or refrigerate.

2.1.9 Nose

1. Anterior nares cultures are easily taken with a regular Dacron swab. In small children this is best done with a swab such as described in section 2.1.8.
2. Place swab in Ames charcoal transport medium and send to CPL immediately.
3. Store at 25°C (room temperature).

2.1.10 Pus

1. Aspirate a minimum of 0.5 mL by sterile syringe, if possible, and submit in sterile tube and/or on a swab well-soaked in pus. Send swab in transport medium.
2. To make thin smears, use the swab or by pressing a small spot of pus between two slides and then sliding them apart. Dry in air. Place slides in cardboard slide-mailer and secure with an elastic band.
3. For anaerobic culture, inject pus or other material into a blood culture tube, or into an anaerobic transport system.
4. Store at 25°C (room temperature).

2.1.11 SKIN

See sections: abscesses; bullae, cellulitis, petechiae, vesicles and wounds.

2.1.12 Sputum

1. Sputum is a very poor specimen unless patient co-operation is assured and unless special laboratory assessment is performed to determine adequacy of the specimen based on the numbers of squamous epithelial cells and leukocytes. Even optimally collected specimens fail to indicate the causal agent of pneumonia in up to 90% of cases.
2. The patient should be properly instructed prior to collection. Early morning sputa from the lungs after rinsing the mouth out with water and gargling; removal of dentures and plates is desired. Keep the amount of saliva in the specimen to a minimum. A sterile wide-mouthed, screw capped, leak proof container is provided for the expectorated material.
3. If the patient is unable to produce sputum, induction may be effected by postural drainage, saline nebulization, or chest percussion. Please inform the laboratory by notation on the requisition when this type of a specimen is obtained. Otherwise, it may be mistaken for saliva, and be rejected.
4. Since some of the organisms are fastidious, the specimen should be transported promptly to the laboratory.
5. In infants, tracheal secretions should be submitted.
6. Collect at least 1.0 mL of sputum, but no more than 30 mL.
7. Store at 4°C. Do not freeze or use preservatives.

2.1.13 Stool, Feces, Rectal

1. From a clean, urine-free receptacle, transfer stool into a sterile screw-capped container, until at least one-third full and no more than one-half full. Transport promptly.
2. Rectal swab is a suitable alternative for Shigella. Insert sterile swab 1 inch into the anal canal so that feces is evident on the swab. Transport in charcoal transport medium.
3. For C&S, toxin testing or FBI investigation, store at 4°C.
4. Keep from freezing or leaking.
5. If unusual pathogens are suspected (e.g. *Vibrio cholerae, Yersinia*, or *Plesiomonas shigelloides*), please indicate this on the requisition. Also indicate whether C&S, C. difficile toxin, or verotoxin testing is desired.
6. For chlamydia see 2.2.2, for gonorrhea see 2.2.1

2.1.14 Throat

1. In adults, a rayon swab is used with good visualization (use a tongue blade and a good light source). Vigorously swab both tonsillar fauces and the posterior pharynx, reaching up behind the uvula and culturing any ulceration, exudate, lesion or area of inflammation. Place in charcoal transport medium.
2. Store at room temperature (25°C or 4°C).
3. Submit within 24 - 48 hours.
4. Indicate on requisition if diphtheria, gonorrhea or epiglottitis is suspected.
5. For chlamydia see 2.2.2

2.1.15 Transtracheal Aspirate

1. This technique is not a routine culture technique and is best done by an experienced individual.
2. Submit specimens in a blood culture media tube or anaerobic transport system, in order to preserve possible anaerobes.
3. Collect at least 0.5 mL, preferably more, in a sterile container.
4. Store at 4°C.
5. Do NOT freeze.

2.1.16 Vagina

1. Wipe away excessive secretions; obtain secretions from mucosal membrane of the vaginal vault with sterile transport swab.
2. Intrauterine device may be sent in a sterile container; transport within 24 hours at room temperature (25°C).
3. Vaginal or vaginal-rectal swabs for Group B Streptococcus should be collected at 35 to 37 weeks gestation.

2.1.17 Urethra

1. Use a sterile bacteriologic wire or disposable plastic loop to obtain the specimen from the anterior urethra by gently scraping the mucosa. An alternative to the loop is a sterile rayon urethral swab that is easily inserted into the urethra.
2. Transport of these cultures are as described for cervix and endometrium (see section 2.1.6).
3. For Chlamydia / GC testing, see section 2.2.

2.1.18 Urinary Specimens

Routine bacteriological culture of urine is not performed at CPL.
Urine for chlamydia - see Chlamydia in section 2.2.2.
Urine for Legionella Antigen - see Legionnaires disease in section 7.0.

2.1.19 Wounds

1. For the closed wound technique, see sections abscesses, bullae, cellulitis, petechiae and vesicles (2.1.1 and 2.1.4).
2. For open wounds:
    a) Clean the sinus tract opening or the wound surface with normal saline.
    b) These areas frequently yield "normal flora" organisms. Therefore, it is important to attempt to culture the base or edges of the wound.
    c) Swab specimens of sinus tracts may be acceptable, but aspiration material obtained by needle or catheterization is preferable. Curettings obtained from the lining of the sinus tract also provide excellent culture material. For ulcerations or open wounds, curettings or biopsy specimens are best. These are placed into a sterile transport container. Tissue or aspirated material provides the greatest yield. Do not freeze. Keep at room temperature (25°C). Transport ASAP.

2.2 STI BACTERIOLOGY

2.2.1 Gonorrhea Culture

Indicated for when the specimen can be processed in the laboratory within 24 hours of specimen collection. All suspected treatment failures should be investigated using culture, which allows for antimicrobial susceptibility testing. Culture, in addition to applicable NAAT, is also strongly recommended in the following situations:

- as a **test of cure** for suspected treatment failure or in situations where there is an increased probability of treatment failure
- for symptomatic msm
- in the case of sexual abuse/sexual assault (rectal, pharyngeal, vaginal)
- for specimens taken from children under 12 years of age (see prepubertal children, below)
- to evaluate pelvic inflammatory disease (pid) or any other suspected extra-genital non-gonoccoccal infection
- if the infection was acquired in countries or areas with high rates of antimicrobial resistance

Collection

1. See section on cervical specimens (see section 2.1.6).
2. A rectal swab can be obtained without an anoscope, by inserting a dacron swab approximately 1 inch into the anal canal. The swab is then moved from side to side to sample the crypts and left for 10 to 30 seconds to allow absorption of organisms onto the swab.
3. In the male, urethral culture is usually obtained either with a rayon swab or a plastic loop (see section 2.1.17). Both smear for gram stain and culture are indicated.
4. Throat swabs are occasionally helpful in the diagnosis of gonorrhea, but vaginal swabs generally have a poor yield of positive results.

Note: Culture for this organism is useful when the specimen can be processed in the laboratory within 24 hours of procurement. Use NAAT where any delay in testing is anticipated.

Note: If purulent material is present in the urethra or if other lesions are present these should be cultured, in addition to the cervix.

Adults

A swab in Amies charcoal transport medium from anus, throat, eye, vagina, cervix or urethra for culture, where culture can be started same day. Dry swabs are unsuitable.

Prepubertal Children

Culture is as above, irrespective of length of delay of processing. Unfortunately many N. gonorrhoeae infections will be missed if delay is greater than 24 hours. A smear should accompany these specimens. (One streak about 0.5 to1.0 inch or 1.5 to 2.0 cm long is made on a clear glass slide. Air dry). Vaginal swabs in Amies charcoal TM are suitable samples from prepubertal females, but must be cultured.

Conjunctivitis in Newborn

A swab in Amies charcoal TM should be taken for culture of gonorrhea.

2.2.2 Chlamydia and Gonorrhea Detection by NAAT

The Hologic Aptima Combo 2 assay is a nucleic acid amplification test (NAAT) used to screen clinical specimens for both Chlamydia and Gonorrhea. At CPL, NAAT is the only method available for detection of Chlamydia trachomatis, and the primary method used for detection of Neisseria gonorrhoeae. NAAT is compatible with diverse specimen types, including urine, genital (e.g., urethral and endocervical) swabs and extragenital (e.g., rectal, throat, eye) swabs. Specimens for Chlamydia and Gonorrhea NAAT must be collected using the appropriate Aptima Collection Kit.

Urine: Use the Aptima Urine Specimen Collection Kit
Collect 20 to 30 mL of first catch (NOT mid-stream) urine in a sterile, plastic, preservative-free container. Then, using the disposable pipette in the collection kit, transfer 2 mL of urine to the Aptima urine specimen transport tube (yellow label). When loaded correctly, the fluid level in the tube should be visible between the black lines on the label. After collection, the transport tube should be stored at 2°C to 30°C until transportation to CPL is available.

Swabs: Use the Aptima Unisex Swab Collection Kit
The Unisex Kit contains two swabs. The white swab is used to clean excess mucous and other material from the site to be sampled. The blue swab is used for sample collection and then placed into the Unisex transport tube. After collection, the transport tube should be stored at 2°C - 30°C until transportation to CPL is available.

Adults
For adult women and legally consenting adolescent females, an endocervical swab is the preferred specimen type. Use the white swab from the Aptima Unisex Swab Collection Kit to remove any excess mucous from the cervix and surrounding area. Discard the white swab. Then, use the blue swab to collect the specimen. Insert the swab into the endocervical canal. To ensure adequate sampling, gently rotate the swab for 10 to 30 seconds. Carefully withdraw the swab, avoiding any contact with the vaginal mucosa. Place the blue swab into the Unisex transport tube. Carefully break the shaft of the swab at the scored line, and then recap the transport tube.

For males, a urethral swab is the preferred specimen type. Use the blue swab from the Aptima Unisex Swab Collection kit. Insert the swab two to four cm into the urethra. To ensure adequate sampling, gently rotate the swab for two to three seconds. Carefully withdraw the swab. Place the blue swab into the Unisex transport tube. Carefully break the shaft of the swab at the scored line, and then recap the transport tube.

First void urine (NOT mid-stream) is an appropriate sample type for men, females without a cervix (i.e. due to hysterectomy), or when a complete examination is not practicable or has been refused. Use the Aptima Urine Specimen Collection Kit and follow the manufacturer's instructions.
Extragenital testing may be appropriate for individuals who have engaged in oral sex, anal sex or have ophthalmalia. Throat, rectal and eye samples for Chlamydia testing should be collected using the Aptima Unisex Swab Collection kit. Use the blue swab from the Aptima Unisex Swab Collection kit. To ensure adequate sampling, gently rotate the swab at the source for 10 to 15 seconds. Place the blue swab into the Unisex transport tube. Carefully break the shaft of the swab at the scored line, and then recap the transport tube.

Note: NAAT specimens cannot be used for epidemiological surveillance or antimicrobial susceptibility testing of Neisseria gonorrhoeae. When collecting a NAAT specimen from an extragenital site, use a dacron swab to collect a second sample for Gonorrhea Culture (see section 2.2.1). Prior to treatment of NAAT-positive patients, consider collecting a sample for Gonorrhea Culture to support provincial surveillance of Gonorrhea.

Prepubertal Children
For vaginal, urethral, eyes, throat, rectal, etc. use Aptima unisex swab collection kit. First void (not midstream) urine may also be collected. **Please indicate boldly on the CPL requisition that these specimens are from young children**.

Newborn
Pulmonary, tracheal secretions and nasopharyngeal aspirates should be submitted in sterile containers. Infant Nasopharyngeal specimens collected with the Aptima Unisex kit blue swabs are also acceptable. When in doubt as to procedure or if you require further assistance, please contact Cadham Laboratory - Microbiology at 204-945-7204.

2.3 REFERENCE MICROBIOLOGY

CPL provides a range of specialized reference activities which may assist in the identification or typing of microbes some of which may be isolated in other clinical laboratories. Material to be examined must be submitted in pure culture in an acceptable manner, bacterial cultures being on slants of appropriate medium in a tightly capped small vial or swab placed in transport media.

Prior to shipping a Risk Group 3 organism, call CPL to notify staff of the anticipated shipment. See section 1.3. for packaging and labelled instructions for suspect Risk Group 3 organisms.

To facilitate testing, it is essential to include as much information about the sample as possible, including: details of the original specimen, the illness being investigated, and results of tests already performed in the submitting laboratory. See Section 1.1.1 for general requisition requirements.

Specimens submitted for tests that are not performed at CPL will be forwarded to an appropriate national reference laboratory. Some delay may be expected when this occurs. Acknowledgement is always provided when the Laboratory reports results of tests performed elsewhere.

A variety of molecular diagnostic and molecular typing techniques are utilized in the Molecular division of the Clinical Microbiology section of CPL. These tests are typically based on methods developed by other laboratories. The protocols for these methods have either been provided directly by these laboratories or have been published in the peer-reviewed literature and validated in-house prior to being put in service. Any clients of CPL who require more detailed information on these tests (e.g. primer sequences used, PCR reaction conditions) should phone the Scientist (Molecular) in the Clinical Microbiology section for further information.

2.4 ANTIBIOTIC SUSCEPTIBILITY TESTING

Antibiotic susceptibility tests are done routinely only on organisms considered to be significant. If testing with particular antibacterial agents is desired, the request should be clearly noted on the requisition. It is not practical to test every available antibiotic.

Routine susceptibility tests are not needed when resistance has not been described to the antibiotic of choice (i.e. *Streptococcus pyogenes* to penicillin).

2.5 REPORTING

Results are sent out primarily by fax or via eHealth_hub electronic reporting. Many results are displayed in eChart Manitoba. Positive test results, which are likely to be required with urgency by the physician, are telephoned with fax copy/electronic results to follow. Refer to the "Alert/Critical Results Call Practice" in the General Guide to Laboratory Use section.

2.6 CLINICAL MICROBIOLOGY TURNAROUND TIMES

Turnaround time is dependent on a variety of factors including:
- purity of submitted isolate
- fastidiousness and growth requirements of detected organisms
- unusual phenotypic traits of the isolate
- complexity of testing methods required for workup
- amount of isolate information provided by the submitter

General Turnaround Time for a Positive Culture

- **Bacterial cultures and yeasts** - rapidly growing cultures can often be identified after overnight incubation, and preliminary results may be available within 24 hours of receipt of specimen.

- **Antibiotic susceptibility tests** - 48 hours after receipt of specimen (the organism must be isolated in culture before being tested).

Note: Referral to reference centres will increase turnaround time.

Laboratory Tests	Minimum Turnaround Time For a Negative Test (working days)
Acitnomyces request	8 days
Anaerobic Culture – miscellaneous specimen	3 days
C. difficile culture & toxin (colon tissue)	5 days
C. difficile toxin (stool)	5 days for tissue culture/24 hrs. or same day for rapid test
Chlamydia (NAAT)	2 days
Diphtheria Culture	3 days
Diphtheria Toxin (NAAT)	5 days
Direct Microscopy	24 hrs. or same day
Ear C&S	2 days
ESBL Screen	2 days
GC (NAAT)	2 days
GC Culture	3 days
Genital C&S	2–3 days
Helicobacter pylori Culture	8 days
Legionella Antigen Detection	24 hrs. or same day
Legionella Culture	15 days
Miscellaneous Specimen (wound, ulcer, skin)	3 days
MRSA Screen	2 days
Peritoneal dialysate fluid Culture & Sensitivity	7 days
Pertussis Culture	8 days
Sputum C&S	2 days
Stool C&S	3 days
Stool Food borne illness	3 days
Throat, Nasal, Mouth Culture & Sensitivity	2 days
Verotoxin	3 days
VRE Screen	2 days

3.0 SEROLOGY - PARASITOLOGY

Serological tests involve the detection and determination of antigen or antibody using a variety of laboratory procedures.

The Serology Section performs procedures for:

- screening and diagnostic purposes – to detect acute or chronic infections due to viral, bacterial, fungal or parasitic agents
- immune status assessment – to detect past exposure to infectious agents or to evaluate response to immunization
- comprehensive parasitology testing
- qualitative detection, molecular-based typing and detection
- viral load and genotyping for patient management and surveillance purposes
- outbreak support

Serology Program Panels and Services

- prenatal screening program includes Rubella, HBsAg, Syphilis and opt-out HIV testing. It is recommended that all expectant women be tested for HIV.
- transplant program support for donors and recipients
- broad STBBI population screening and diagnosis
- dialysis program consists of regular screening of all dialysis patients for hepatitis and HIV if requested
- zoonotic disease testing (e.g., WNV, Lyme, Anaplasmosis, etc)
- Outbreak support services
- occupational health pre-employment immunity screening

Referred out Services

- The Serology Section acts as a coordinating body for the referral of specimens to appropriate national serology and molecular reference centres.

Emergency On-call Service (Paging System)

Serology provides 24-hour call back service. Call 204-945-6655 and the on-site security guard will refer the call to the medical staff on call. Most after-hour STAT requests must be authorized through the 'on-call' physician.

Note: This is a general description of services and not meant to be exclusive.

3.1 SEROLOGY TESTS

Serological tests involve the detection of specific antibody and/or antigen titers, using a variety of laboratory procedures. These procedures may be used for:

- **Screening or diagnostic purposes** – to detect acute or chronic infections due to viral, bacterial, fungal or parasitic agents (IgM specific antibody is usually associated with acute phase of illness).
- **Immune Status Assessment** – to detect past exposure to infectious agents or to evaluate response to immunization (IgG antibody).
- **Prenatal testing** includes HBsAg, Rubella, Syphilis and HIV (HIV opt-out) tests. Additional antibody tests may be specifically requested (i.e., toxoplasmosis, Varicella Zoster, HCV, HTLV, Parvovirus, etc.).
- **Quantitative Molecular Testing of Viral Agents** – to monitor response to/or direct management of blood-borne viruses and not intended for diagnostic purposes. Only available to practitioners treating HIV and viral Hepatitis.
- **Viral Genotyping** – as part of epidemiologic investigation or patient management.
- **Hepatitis** – indicate clinical condition or reason for requesting the test.
- **Post-exposure protocol** – follow instructions developed by Manitoba Public Health at: www.manitoba.ca/health/publichealth/cdc/protocol/hiv_postexp.pdf or telephone 204–788–6737 during work hours or 204–788–8666 after hours and on holidays/weekends.
- Refer to ***www.manitoba.ca/health/publichealth/cpl/forms*** for General Requisition (see reverse for description of test panels), as well as Retrovirus Nucleic Acid Testing Requisition.

3.1.1 Hepatitis B Testing Guidelines

There are several different protocols for appropriately testing for HBV, each depending on the clinical scenario. It is therefore, extremely important to include patient clinical information on the requisition when requesting HBV tests.

The following are some important facts to consider when ordering:

- HBs Ag (HBV surface antigen)
  This is a marker of current active HBV infection. It cannot differentiate between acute and chronic infection. Screen test of choice.
- HBe Ag (HBV e antigen)
  A marker of highly infectious active HBV infection.
- HBs Ab (HBV surface antibody)
  A marker of immunity to HBV. Cannot differentiate between immunity acquired from vaccine and natural infection.

- HBe Ab (HBV e antibody)
  Another marker of current or past infection; not protective and not indicative of resolved infection.
- HBc IgM (HBV core IgM antibody)
  The marker of acute HBV infection.
- HBc Ab (Total HBV core antibody)
  The most reliable marker of past or present HBV infection; not present as a result of HBV immunization.
- HBV DNA (quantitative or qualitative)
  Only to be used under special circumstances, a marker of active HBV replication. Quantitative HBV DNA test is not a diagnostic test and is available for treatment monitoring only.
- HIV Point-of-Care Testing (HIV-POCT)
  CPL supports HIV-POCT conducted in Regional Health Authority (RHA) facilities where the services meet Manitoba Health guidelines.

3.1.2 Galactomannan (GM) Antigen Test

Serum (red-topped tubes, no EDTA) and BAL specimens (in sterile containers with no additives or preservatives) will be accepted. Only one serum and one BAL is accepted per patient per week. Other specimen types are not acceptable.

Eligibility criteria:

1. The test is to be requested by Hematology-Oncology or Infectious Diseases (ID) and/or the test is requested in consultation with Hematology-Oncology, ID or a CPL microbiologist and consultant staff is copied on the requisition by the submitter, AND
2. The patient must be known to be immunocompromised. Appropriate conditions include:
   - primary immunodeficiencies; HIV/AIDS (CD4 count less than 200 cells/µl),
   - transplant recipients; patients with neoplastic conditions on intensive chemotherapy,
   - patients on immunosuppressive/immunomodulatory medications for other conditions such as autoimmune disorders, etc., AND
3. Radiological/ophthalmological findings suggesting invasive pulmonary/ extrapulmonary aspergillosis (excluding Allergic Bronchopulmonary Aspergillosis), OR
4. Culture- and/or histopathologically-confirmed cases of invasive Aspergillosis and GM testing is required for monitoring response to antifungal therapy.

Please note, in order to be eligible for diagnostic testing, the first three criteria above must all be met. Where the fourth criterion is also met, weekly monitoring is permitted up to four weeks (longer requires consult with a CPL Microbiologist). For optimal turnaround times, specimens must be received at CPL on Mondays or Wednesdays, no later than noon. Please write "galactomannan" in the "other tests or request" box on the bottom of the CPL requisition.

3.1.3 Interferon Gamma Release Assay (IGRA) for Latent Tuberculosis Infection

The IGRA is a live-cell assay that exposes lymphocytes to a combination of tubercular antigens, causing sensitized cells to release interferon gamma. The amount of interferon gamma produced is measured, and compared to the baseline production of interferon gamma. The purpose of the test is to assist in the diagnosis of latent tuberculosis infection (LTBI).

Current indications for IGRA:

1. Those with a new diagnosis of HIV infection, to rule out LTBI
2. Where required for support of a public health outbreak investigation, to rule out LTBI
3. For suspect LTBI cases from high risk areas (tentatively defined as >30 cases per 100,000), and who are TST+/BCG+, and not part of a contact investigation
4. Indications obtained with prior laboratory approval, obtained by the ordering practitioner for select cases of suspect LTBI. For approvals outside of the indications above, please contact the Clinical Microbiologist at 204–945–7545 or the CPL physician on-call at 204–787–2071.

The following IGRA requests will be cancelled if received at the laboratory without prior approval:

- specimens from children less than five years of age
- serial IGRA requests - multiple IGRA measurements are not recommended, especially if employed to monitor treatment
- specimens that do not meet essential specimen collection, transport and receipt requirements as described below
- As a generality, IGRA is not intended for diagnosis of active tuberculosis; more specific means of establishing diagnosis is recommended. Similarly, use of IGRA to rule out active tuberculosis may yield falsely negative results. Unapproved requests that seek IGRA to assist with diagnosis of active disease will be cancelled.

Specimens collected to fulfill admission requirements to technical colleges, universities or other educational institutions are not eligible and will be cancelled. Private laboratory providers may offer fee-for-service IGRA for such requirements.

In addition, the following limitations of IGRA must be considered when requesting IGRA:

- Active infection with other mycobacterial species, other than tuberculosis, may result in falsely positive IGRA. Mycobacterial species expected to result in cross-reaction include: M. kansasii, M. marinum, and M. szulgai, and M. flavescens
- Absolute lymphopenia interferes with the conduct of IGRA testing may render the IGRA result falsely negative or indeterminate.
- In HIV-infected patients, CD4 counts <100 cells/mm3 may cause IGRA to be falsely negative
- Systemic immune suppression has potential to decrease sensitivity of IGRA.
- Development of cellular immunity to tuberculosis generally takes ~120 days to develop after exposure.
- Recent administration of tuberculin skin test (TST) may cause falsely positive IGRA. If IGRA remains necessary after a TST, IGRA specimen should be collected within three days of the recent TST or deferred until three months has passed. Isolated cases of false positive IGRA may still be seen beyond 3 months post TST

Specimen Collection and Shipping

- Collect 2 full 4 mL lithium heparin tubes
- The tubes must be dark green-capped containing lithium heparin without gel
- Shipping temperature: room temperature, avoid freezing or exposing to temperatures above or below room temperature
- Specimens need to be drawn and arrive at CPL on the same day, no greater than 15 hours from the time of blood draw, and preferably within 12 hours of the blood draw.
- Acceptable days and hours: Monday through Thursday received by no later than 3 p.m. Specimens received on Friday immediately before or after a government holiday, or on weekends will not be processed. No specimens should be submitted immediately before statutory holidays.

3.1.4 Viral Load (NAAT) Testing and Genotyping

Specimen type and patient history are required to determine the most suitable test to perform. Following the instructions will reduce specimen rejection and unnecessary phone calls. Viral load testing is only offered to practitioners with treating privileges. Triaging criteria may apply.

3.1.4.1 HBV, HCV and HIV Viral Loads

Requisition Requirements

- Use the general requisition (MG–696) for Hepatitis B/C Viral Load (quantitative)
- Use Retrovirus Nucleic Acid Testing Requisition (form MG–5126) for HIV Viral Load. Older versions of this requisition will not be accepted. The most recent version of the form can be found on the CPL website.
- Proper requisition and specimen information are required. Indicate specimen collection date, time, and patient's name on the requisition.
- Patient history, e.g., initial assessment, follow-up, patient on treatment, etc. is required to perform the proper test. Test acceptance is subject to triaging.
- Please ensure physician name and address for report distribution is completed.

Specimen Type

- 10 cc whole blood in EDTA tube (purple top tube) on cold packs or
- EDTA plasma aliquoted into a separate tube, label the tube "EDTA plasma" and include patient's name and PHIN (or alternate ID).

Transport Requirements

- Deliver whole EDTA blood to CPL within four hours and no later than 4 p.m. during working days.
- Keep plasma refrigerated and deliver, within 24 hours from collection time on cold pack. For longer transportation time, store plasma frozen at –20°C and deliver frozen to CPL.

3.1.4.2 HIV1/2 and HTLV-I/II Provirus Testing

NOTE: For all provirus Testing, CPL requires prior notification. Call (204) 945–7612

Specimen Collection – Whole Blood Only (Anticoagulant Required)

- Use Retrovirus Nucleic Acid Testing requisition (form MG–5126)
- Collect blood in EDTA tubes (purple top)
- A minimum volume of 5 mL is required
- Whole blood should be kept at room temperature at all times and received on the same day, Monday through Thursday before noon. No specimens should be submitted immediately before stat holidays.

Shipping

- Record date blood was drawn. Specimen should be received at CPL Monday-Thursday a.m. only
- Ship by courier directly to CPL to ensure receipt within four hours of collection.
- Ship at ambient temperature; do not freeze or cool.

For further information, please contact 204-945-7612 or for consultation call 204-945-7545.

3.1.5 Syphilis PCR

Specimen

- Dacron, Rayon or flocked nylon swab from anogenital or mucosal sites, CSF
- Minimum of 0.5 mL of CSF

Collection Method

- Use Dacron, Rayon or flocked nylon swab to obtain specimen from mucosal or skin lesions
- Gently remove necrotic material or crusts from lesion with sterile gauze; may wet gauze with sterile preservative-free saline if desired
- Gently express clear exudates from lesion and touch swab to exudates to absorb it
- Place swab in vial containing sterile UTM

Storage and Shipping

- Store swabs and CSF samples frozen or refrigerated until shipped for testing
- Ship frozen on dry ice as Biological Substance, Category B, UN3373
- Ship refrigerated (on cold packs) if shipped within the same day of collection (Monday through Thursday)

3.1.6 HIV Point-Of-Care Testing (HIV POCT)

CPL supports HIV POCT conducted in Regional Health Authority (RHA) facilities where the services meet MHSAL guidelines. Contact Dr. Jared Bullard at204-945-1306 for any intent to offer HIV POCT in Manitoba.

3.1.7 Haemophilus Influenzae Type b Antibody (IgG) for Immune Status Assessment

Specimen Collection

- collect blood in SST tube
- a minimum volume of 1 ml serum is required
- grossly hemolyzed or lipemic specimens will not be processed
- specimen stability is seven days from collection date

Shipping

- must be received at CPL within 48 hours of collection
- ship refrigerated (on cool packs) Monday to Thursday ONLY and specimen must arrive at CPL before noon

3.1.8 COVID–19 Serology (Antibody Testing)

- Please note that COVID–19 Serology testing is available in Manitoba, at this point only at CPL. There are very few clinical indications for COVID serology, thus all COVID serology requires prior CPL physician on-call approval. Many requests have been received to see if a patient had prior exposure but does not change clinical or public health management in any way; such requests will not be approved.
- The current clinical indications only include investigation of MIS-C (Multisystem Inflammatory Syndrome in Children) or related investigations.

3.2 SEROLOGY TEST SCHEDULE

LABORATORY TESTS	SPECIMEN REQUIRED	MIN. VOL. REQ. FOR TESTS (Ml)	FREQUENCY OF TESTING	APPROXIMATE TURN-AROUND TIME IN DAYS
ASOT	Serum	.1–.5	Weekly	7
CHLAMYDIA IgM Ab	Serum	.5–1	As required	14
CMVIgG	Serum	2–5	Weekly	7
CMVIgM	Serum	.1–.5	Twice/week	3
EBV IgM & IgG	Serum	.1–.5	Daily	3
HB Core IgM & IgG	Serum	1–5	Daily	3
HBsAG	Serum	1–5	Daily	3
HCV GENOTYPING	Plasma (EDTA)	5	Batched	21
HBs Ab	Serum Plasma	1–5	Daily	3
HBV Viral Load	(EDTA)	5	Batched	21
HCV Ab	Serum	1–5	Daily	3
HCV Viral Load	Plasma (EDTA)	5	Batched	21
HEP A IgG	Serum	1–5	Daily	3
HEP A IGM	Serum	1–5	Daily	3
HIV ½ Ab & p24 Ag	Serum	1–5	Daily	3
HIV Viral Load	Plasma (EDA)	5	Batched	7
H. PYLORI Ab	Serum	1–5	Twice/Week	5
HSV IgM & IgG	Serum	.1–.5	Twice/Week	5
HTLV 1/2	Serum	1–5	Weekly	7
IGRA[1]	Lithium heparin blood	5	As required Batched	21
LYME Ab	Serum	.5–1	Weekly	6–14
MEASLES IgM	Serum	.1–.5	Twice/Week	3
MEASLES IgG	Serum	.1–.5	Daily	3
MUMPS IgM & IgG	Serum	.1–.5	Twice/Week	3–7
MYCOPLASMA IgM	Serum	.1–.5	Weekly	5
PARVO IgM & IgG	Serum	.2–.5	Twice/Week	7
PNEUMOCOCCAL AB (pre and post-vaccine sample required)[1]	Serum	.5–1	Monthly	25
RUBELLA IgG	Serum	.5–1	Daily	3
RUBELLA IgM	Serum	.1–.5	Twice/Week	3
SYPHILIS (PCR)	Swab, CSF, blood	.5	Referred out	10
SYPHILIS	Serum	.5–1	Daily	3
SYPHILIS (VDRL)	CSF	.5–1	Daily	3
TOXOPLASMA IgM & IgG	Serum	.5–1	Weekly	7
VZV IgM	Serum	.1–.5	Twice/Week	5
VZV IgG	Serum	.1–.5	Daily	3
WEST NILE Ab	Serum	.5–1	Weekly (min.)	6
WNNAT	Plasma (EDTA)	5	Batched	6

NOTE: For STAT requests, please call Serology at 204–945–7582 or 204–945–7634 or after hours 204–945–6655. During outbreaks or increased disease activity, testing may occur more frequently. The published testing frequencies represent baseline service. West Nile Ab testing is performed monthly during the winter season. For consults, contact Serology Section Clinical Microbiologist at 204–945–7545.

1 Not routinely available. See 3.1.3 for further information.

3.3 SAMPLE REQUIREMENTS

Collect 5 to10 mL of blood as early as possible after onset of illness and preferably before administration of IVIG or transfusions. Tests requiring serum require a 9 mL SST EDTA tube. For plasma collect two 5 mL EDTA tubes (purple top tube). Refer to Serology test list on previous page. Acute and convalescent or paired sera are:
- **Acute: One to three days after onset of illness**.
- **Convalescent: 21 days after onset of illness**.

3.4 REQUISITIONS

Use the general requisition (MG–696) for all serological or parasitological testing. Fill out requisition completely, see Section 1.1.1 for requirements.

HIV viral load and HTLV PCR – use the Retrovirus Nucleic Acid Testing Requisition (MG–5126): see previous section 3.1.4.1 Instructions for Viral Load (NAAT) Testing and Genotyping. The previous versions of the form cannot be accepted.

3.5 TRANSPORT

Ship serum or plasma in tightly capped polypropylene tubes. Place specimens individually in leak proof bags with requisition on the outside of the bag. DO NOT USE STAPLES.

3.6 REFERRED OUT SEROLOGY TESTS

Amoeba Ab
Anaplasma phagocytophilum
Anti-DNase B Ab
Anti-hepatitis D Ab
Anti-hepatitis E virus
Arbovirus Ab
Aspergillus IgE Ab
Babesia Ab
Babesia PCR
Bartonella Ab
Baylisascaris Ab
Blastomyces Ab
Botulinum Ab titre
Botulinum toxin
Brucella Ab
C. burnetti Ab
Coccidioides Ab
Cysticercosis Ab
EBNA IgG
Echinococcus Ab
Endemic treponematoses PCR
Endemic typhus Ab
Erlichia chafeensis species
Fasciola Ab
Filaria Ab
FTA-ABS Serology (CSF)
Galactomannan Antigen (EIA)[1]
Haemophilus influenzae type b Ab
Hantavirus Ab
HBV DNA qualitative
HBV drug resistance testing
HBV genotyping
HBV pre-core mutations
HBV surface Ag mutation
HDV RNA qualitative
HDV RNA quantitative
HEV Ab and RT-PCR
HHV–8 Ab
Histoplasma Ab
HIV co-receptor tropism (RNA)
HIV-genotyping
HIV proviral DNA tropism
HIV 1/2 provirus
HTLV-I/II proviral DNA
HTLV-I proviral load
HTLV I/II provirus
Leishmania Ab & PCR
Legionella Ab
Leptospira species Ab
Lyme PCR
Lymphocytic choriomeningitis virus Ab
Malaria Ab and PCR
Meningococcus Ab[2]
Orientia tsutsugamushi Ab
Paragonimus Spp Ab
Rabies antibody (RFFIT)
Rickettsia Ab
Ross River Virus Ab
Rubella IgG avidity
Streptococcal anti-DNase B Ab[3]
Syphilis PCR
Toxocara Ab
Toxoplasma IgG avidity
Trichinella Ab
Trypanosoma (African) Ab & PCR
Trypanosoma (American) Ab & PCR
Tularemia Ab
Yersinia species Ab
Zika Virus Ab & RT-PCR[3]

1 Not routinely available. See 3.1.2 for further information.
2 Only available for transplant recipients.
3 Not routinely available - Subject to eligibility.

Note: This is not an exclusive list. Please include recent vaccines received, clinical symptoms and travel history when requesting tests.

3.7 PARASITOLOGY TESTING

Specimen Collection:

- Reliable screens for enteric ova and parasites require three stool samples collected on different dates (preferably two to three days apart) within a seven to 10 day time period.
- Specimen must be thoroughly emulsified at the time of collection. One part of stool into three parts SAF fixative. Solid specimens will not be tested.
- Specimens not in fixative, or not in proper SAF containers, will not be processed.
- Specimens for ova and parasites from patients hospitalized for more than 3 days are not processed.
- Ensure patients are free of barium, cathartics, oily laxatives or antibiotics as these substances may interfere with the examination.
- For full Parasitology work-up on stool specimens, please ensure pertinent clinical information along with travel history to endemic regions, where available, is provided on the requisition. For information regarding other Parasitology services offered at CPL, please call the Parasitology lab directly at 204–945–7825. For consults, please call Section Clinical Microbiologist at 204–945–7545.
- **For scabies skin scrapings**: Place a single drop of mineral oil over unexcoriated burrow. Scrape lesion six to seven times with a 15 scalpel blade until tiny specks of blood appear. The mineral oil will emulsify the scrapings. Transfer the emulsified scrapings with the blade to a clean glass slide and cover with a cover slip. Repeat several times. Package securely and forward to CPL expediently. CPL will do a microscopic exam to look for any stage or sex of mite, feces, eggs and egg casings.

Requisition:

- Use the CPL General Requisition (MG–696) for requesting parasite investigations.
- Ensure all relevant clinical information is given; i.e. symptoms, history of travel, date of onset of symptoms, etc. This will affect test selection at CPL.

CAUSAL AGENT *Note: Processed daily.*	SPECIMEN REQUIRED	TEST PERFORMED
Acanthamoeba species	Contact Parasitology laboratory	
Ancylostoma duodenale *Necator americanus*	Feces in SAF	Microscopy
Angiostrongylus cantonensis	Contact Parasitology laboratory	
Arthropods (mites, ticks, fleas, lice, fly maggots, etc.)	Dead: submit dry or in 70% alcohol Alive: submit with slightly moistened cotton	Microscopy, Gross ID
Ascaris lumbricoides	Feces in SAF Worms passed in feces Submit unpreserved in 0.85% NaCl, or if there is a delay in transit of three or more days, submit in 5% formalin or 70% alcohol.	Microscopy Gross ID Serology
Babesia species	Thick and thin blood films Blood with anticoagulant (EDTA)	Microscopy, PCR, Serology
Balantidium coli	Feces in SAF	Microscopy
Blastocystis hominis	Feces in SAF	Microscopy
Clonorchis sinensis (Chinese liver fluke) *Opisthrochis felineus* *Opisthorchis viverrini* *Metorchis conjunctus*	Feces in SAF	Microscopy
Cryptosporidium species	Feces in SAF	Microscopy
Cyclospora cayetanensis	Feces in SAF	Microscopy
Cysticercosis (Pork tapeworm, larval stage)	Serum	Serology
Demodex folliculorum *Demodex brevis*	Skin scrapings including hair follicles and sebaceous glands Submit dry or mounted between two slides. Prior consultation is preferable.	Microscopy
Dientamoeba fragilis	Feces in SAF	Microscopy
Diphyllobothrium species (broad fish tapeworm)	Feces in SAF Worm segments Submit unreserved in 0.85% NaCl, or if there is a delay in transit of three or more days, submit in 5% formalin or 70% alcohol.	Microscopy

CAUSAL AGENT *Note: Processed daily.*	SPECIMEN REQUIRED	TEST PERFORMED
Echinococcus granulosus (dog tapeworm) *Echinococcus multicolaris*	Aspirated fluid from cyst Contact Parasitology laboratory Cyst, excised Serum	 Ab detection
Entamoeba histolytica	Feces in SAF Serum Tissue cyst aspirate	Microscopy Ab detection Microscopy, PCR
Enterobius vermicularis (pinworm)	Pinworm paddle applied to perianal region Clear cellophane (transparent NOT translucent or opaque) tape preparations (Scotch tape)	Microscopy
Fasciola species	Feces in SAF, serum	Microscopy, Serology
Fasciolopsis buski	Feces in SAF	Microscopy
Giardia lamblia	Feces in SAF Duodenal drainage	Microscopy
Heterophyes heterophyes *Metagonimus yokogawai*	Feces in SAF	Microscopy
Isospora belli	Feces in SAF	Microscopy
Leishmania tropica	Smear from edge or base of lesions Contact Parasitology laboratory Serum	Microscopy
Leishmania brasiliensis *Leishmania Mexicana*	Smear from edge or base of lesions Contact Parasitology laboratory Serum	Microscopy
Leishmania donovani complex	Thick and think blood films Contact Parasitology laboratory Biopsy material (spleen, liver, lymph nodes) Blood with anticoagulant (EDTA) Serum	 PCR Ab detection
Loa loa	Thick and thin blood films Blood with anticoagulant (EDTA) Serum	Microscopy PCR Ab detection
Microsporidia	Feces in SAF Other specimens	Microscopy Please contact CPL

CAUSAL AGENT *Note: Processed daily.*	SPECIMEN REQUIRED	TEST PERFORMED
Maggots	Maggots (clinical specimens only) Dead: submit dry or in 70% alcohol Alive: submit with slightly moistened cotton	Microscopy Gross ID
Naegleria species	Contact Parasitology laboratory	PCR (referred out)
Naegleria species *Balamuthia species* *Acanthamoeba species* others	Contact Parasitology laboratory	PCR (referred out)
Onchocerca volvulus *Mansonella streptocerca*	Skin biopsy Contact Parasitology laboratory Aspirated material from skin nodules Excision of nodule	Microscopy (indicate)
Paragonimus species (lung fluke)	Feces in SAf Sputum Serum	Microscopy Microscopy Ab detection
Pediculus humanus capitis (head louse)	Adults, nymphs, or eggs ("nits") Submit dry or in 70% alcohol Infested hairs	Microscopy
Pediculus humanus corporis (body louse) *Phthirus pubis* (crab louse)		
Plasmodium vivax *Plasmodium malariae* *Plasmodium ovale* *Plasmodium falciparum* *Plasmodium knowlesi*	Thick and think blood films from finger blood (at height of paroxysm and 8–16 hours later) Blood with anticoagulant (EDTA) Serum	Microscopy (indicate) PCR Ab detection
Sarcoptes scabiei	Skin scrapings at end of tracks, fresh Submit dry or mounted mineral oil scrapings between two slides Prior consultation is preferable.	Microscopy
Schistosoma haematobium (bladder blood fluke)	Urine Serum	Submit mid-stream to terminal urine Microscopy Serology
Schistosoma japonicum (oriental blood fluke)	Feces in SAF Serum	Microscopy Serum
Schistosoma mansoni Schistosoma intercalatum	Feces in SAF Serum	Microscopy Serology
Strongyloides stercoralis		

CAUSAL AGENT *Note: Processed daily.*	SPECIMEN REQUIRED	TEST PERFORMED
Strongyloides stercoralis	Feces in SAF Duodenal contents by intubation Sputum Serum	Microscopy Microscopy Microscopy Ab detection
Taenia saginata (beef tapeworm)	Feces in SAF	Microscopy
Taenia solium (pork tapeworm)	Worm segments Submit unpreserved in 0.85% NaCl, or if there is a delay in transit of three or more days, submit in 5% formalin or 70% alcohol. Gross ID	
Toxoplasma gondii	CSF, amniotic fluid Biopsy material Serum	PCR Ab detection
Trichinella spiralis	Serum	Ab detection
Trichostrongylus species	Feces in SAF	Microscopy
Trichuris trichiura (human whipworm)	Feces in SAF	MIcroscopy
Trypanosoma rhodesiense *Trypanosoma gambiense*	EDTA Blood films, thick and thin Lymph aspirated from nodes CSF Serum	Microscopy, PCR Ab detection
Trypanosoma cruzi	Blood films, thick and thin Lymph aspirated from nodes CSF Serum	Microscopy Microscopy, PCR Ab detection
Wuchereria bancrofti *Brugia malayi* *Mansonella perstans* *Mansonella ozzardi* *Loa loa*	Blood smear, thick and thin Blood with anticoagulant Aspiration from lymph vessels and nodes Serum	Microscopy (indicated) Microscopy Ab detection

Note: Not an exclusive test list. For consults contact CPL physician on-call through HSC paging at 204–787–2071.

4.0 VIRUS DETECTION

Clinical virology services involve the isolation or detection and characterization of human viral pathogens from clinical specimens using established procedures such as:

- Cell culture – many viruses are grown and identified in established cell lines.
- Rapid diagnostics – sensitive and specific procedures that provide accurate results within hours to aid in patient management or disease control efforts.
  - immunofluorescent antibody techniques
  - molecular-based diagnostics
- Viral strain identification – subtyping for epidemiological and public health purposes, e.g., outbreak management, etc.
  - neutralization
  - immunofluorescence
  - molecular- and sequence-based typing

Emergency on-call service (paging system)

Call 204–945–6655 and the on-site Security Guard will refer the call to the medical staff on call. A virological technologist is always available for appropriate STAT testing requests.

Other services

- Virology studies and projects generated from outside Manitoba Health.
- Education activities including participation in University of Manitoba post-graduate medical education programs.

Transplant program support

Surveillance for, and diagnosis of viral infections common in immunocompromised patient populations and monitoring of response to antiviral therapy.

Public Health program support

- Participation in surveillance programs (national and international).
- Viral strain characterization.
- Meningoencephalitis, exanthematous, respiratory and enteric outbreak investigations.
- Participation in setting public health policy regarding viral disease.

Referral services

- Esoteric test requests are forwarded in partnership to national or international reference laboratories.
- Level 3 and 4 pathogen investigations and prion investigations are forwarded in partnership to appropriate reference facilities.

Note: This is a general description of services and not meant to be exclusive.

4.1 SPECIMEN REQUIREMENTS

- Most viruses do not survive well at room temperature.
- Feces should be sent fresh, unpreserved and unfrozen.
- EDTA blood must reach the laboratory within six hours of collection (Monday to Friday 8 am – 4 pm) if it is being sent as whole blood. Keep at 4°C and transport with cold pack. See 4.2 for further instructions if sample will arrive outside this window.
- Tissues should be placed in saline in a sterile container.
- Other specimens for virus isolation should be refrigerated and transported to the laboratory as quickly as possible (i.e. cold pack). Swabs should be sent in universal transport medium (UTM), see Transport Media (Section 1.6). Ensure each specimen is properly labelled with name and PHIN.
- Requests for Respiratory Multiplex PCR will be prioritized to the following populations:
  (a) patient is admitted to an Intensive Care Unit (ICU) with Severe Respiratory Illness (SRI)
  (b) specimens from an outbreak investigation
  (c) samples from bone marrow and other transplant patients
  (d) Acceptable specimens for Respiratory Multiplex PCR include NP, BAL, and ETT specimens. All others will be subject to seasonal response schedules based on dominant circulating viruses.

If in doubt, always consult with the laboratory before sending the specimen. A brief clinical history, DATE OF ONSET of symptoms, the DATE OF COLLECTION and the TYPE of specimen along with testing request must accompany each specimen. Be sure to include any outbreak designation and a contact phone number.

Creutzfeldt-Jakob Disease requests (typically of CSF) require detailed patient history submitted with each request. Any CSF specimen from a suspect or confirmed CJD patient must indicate CJD on the requisition.

4.2 SPECIMEN COLLECTION

Specimens should be collected as early in the disease as possible. **Do not send dry swabs or swabs in bacterial transport medium**.

4.2.1 EDTA plasma for quantitative CMV NAAT: 5 mL purple top EDTA tube (without separator). Must reach CPL within six hours of collection during lab hours (Monday to Friday, 8 am – 4:30 pm) if it is being sent as whole blood. If the specimen cannot be forwarded to CPL within these parameters, the specimen must be centrifuged at 800xg for 20 minutes and the plasma removed. The specimen should be marked on tube as EDTA plasma, keep at 4°C and transported with a cold pack.

4.2.2 EDTA Plasma for BK virus: Requires a minimum 5 mL purple top EDTA tube (without separator). Plasma may be separated. Keep at 4°C and transport with a cold pack.

4.2.3 EDTA whole Blood for quantitative EBV: Requires whole blood in a purple top EDTA tube (without separator) received at CPL within 48 hours (Monday to Friday, 8 a.m. to 4 p.m.). Keep at 4°C and transport with a cold pack.

4.2.4 EDTA whole Blood for HSV (requires CPL on call medical staff approval) prior to drawing: Requires whole blood in a purple top EDTA tube (without separator). Keep at 4°C and transport with a cold pack.

4.2.5 EDTA plasma for quantitative Adenovirus: (Requires CPL on call medical staff approval.) Keep at 4°C and transport with a cold pack.

4.2.6 Bone marrow aspirate: Collect in purple top EDTA tube (without separator). Immediately invert several times to mix properly. Must be kept at room temperature and deliver to CPL within six hours.

4.2.7 Bronchial Alveolar Lavage (BAL): 10 mL in a sterile container. If < 3 mls, add to a UTM bijou. Keep at 4°C.

4.2.8 CSF: See Section 2.1.5, items 1–4 for collection instructions. A minimum of 0.5 mL in a sterile container is required for each test requested. Keep at 4°C.

4.2.9 Eye: Gently but quickly roll or swipe rayon or dacron swab on affected bulbar/palpebral conjunctiva, from a single eye. Place swab into UTM, breaking or cutting the swab shaft to fit in the UTM bottle. Seal the UTM cap well to avoid leaks. Keep at 4°C.

NOTE: Right and left eye swabs are considered separate samples. Submit separate samples and requisitions if sending both and label sample and requisition accordingly.

4.2.10 **Genital or mouth swabs for Herpes:** Use dacron, rayon or flocked swabs. Calcium alginate swabs or wood-shafted are not recommended. Swab the affected area, break off swab into UTM. Keep at 4°C.

4.2.11 **Lesion for Molluscum contagiosum only:** Collect lesion or crust material, scabs, swabs in sterile 1.5–2.0 mL tube, avoid dilution of the sample, transport media is not needed. Tissues: Fresh frozen tissues should be placed in plastic containers. Tissues that are formalin-fixed should also be sent in plastic containers and clearly identified as being in formalin. Paraffin-embedded tissues can be sent as entire blocks or four to six 10 uM sections in a plastic tube or vial. Store at 4°C.

4.2.11 **Lesion:** Expose and clean base of lesion with sterile gauze and saline. Scrape epithelial cells from base vigorously with a sterile swab. If dry, moisten swab in sterile saline, swab lesion, break off into UTM. Use a cotton or rayon swab, not calcium alginate. Keep at 4°C.

4.2.12 **Lesion Smear for Molluscum contagiosum only:** Touch a glass microscope slide directly to an unroofed lesion. Air dry. Do not use cover slip or fixative. Place slide in slide-mailer and secure with an elastic band or clip. A swab in UTM is also an appropriate specimen. Keep at 4°C.

4.2.13 **Nasal Swab:** Swab anterior nares as far back as possible. Break off into UTM. This specimen is not suitable for Flu and/or RSV rapid testing. An NP swab is the appropriate specimen (see 4.2.12). Keep at 4°C.

4.2.14 **Nasopharyngeal aspirate:** Place a flexible plastic catheter gently into the posterior nasopharynx. Apply gentle suction with a syringe or wall suction, collect sample into a trap device, flush with 2.0 mL of UTM, then transfer to a sterile bijou bottle; do not send the trap or tubing. Keep at 4°C.

4.2.15 Nasopharyngeal swab:

a. Per nasal method: Remove any mucous from the patient's nose by having them blow into a facial tissue. Tilt the patient's head back slightly (about 70°) to straighten the passage from the front of the nose to the nasopharynx to make insertion of the swab easier. Gently insert a flocked swab into the nasopharynx (half the distance from the corner of the nose to the front of the ear along the top of the palate at the floor of the nasal cavity). In adults, this distance is usually about 4 cm, in children this distance is less. Gentle rotation of the swab may be helpful. Rotate the swab several times to dislodge the columnar epithelial cells. Place swab(s) in UTM and break/cut shaft short enough to fit in bottle. Keep at 4°C.

b. Per ora method: Insert a flocked swab (if small-tipped, wire shaft used then bend shaft to give a slight curve) into the nasopharynx by passing the swab up behind the soft palate (see Figure). Vigorous swabbing will be more likely to collect the needed nasoepithelial cells. Place swab in UTM and break/cut shaft short enough to fit in bottle. Keep at 4°C.

4.2.16 Rectal Swab: If stool is unobtainable, a rectal swab may be submitted. Break off into UTM. Keep at 4°C.

4.2.17 Stool (Raw): Submit raw material in sterile container (no more than one-half full), without any preservatives or transport media. **DO NOT FREEZE**. Keep at 4°C.

4.2.18 Throat Swab (Oropharyngeal): Use dacron or rayon-tipped swab. Swab back of throat vigorously. Break off swab into UTM. Keep at 4°C.

4.2.19 Tissue Biopsy: A minimum specimen diameter of 2 mm is required. Tissue should be suspended in saline for transport. Keep at 4°C.

4.2.20 Trachael Secretion: Add specimen to UTM. Keep at 4°C.

4.2.21 **Urine:** Approximately 15 to 20 mL is required. Place in sterile container. Keep at 4°C.

4.2.22 **Vesicle Fluid:** Disinfect area with alcohol swabs (except if vesicle is located on mucous membrane.) **Remove 1.5 mL** of UTM from Bijou bottle. Fluid is collected by piercing the vesicle with a sterile needle attached to a tuberculin syringe, and aspirating as much material as possible. Rinse needle and syringe in the 0.5 mL UTM remaining in Bijou bottle. Discard needle and syringe. Keep at 4°C.

4.2.23 **Amniotic Fluid:** Place a minimum of 5 mL in sterile container. Keep at 4°C.

LABORATORY TESTS	SPECIMEN REQUIRED	TEST METHODS	FREQUENCY OF TESTING	TURN-AROUND TIME
Adenovirus	Respiratory, Throat NPA, Eye, Fecal	Tissue Culture	Daily	3–14 days
	Fecal	BD Max NAAT	Daily	1–4 days
			Daily	1–2 days
	NP, BAL ETT	NAAT (prior CPL approval required)	Mon., Wed., Fri.	1–4 days
	EDTA plasma		Referred out	7–14 days
Bocavirus	BP, BAL, ETT	NAAT	Mon., Wed., Fri. Tue., Thurs.	1–4 days
Creutzfeld Jacob (CJD)	CSF (Min 1 mL: must not have visible blood or be xanthochromic)	EP-QuIC ELISA	Referred out	15 days
Coronavirus, common	NP, BAL, Throat, ETT, Nasal	NAAT (229E, NL63 and OC43 only)	Mon., Wed., Fri.	1–4 days
Coronavirus, novel (COVID 19)	Respiratory NP, BAL, ETT	NAAT	As-needed basis	2 days
Coxsackievirus	Respiratory, Fecal	Tissue Culture	Daily	3–14 days
CytomegaloVirus (CMV)	Urine, amniotic fluid, Respiratory, Biopsy, Bone Marrow Aspirate CSF, EDTA Plasma	Tissue Culture	Daily	7–21 days
		NAAT	Mon.-Wed.	1–5 days
Echovirus & Enterovirus	Fecal	Tissue Culture	Daily	3–14 days
	BAL	Rapid NAAT	Daily	1–2 days
	ETT	Multiplex NAAT	Mon., Wed., Fri.	1–4 days
Epstein Barr (EBV)	CSF	NAAT	Referred out	7–14 days
	EDTA whole blood	NAAT	Thurs.	1–8 days
Herpes simplex	Lesion swabs, CSF	NAAT	Mon., Wed., Fri	2–5 days
	Lesion swab only	IFA		STATS–3 hrs.
	EDTA (whole blood)	NAAT	Referred out	7–14 days
Human Herpesvirus 6, 7, 8	CSF EDTA blood (requires prior CPL approval)	NAAT	Referred out	up to 14 days
Influenza	Respiratory	Tissue Culture	Daily	3–10 days
	NP, BAL, ETT	NAAT	Seasonal	1–8 days
	NP Specimen	Rapid NAAT	Seasonal	STAT–2 hrs.

LABORATORY TESTS	SPECIMEN REQUIRED	TEST METHODS	FREQUENCY OF TESTING	TURN-AROUND TIME
Measles	Throat Swab NP swab Urine	NAAT	STAT basis (needs prior CPL approval	STAT–2 days
MERS COV	NP, BAL, throat, ETT	NAAT	Referred out	
Metapneumo-virus	NP, BAL, Throat ETT, Nasal	NAAT	Mon., Wed., Fri.	1–4 days
Molluscum contagiosum	Lesion fluid Crust material (scab) tissue	NAAT	Referred	7–14 days
Mumps Virus	Buccal swab Urine	Culture NAAT	Daily STAT basis (needs prior CPL approval)	7–15 days 1–4 days
Norovirus	Feces	NAAT	Mon-Fri	1–4 days
ORF	Pustular	NAAT	Referred out	14 days
Papilloma Virus	Tissue, Biopsy	NAAT	Referred out	up to 21 days
Parainfluenza	Respiratory NP, BAL, ETT	Tissue Culture NAAT	Daily Weekly	5–14 days 1–8 days
Parvovirus	EDTA blood	NAAT (referred out)		7–14 days
Poliovirus	Respiratory, Fecal	Tissue Culture	Daily	3–14 days
Polyoma (BK, JC)	Urine (BK only) EDTA Blood	NAAT	Referred out	Up to 14 days
Poxvirus	Vesicle, Pustule (call lab before sending)	NAAT	Referred out	7–14 days
Prion (see CJD)				
Reovirus	Fecal	Tissue Culture	Daily	5–14 days
Respiratory syncytial virus	NPA, NPS, Trach secretions NP, BAL, Throat ETT, Nasal	Tissue Culture NAAT	Daily Mon., Wed., Fri.	7–14 days 1–4 days
Rhinovirus	Respiratory NP, BAL, Throat ETT, Nasa	Tissue Culture NAAT (NP, BAL, ETT)	Daily Mon., Wed., Fri.	7–14 days 1–4 days

LABORATORY TESTS	SPECIMEN REQUIRED	TEST METHODS	FREQUENCY OF TESTING	TURN-AROUND TIME
Rotavirus	Fecal	NAAT	Mon.-Fri.	1–4 days
Rubella	Products of conception			
	Urine	Tissue Culture	Daily	7–14 days
	NP, Urine	NAAT	Referred out	7 days
SARS	Respiratory, Fecal (call MOH before sending)	Culture NAAT	Referred out	up to 14 days
Varicella Zoster	Lesion swab	NAAT	Mon, Wed., Fri.	2–5 days
	Base of lesion Swabbed vigorously	Culture (needs prior CPL approval)		6–14 days
		IFA		STAT–3 hrs.
	EDTA, whole blood	NAAT (needs prior CPL approval)	Referred out	7–14 days

NOTE: For STAT requests, please call Virology at 204–945–6858, or after hours 204–945–6655. Not an exclusive test list.

5.0 PERINATAL CHEMISTRY

Newborn Screening

The Newborn Screening program at CPL screens all newborn babies in Manitoba for inherited disorders of metabolism and endocrine dysfunction, Cystic Fibrosis and Severe Combined Immunodeficiency. The screening program is guided by the Manitoba Perinatal Screening Committee. Screening is facilitated by the application of three distinct testing platforms: tandem mass spectrometry, immunohistochemistry and molecular genetic analysis using dried blood spot specimens collected following birth, second tier testing at the genetic level is available for select screen positive cases. Potentially screen positive cases are further investigated by Pediatric Genetics and Metabolism, Pediatric Endocrinology, Pediatric Respirology, and Pediatric Immunology specialists at Health Sciences Centre.

The Manitoba Perinatal Screening Committee defines neonates as less than 28 days of age; therefore any unscreened children older than this (including refugee and immigrant children) should have any concerns followed up by the practitioner caring for the patient.

Newborns are screened for inborn errors of carbohydrate metabolism (Classical Galactosemia), fatty acid oxidation defects, organic acidemias and amino acid metabolism defects. Other screening assays detect disorders of endocrine function (Congenital Hypothyroidism and Congenital Adrenal Hyperplasia) and multiple carboxylase deficiency (Biotinidase). The Newborn Screening Panel also includes Cystic fibrosis screening, and most recently Severe Combined immunodeficiency screening was added to the panel September 28, 2020. Every child screened is tested for over 44 different disorders affecting newborns.

Maternal Serum Screening

CPL, in collaboration with the WRHA Genetics and Metabolism and the Fetal Assessment Unit offers Second Trimester Maternal Serum Screening (MSS) to pregnant women in Manitoba as part of their prenatal care. This test provides an estimation of the risk for fetal open neural tube defects, Down Syndrome, Trisomy 18 and Smith-Lemli-Opitz syndrome (SLOS). CPL tests four biochemical markers (Quad Test) in the mother's blood that are produced by the fetus or placenta. The biochechemical markers are alphafetoprotein (AFP), unconjugated estriol (uE3), human chorionic gonadotropin (hCG), and dimeric Inhibin A (DIA).

Emergency or On-call

By special arrangement only. Contact the Chief Technologist or on-call physician to arrange for after- hours services.

5.1 NEWBORN SCREENING PROGRAM

Supplies

Cadham Provincial Laboratory supplies blood collection cards to birthing facilities public health nurses, nursing stations, and midwives, information pamphlets about the program to new parents, and program information to health care professionals upon request. Specimen collection instructions are provided on the back of the blood collection card and in the newborn screening guidelines for health care providers. Call 204–945–7458 for supplies.

Specimen collection

Materials Required:

- unexpired MB blood collection card (all information completed).
- alcohol pledget
- sterile 2x2 gauze
- 1.0 mm deep by 2.5 mm long heel lancet. MDA#049891

Collection: Clean skin of heel with alcohol pledget, wipe dry with a sterile gauze pad. Puncture with disposable lancet; wipe away first drop of blood. If bleeding is slow, it is helpful to hold limb dependent for a short period of time before spotting the blood on the filter paper; ensure blood completely soaks through the centre circle from front to back of the card. View from the other side to ensure applications successful to prevent recollection due to being a poor sample. Fill all circles completely. Do not layer blood sample.

Optimum Time for screening is 24 to 48 hours of age.

Samples collected before 24 hours of age will require a repeat collection before five days of age.

Premature infants less than 33 weeks gestation or less than 1500 g require a repeat newborn screen collected on day 10 of life to complete screening for Congenital Hypothyroidism.

Home Birth: Take sample at 24 to 48 hours of age.

Blood Card Handling: Fill **all** circles with blood, apply from **one** side only. Let blood soak through to the periphery of each circle. Allow to dry on a clean, dry surface at room temperature, before covering with the protective card flap (minimum three hours). Do not handle or contaminate blood spot area. Fill all circles completely.

Keep the card out of direct sunlight and away from bleach and heat sources while drying.

Once dried, deliver cards immediately to Cadham Provincial Laboratory. For optimal clinical impact, specimens should be received at CPL before five days of age.

All **requested information** must be supplied. Do not use regular postal services to mail the cards as this may cause unnecessary delays. Forward on the day of collection, if possible.

The largest percentage of poor specimens occurs when the blood does not soak through the filter paper (false negative). Poor specimens require a repeat collection.

Samples collected at <24 hours of age
Infants whose first sample is taken at <24 hours of age, will require a repeat collection. The ordering practitioner or the appropriate public health office will be called to initiate collection of a second sample. Substrate-dependent disorders (e.g: Phenylketonuria) require the newborn to be feeding well.

Twins
At 10 days of age, same gender twins will be referred to the appropriate public health office for the collection of a second sample for a repeat TSH test. This is to rule out congenital hypothyroidism of one infant masked by the healthy twin on the first screen due to in utero twin-to-twin transfusion. Repeat samples will be requested from all same-gender twins. In cases of male and female twins (fraternal twins) the birthing facility will be contacted to verify the gender of the twins, but further follow-up will not be required.

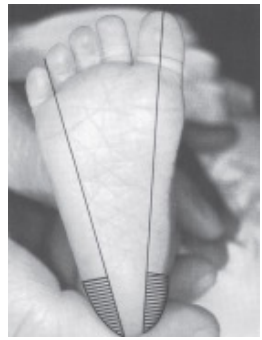
Results
A negative report will be sent to the follow up practitioner, community health care facility, Medical Records Department of the birthing facility, and/or to the ordering practitioner office. Immediate referral to a pediatric consultant is made in cases of significantly abnormal findings or critically elevated results. In cases of moderately abnormal results, a request for a repeat sample is made to the infant's follow-up physician, midwife, Public Health Nurse, or to the Nurse-In-Charge for newborns living in remote communities.

Neonatal Screening: Blood Specimen Collection and Handling Procedure

- Filter paper cards are intended for use by health professionals in the collection of newborn dried blood spots (DBS) for the purposes of Newborn Screening.

1. The preferred method of collection is direct application.

- Puncture the heel using a 1mm deep by 2.5mm long sterile lancet, single use (Quikheel Lancet MDA #049891).
- After the heel is punctured, wipe away the first drop of blood using a sterile gauze pad to eliminate the risk of dilution of the blood drop by tissue fluids and any residual alcohol.
- Touch the filter paper to subsequent blood drops only. Do not press or touch the filter paper against the skin of the heel. Allow the full drop of blood to soak through the filter paper, completely filling the circle. Fill all circles completely.



Preferred Puncture Site

**** Shaded area (▨) indicates safe areas for puncture site.***

- After the collection of each circle, check the back of the card to ensure the blood has soaked through the filter paper fully. If the circle is not fully saturated from front to back, recollect the sample on a new circle.

2. **The capillary tube method:(used only if direct application not possible) can be satisfactory if:**
   - A non-glass, sterile, plain (anticoagulant-free) tube is used. Anticoagulants interfere with NBS tests, however, with no anticoagulants present, clotting may occur in the tube so dispensing onto the filter paper must be done promptly.
   - Touching and/or scratching the capillary tube to the filter paper surface can cause both false positive and negative results. Touch the card lightly and let the filter paper draw in blood from the capillary tube.
   - Use a fresh capillary tube for each circle.

Acceptable		**Unacceptable**	
Entire circle filled and evenly saturated:		Insufficient or Not Fully Saturated	
			
Front of Card	Back of Card	Front of Card	Back of Card

3. **What is considered a poor specimen?**
   - not enough circles of blood for the tests; inadequately filled circle or not saturated through
   - clotted blood adhering to filter paper
   - smearing or contamination
   - oversaturation (heavy and caked on either or both sides)
   - layering
   - scratching or abrading by capillary tube, spotting/drawing/pressing
   - incomplete drying before shipping/improper shipping/spots sticking to the flap

IMPORTANT: **Poor sample quality can yield unreliable, misleading, or clinically inaccurate results, which may result in a missed or late diagnosis, unnecessary recollection from the newborn, and anxiety to caregivers.**

Results are dependent on a satisfactory collection.

4. Top Reasons for Requesting Recollections - Why and how do you help prevent an unnecessary re-collection?

#1 Insufficient quantity may result in a False negative OR False positive

- Attempt to absorb the blood into the centre of the spots marked as dotted lines on the filter paper.
- The blood should be applied to the front of the card, avoid layering.
- Both sides of the filter paper should be examined to ensure that the blood uniformly penetrated and saturated the paper on both sides (from front to back of the card).
- Warming the site with a soft cloth, moistened with warm water up to 41°C, for three to five minutes will improve circulation and bleeding.

#2 Layering may result in both a False negative OR False positive

- Applying successive drops of blood to already partially collected DBS may cause layers, affecting analyte concentrations.
- Oversaturated samples may result in falsely high concentrations, which in turn may result in a false-negative screen in cases where a low analyte value is considered out of range.
- Do not go back to a previously collected spot in an attempt to fill a circle, this could result in layering.
- If blood flow diminishes and the target cannot be completely filled, repeat using a new circle.
- Apply from the front of the card only. Do not apply multiple capillary specimens to the same circle.
- Caking or uneven spreading will occur and might adversely affect test results.

#3 Clotting may result in both False negative OR False positive

- Slow application may allow the blood to clot, or cause cells and plasma to separate, resulting in a heterogeneous blood sample and possible erroneous results.
- Separated blood samples may exhibit serum rings on the filter paper.

#4 Abrading may result in both False negative or False positive

- To avoid damaging the filter paper fibers, allow only the blood drop to touch the surface of the filter paper.
- Actions with a capillary tube such as "coloring in" the circle, repeated dabbing around the circle, or any technique that might scratch, compress, or indent the paper should not be used.
- Do not reuse capillary tubes.

#5 Drying may result in False negative

- Blood spots should be dried at room temperature only on a dry, clean, flat non-absorbent surface for a minimum of three hours.
- High humidity (> 50% relative humidity) may cause longer drying times.
- Do not dry cards in direct sunlight or other heat sources.
- Ensure filter paper is thoroughly dry before flap is closed over spots or the flap will stick to the spots. Do not tape the flap down to the card.
- Do not package in airtight sealed containers (e.g. plastic bags). Never store in a fridge or freezer.
- Heat, direct sunlight, humidity, residual cleaners (e.g. bleach) and moisture are detrimental to the stability and analyte recovery.
- Specimens should not be allowed to come in direct specimen-to-specimen contact during handling, shipment, or storage. Close the flap after drying.

#6 Contamination may result in both False negative or False positive

- Avoid contaminating or smearing the blood spots.
- Never touch the filter paper area by hand or anything likely to cause cross-contamination.
- Minimize "milking" of the heel to prevent contamination with tissue fluids.
- Ensure to wipe away the first drop of blood with a sterile gauze pad to eliminate risk of dilution or any residual alcohol.

MANITOBA NEWBORN SCREENING PROGRAM

Condition	Congenital Hypothyroidism (CH)	Classical Galactosemia	Multiple carboxylase deficiency	Congenital adrenal hyperplasia (CAH)	Cystic Fibrosis	Amino Acidemias*	Organic Acidemias	FAOD* Type 1 (GA-1)	SCID
First Tier Test	Thyroid stimulating hormone (TSH)	Galactose-1-Phosphate Uridyl Transferase-GALT	Biotinidase	17-OH-progesterone (17-OHP)	Immunoreactive trypsinogen	Tandem Mass Spectrometry	Tandem Mass Spectrometry	Tandem Mass Spectrometry	Severe Combined Immunodeficiency (SCID)
Second Tier Test		Galactose-1-Phosphate Lc/MS/MS Referred Out		CAH by LC/MS/MS	DNA mutational analysis Referred out	Interpretation required	Interpretation required	Interpretation required	Quantitative T-cell Receptor excision circles (TREC) and JKBKB + ZAP 70 mutation analysis
Normal Reference Range	<30 mIU/L at <=72 hours of age; <20 at >72 hours of age	>4.9 u/gHb	>48u	<25 nmol/L	<75 mg/mL	See table next page	See table next page	See table next page	TREC>33 copies/uL whole blood Not homozygous for IKBKB mutation Not homozygous for ZAP70 mutation
Action: Moderately abnormal results	Request for repeat collection made to follow up health care provider								
Action: Critically abnormal	Referral to Pediatric Consultant								
Daily: Monday – Friday	Time tested	Twice weekly: Monday & Thursday	Daily: Monday – Friday	Four times a week: Monday, Tuesday, Thursday & Friday	Monday, Tuesday, Thursday & Friday	Daily: Monday – Friday	Daily: Monday – Friday	Daily: Monday – Friday	Daily: Monday – Friday

	Normal Range (µmol/L)	Critical Range (µmol/L)
Glycine	110 – 811	
Arginine	1.30 – 40	
Ornithine	5 – 35	>100
Citruline	5 – 35	
Alanine	97 – 528	
Valine	53 – 250	>667
Leucine	80 – 275	>344
Methionine	11 – 52	>69
Phenylalanine	22 – 110	>189
Tyrosine	20 – 250	>625
C0	12 - 80	>171
C2	11 – 70	
C3	0.6 – 6.5	>11.5
C4	<1	>3.1
C5:1	<0.1	
C5	<0.4	>1.6
C4OH	<0.56	
C6	<0.2	
C5OH	<0.5	>1.15
C8	<0.3	>1.2
C3DC	<0.2	
C10:2	<0.08	
C10:1	<0.21	
C10	<0.3	
C4DC	<0.8	
C5DC	<0.18	>0.54
C12:1	<0.32	
C12	<0.45	
C6DC	<0.16	
C14:2	<0.12	
C14:1	<0.5	>1.07
C14	<0.6	
C16:1	<0.54	
C16	0.7 – 7.2	>10
C16:1OH	<0.12	
C16OH	<0.1	>0.1
C18:2	0.04 – 0.61	>0.83
C18:1	0.4 – 2.73	>4
C18	0.3 – 2.27	
C18:1OH	<0.08	>0.08
C18OH	<0.08	>0.08

Condition Group	Condition
ENDOCRINE DISORDERS	**Primary congenital hypothyroidism**
	Congenital adrenal hyperplasia (CAH)
GENETIC DISORDERS	**Biotinidase deficiency (BIOT)**
	Cystic Fibrosis
	Severe Combined Immunodeficiency
GALACTOSEMIAS	**Classical galactosemia**
FATTY ACID OXIDATION DISORDERS	**Carnitine uptake deficiency**
	CPT 1 deficiency
	Carnitine palmitoyltransferase (CPT2)
	Carnitine/acylcarnitine translocase deficiency (CACT)
	Glutaric acidemia 2
	Long chain hydroxyacyl-CoA dehydrogenase deficiency (LCHAD) **Trifunctional protein deficiency (TFP)**
	Medium chain acyl-CoA dehydrogenase deficiency (MCAD)
	Medium/Short Chain Acyl-CoA Dehydrogenase Deficiency (M/SCHAD)
	Short-chain acyl-CoA deficiency (SCAD) Ethylmalonic encephalopathy Isobutryryl-CoA dehydrogenase deficiency
	Very Long Chain acyl-CoA dehydrogenase deficiency (VLCAD)
ORGANIC ACIDEMIAS	**Beta-ketothiolase deficiency (BKT)** Holocarboxylase deficiency **Multiple carboxylase deficiency (MCD)** **HMG-CoA lyase deficiency (HMG)** 2–methyl–3–hydroxybutyric acidemia (2M3HBA) 3–methylgutaconic aciduria (3MGA)
	3–methylcrotonyl-CoA carboxylase (3MCC)
	Glutaric acidemia 1 (GA1)
	Isovaleric acidemia (IVA) Short/branched chain acyl-CoA dehydrogenase deficiency
	Malonic acidemia
	Methylmalonic acidemia (MAT)
	Propionic acidemia (PROP)
	Cobalamin A/B deficiency
AMINO ACIDEMIAS	Argininemia **Citrullinemia I (CIT)** Citrullinemia II Pyruvate carboxylase deficiency
	Homocystinuria* (HCV) Hypermethioninemia Aenosylhomocysteine hydrolase deficiency
	Maple Syrup Urine Disease (MSUD)
	Phenylketonuria (PKU) Benign hyperphenlalaninemia Biopterin cofactor biosynthesis defect Biopterin cofactor regeneration defect
	Tyrosinemia I* Tyrosinemia II Tyrosinemia III

NOTE: Not all cases are detectable with current protocols.
Bold items represent the 2006 American College of Medical Genetics (ACMG) Core Conditions.

5.2 MATERNAL SERUM SCREENING (QUAD TESTING) PROGRAM

CPL, in collaboration with the Winnipeg Regional Health Authority (WRHA) Genetics and Metabolism Program, provides Maternal Serum Screening (MSS) to pregnant women in Manitoba in their second trimester as part of their prenatal care. This test provides an estimation of the risk for fetal open neural tube defects, Down Syndrome, Trisomy 18 and Smith-Lemli-Opitz syndrome (SLOS). CPL tests four biochemical markers (Quadruple Test, or Quad Test) in the mother's blood that are produced by the fetus and/or placenta. The biological markers are alpha-fetoprotein (AFP), unconjugated estriol (uE3), human chorionic gonadotropin (hCG) and Inhibin A (DIA). In addition, the Manitoba Program is capable of incorporating the Nuchal Translucency measurement, when available, as part of a consolidation risk estimate.

Specimen requirements

A serum sample is required at 15 weeks 0 days to 20 weeks 6 days of gestation for testing. Collect blood in a serum separator tube; a full 8 to 9 mL serum separator tube is preferred (minimum half-full required). Within two hours of collection, centrifuge to separate the serum from cells (**plasma is not suitable**). Send centrifuged primary tube, (no aliquots) labelled with patient name and PHIN, or a unique health identification issued by other authorities to CPL as soon as possible. DO NOT SEND ALIQUOTS IN PLASTIC TUBES. Delay in sending sample should be avoided. If delay is unavoidable, do not freeze. Store the centrifuged specimen at 4°C until shipment. Samples in transit for seven or more days may be compromised for analytes tested and will be rejected.

Requisition requirements

Fill in all clinical information including sample collection date on the Manitoba Maternal Serum Screen requisition as completely and accurately as possible. This is essential to ensure correct calculation of the risk. Turnaround time is significantly improved when all required information is included on the requisition. The following patient information is required for accurate interpretation:

1. name of patient
2. PHIN, if no PHIN use other identifier
3. date of birth
4. patient weight in lbs or kgs
5. gestational age, ultrasound date and measurements (BPD or CRL cm or
5. mm or composite gestational age, most accurate for interpretation).
6. last menstrual period (LMP) date.
7. examination date and gestational age
8. patient ethnicity (race)

9. if IVF pregnancy, egg donor, harvest and transfer dates
10. insulin dependent diabetes mellitus, (IDDM) status
11. multiple gestation of current pregnancy
12. smoker or non-smoker

Results
Samples obtained between 16 to 18 weeks of gestation are optimal. However, interpretation can be provided for samples collected between 15 weeks 0 days and 20 weeks 6 days. A limited MS AFP interpretation can be made up to 23 weeks 6 days. Follow-up of abnormal results can be referred to the WRHA Genetics and Metabolism Program Department of the University of Manitoba, CSB - FE231, 685 William Avenue, Winnipeg, Manitoba; telephone 204–787–4631 or 204–787–2098.

5.2.1 Adding Nuchal Translucency (NT) to the Risk Calculation

Nuchal Translucency (NT) information will be incorporated by CPL into the final consolidation risk calculation for fetal aneuploidy as part of the Maternal Serum Screening Program.

For patients consenting and eligible to have an NT examination, please provide your patient with a completed Maternal Serum Screening requisition prior to her NT appointment. Following the NT ultrasound, the ultrasonographer will fill in the NT information (on the requisition) and return the requisition to the patient with appropriate timing instructions as to when to have her blood drawn.

A risk calculation will not be provided on NT alone. A risk calculation will be provided that combines the second trimester quadruple serum test results with the NT. If a patient is not eligible for NT or is too late in gestation for an NT measurement, only the quadruple serum test result can be provided.

Please note that it is inappropriate to request an NT scan for those patients who do not wish to have maternal serum screen completed.

5.2.2 Non-Invasive Prenatal Screening (NIPS)

NIPS, more generally known as cell-free fetal DNA testing, is a method in which fetal DNA is detectable in maternal plasma and can be screened for probable aneuploidy. The current funded indicators for NIPS at CPL are:
The pregnant woman is Manitoba Health insured (out-of-province referrals are not funded) **AND ONE OR MORE OF**:

1) either biological parent with a previous trisomy-affected pregnancy (specifically trisomy 21, 18 or 13)
   OR
2) either biological parent with a translocation involving chromosome 13, 18 or 21,
   OR
3) the pregnant woman is infected with sAg or eAg-positive HBV, or HIV with detectable viral loads, and is at elevated risk for aneuploidy as determined by fetal assessment or maternal serum screening,
   OR
4) the pregnant woman is a known carrier of severe X-linked disease for which pre-natal detection would be available
   OR
5) a positive Down Syndrome (T21) screen with ultrasound confirmed dating (only during COVID– may not be a permanent indication).

If your patient meets criteria and is interested in NIPS, consult WRHA Genetics at fax 204–787–2031.

6.0 INFORMATION MANAGEMENT

The Information Management section is responsible for the provision of service in five main areas for microbiology, serology, virology and public health chemistry:

- data entry services
- patient inquiry services
- results reporting (paper/fax/electronic messaging)
- data requests
- request for data retrieval

Data Entry Services

- Data entry of all incoming requisitions (excluding Newborn Screening and Maternal Screening) will match patient demographics with the Client Registry to ensure the integrity of the CPL database in matching test requests and maintaining a comprehensive patient profile.
- All requests for laboratory testing must be accompanied by a completed CPL requisition. The integrity of the data entered into the CPL database is compromised by incomplete or illegible requisition information, and may result in rejection or delayed reporting. Requisition entry requires extensive searching on the Client Registry to ensure correct patient matching.
- **Equally important is the clarity and completeness of the "return report to" portion of the requisition. This will ensure prompt reporting to the ordering practitioner and if requested on requisition, a copy will be forwarded to another practitioner. If no practitioner or address is provided, the sample will be rejected**.
- Request to amend requisition information - changes to requisition information will require the completion of this form (see www.manitoba.ca/health/publichealth/cpl/forms).
- Inclusion of data entry and verification of laboratory results.
- Ensuring reportable results are flagged and reported to CDC in Manitoba and Nunavut.

Patient Inquiry Services

- Patient Inquiry 204–945–6611
  Hours of operation: Monday to Friday, 8 a.m. to 4:30 p.m.
  Saturday, 8 a.m. to 4 p.m.

When making a telephone inquiry for results, callers will be asked to provide the following information to ensure the authenticity of the requester and also to ensure correct patient and/or results are being given. A log of all patient inquiry calls is maintained at CPL.

a. Caller name, telephone number and institution you are calling from.

b. The patient PHIN, which is the most efficient way of searching patient results from both the online system and/or the archived tape files.

   When a PHIN is not readily available, you will be asked for the patient name, gender and date of birth. As many people have aliases or change names (married, etc.) this information may be required to verify the correct patient file.

c. The clerk will then verify with the caller the corresponding demographics and pertinent requisition information before providing results. If the request is for HIV results, or if any type of interpretation or explanation of results is required, the call will be transferred to the appropriate section.

d. Results (verbal or hard copy) may be provided with a valid request.

e. The requester must be verified before confidential information is provided by phone. Results will be released only to physicians, midwives, public health practitioners and other practitioners authorized to order tests under The Regulated Health Profession Act or under public health protocols.

   Reporting to one other practitioner will occur by completing the "Copy Report To" area on the general requisition.

f. In some cases it may be deemed necessary to have the requested results telephoned back to the physician and/or facility (certain results, results requiring interpretation or to validate the requester, preliminary results, etc.).

g. Calls made to Patient Inquiry 204–945–6611 after regular hours will receive a voice

message and an alternate number to call for emergent requests: 204–945–6655. CPL Security will record the information required and relay it to the physician on call. The computer system is available to the physician on call every day between 6 a.m. and 10 p.m.

Results Reporting – Paper and Fax

Based on the return address information, result reports produced on paper will be delivered either by mail or fax. Results may also be sent electronically to clinics provisioned for eHealth_hub laboratory result delivery. CPL's default policy is to deliver reports by confirmed secure fax, or to electronic medical records via the service application.

- Some paper reports printed at CPL are mailed or couriered out where fax or hub delivery is not possible.
- Where fax delivery is not feasible, paper reports printed at CPL are mailed or couriered out.
- eHealth_hub is a Shared Health business service that coordinates electronic delivery of information between systems to authorized healthcare providers who are using a Manitoba Certified Electronic Medical Record (EMR). More information on this service can be found at: ***https://sharedhealthmb.ca/services/digital-health/ehealth-hub/***
- CPL reports communicable disease data to Manitoba Public Health
- Critical results identified through core screening programs (e.g. Newborn Screening and Maternal Serum Screening)

Requests for Data Retrieval

- Co-ordinate and respond to all incoming requests for the retrieval of data including statistical requests, patient profiles, reprinting of previous reports, etc. are reported to the appropriate on-call specialist as well.

  Requesters may be asked to complete a CPL Data Request Form according to the CPL Data Request Guidelines (see below), and to submit application to the Manitoba Health Information Privacy Committee. As an alternative, historic CPL data is also available in the Manitoba Centre for Health Policy Data repository.

  A charge for service may be applicable to agencies outside Manitoba Health, Seniors and Active Living. Once the Data Request is received an estimate of cost will be provided.

Data Request Guidelines

1. Requests for CPL data (internal and external), will be made using the CPL Data Request Form (go to: www.manitoba.ca/health/publichealth/cpl/forms) and forwarded to the Information Co-ordinator at 750 William Avenue (fax number: 204–786–4770).

2. Once a request is assessed for priority and an estimated project time (internal) is given, the requestor will be notified with the most appropriate approval process and necessary contact information. Please provide as much lead time as possible.

Note: Research project requests for data usually requires ethics approval from an appropriate institutional review board (i.e., Faculty Committee on the Use of Human Subjects in Research, U of M, etc.) prior to approval at CPL. In general, data requested for research purposes will be directed to the Manitoba Centre for Health Policy, as is required under Manitoba Health policy.

3. All relevant correspondence must accompany the CPL Data Request form. In addition, all external research projects will either require approval from the Health Information Privacy Committee (HIPC) if identifiable personal health information is requested, or will be directed to the Manitoba Centre for Health Policy.

4. The data request procedure will be reviewed annually to ensure appropriateness.

Requests by Individuals or Their Representatives for Personal Health Information

- Requests to CPL by individuals or legal representatives for personal health information must be in writing, except in an emergency (involving an immediate threat to the mental/physical health or safety of an individual the information is regarding). Whenever possible, the report will be forwarded to the appropriate attending physician.
- A standard request for information form will be used (go to: ***www.manitoba.ca/health/publichealth/cpl/forms***). The form will be submitted to the Privacy Officer.
- CPL must respond within thirty (30) days to the requester.
- A fee may be charged for acquisition of personal health information. A charge-back policy consistent with the fee regulated under The Freedom of Information and Protection of Privacy Act will apply (see www.manitoba.ca/health/publichealth/cpl/forms).

7.0 ALPHABETICAL INDEX OF TESTING

SECTIONS:	CM = Clinical Microbiology NBS/PHC = Newborn Screening & Public Health Chemistry PA = Parasitology	SE = Serology VD = Virus Detection

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Actinomycosis (Actinomyces israelii)	Pus (preferably with granules) Bronchial washing Intrauterine device	Microscopy and special culture	CM
NOTES: Organism takes 3 or more days to grow in cultures. If suspected, Actinomyces culture must be specifically requested.			
Adenovirus infections (Adenoviruses types 1–41) upper respiratory tract; pneumonia; acute respiratory disease syndrome (ARD); Infections of conjunctiva	Throat swab in UTM NPA, NP swab in UTM, BAL, Throat, ETT, Nasal Conjunctival swab Lung aspirate or biopsies in UTM	Viral culture NAAT	VD
Gastroenteritis	Feces		VD
Aeromonas hydrophila group	Stool or rectal swab	Culture	CM
NOTES: Causal agent of diarrhea			
AIDS (HIV Virus)	Clotted blood or serum EDTA blood	Serology – EIA WB confirmatory Viral load Genotyping	SE
NOTES: HIV viral load increases up to 1000 copies/ml after several below detection results have been reported by several laboratories. These increases are not typically indicative of the development of drug resistance. Follow-up specimen in 4 weeks may help in resolving this issue. Viral load and genotyping only done on confirmed positives. Use special HIV antibody and viral load requisitions only. See section 3.2.			
Amebiasis (see Dysentery, amebic, amebic encephalitis, amebic hepatitis)			
Amebic encephalitis (Hartmanella, Naegleria, Ancanthamoeba species)	CSF	Microscopy for trophozoites	PA
NOTES: DO NOT REFRIGERATE CSF specimens. Infection acquired from water by swimming or bathing, even in chlorinated pools. Suspicion of amebic disease must be indicated on the requisition.			
Amebic hepatitis *(Entamoeba histolytica)*	Clotted blood or Serum	Serology	PA

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Anaerobic infections (see also Gas Gangrene)	Pus from deep abscesses, brain, lung or pelvic region or body cavities in TM. See also pus. Lung aspirates or biopsies.	Microscopy and culture	CM
NOTES: Many anaerobic strains are slow to grown and reports cannot be expected for 4 days or more. Many body sites have anaerobic normal flora. Culture of such sites is unprofitable (eg. Skin, mouth, throat, sputum, vagina and bowels).			
Ancyostomiasis (see Hookworm Disease)			
Anthrax *(Bacillus anthracis)*	Isolate Swab or pustular fluid from skin lesion in TM Sputum in rare instances of pulmonary infection Blood for culture	Identification, toxin testing Microscopy and special culture Culture	CM
NOTES: Use gloves and mask for collection. If lesion is dry, moisten swab in sterile water, saline or broth and rotate beneath the edge of the eschar. Notify the laboratory when anthrax is suspected and mark the requisition clearly "suspect anthrax". Consider notification of regional MOH. Phone each lab in the shipping chain prior to transporting – 204-945-6805.			
Arbovirus infections (Arboviruses)	Clotted blood or serum	Serology (Referred out)	SE
NOTES: Consult with laboratory, Virology Section, for submission of brain biopsies. Requests for other than West Nile Virus are referred out to the National Microbiology Laboratory.			
Ascariasis *(Ascaris lumbricoides)*	Feces in SAF Worm (passed in feces or vomit)	Microscopy for ova Identification of worm	PA
NOTES: Worms may be submitted in sterile urine container with or without formalin or alcohol preservative. Infected persons must be treated.			
Aseptic meningitis (see Meningitis, viral)			
Aspergillosis (*Aspergillus fumigatus* *Aspergillus species*)	Clotted blood or serum	Serology (Referred out)	SE
NOTES: May be a contaminant in sputum and isolation does not necessarily indicate infection. Please indicate on requisition form if aspergillosis is suspected.			
Atypical mycobacteria (see Mycobacteria)			
Atypical pneumonia (see Mycoplasma infections; also Pneumonia, viral and other non-bacterial)			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Balanitis (Various bacteria and yeast)	Swab in TM	Microscopy and culture	CM
Balantidiasis (Balantidium coli)	Feces in SAF Scrapings of ulcerated bowl (sigmoidoscopic)	Microscopy for trophozoites and cysts	PA
Bilharziasis (see Schistosomiasis)			
Biotinidase deficiency	Newborn screening card	Qualitative spot test and semi-quantitative spectrophotometry	NBS/PHC
Blastomycosis (North American) *(Blastomyces dermatitidis)*	Serum	Serology (Referred out)	SE
NOTES: A dimorphic fungus found in the Kenora area, and in Southeast Manitoba. Consult with the laboratory and mark requisition clearly "Blastomycosis suspected." Phone lab prior to transporting – 204-945-6805.			
Bocavirus infections	NP, BAL, ETT	NAAT	VD
Bornholm's Disease (see Coxsackievirus infections)			
Botulism (*Clostridium botulinum* types A, B, and E)	Isolate Feces, tissue Exudate in TM, gastric contents unfixed Clotted blood or Serum (3 x 10 mL)	Confirmation Culture for *C. botulinum* neurotoxin detection in blood, food, vomit or gastric contents (Referred out)	CM
NOTES: Consult laboratory ASAP! Relevant clinical information is required. Collect in sterile screw-capped jars. Transport immediately. Take blood early in illness (30 mL if possible) BEFORE giving antitoxin. Very rarely *C. botulinum* causes wound infections.			
Bronchioloitis and viral respiratory disease (Respiratory syncytial virus; adenovirus, parainfluenza, influenza)	NPA, NPS in UTM BAL, Throat, ETT, Nasal NPA, NPS, ETT	Viral culture NAAT	VD VD
NOTES: Throat swabs will not be rejected, but sensitivity reduced. Pack specimens for virus isolation in cold packs and send by fastest possible means. DO NOT FREEZE (or RSV will not survive).			
Brucellosis (*Brucella abortus, B. melitensis, B. suis*)	Isolate Blood for culture Culture blood or Serum	Identification and Typing Culture Serology (Referred out)	CM SE
NOTES: Multiple cultures are recommended; they are given prolonged incubation before being reported as negative. Interpretation of serologic findings is difficult in some chronic infections, consult the laboratory. Mark requisition clearly if Brucellosis suspected. Phone lab prior to transporting – 204-945-6805.			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Campylobacter Infections (*Campylobacter jejuni, C. coli*)	Feces Rectal swab in TM	NAAT Culture if NAAT positive	CM
NOTES: Major cause of sporadic gastroenteritis, occurring in summer and early fall. Highest incidence in infants and young children, associated with ingestion of contaminated milk and water or improperly handled or cooked food – primarily poultry products.			
Candidiasis (*Candida albicans Candida spp.*)	Mouth, throat, cervical Vaginal or urethral swabs in TM Skin swabs in TM	Microscopy and culture	CM
NOTES: If pulmonary involvement suspected, submit transtracheal or lung aspirates. Refrigerate samples if delay in transport.			
Carditis (see Coxsackie virus infections)			
Catscratch fever (*Bartonella henselae*)	Tissue biopsy (i.e., lymphnode, heart) Fluid aspirate from suspected area of infection (1 mL minimum) Clotted blood or Serum	PCR Serology (Referred out)	CM
NOTES: Clinical information leading to suspicion of infection must be provided. Samples should be frozen immediately after collection (ensure specimens held at appropriate temperature during shipment) or delivered on ice to CPL ASAP.			
Cercopithecine herpes virus (simian herpes virus, Herpes B virus)	Wound swab in UTM Clotted blood or serum, 3–4 mL CSF, biopsy or necropsy tissue in UTM	Viral culture (Referred out) PCR (Referred out)	VD
NOTES: In all cases, contact the lab before collecting or submitting specimens			
Cervicitis (see Gonorrhoeae, Chlamydial Infections)			
Chagas disease (*Trypanosoma cruzi*)	Blood films (thick and thin; unstained) Lymph aspirated from nodes or chagoma Clotted blood or Serum	Microscopy PCR (Referred out) Serology (Referred out)	PA SE
NOTES: Endemic occurs in Central and South America			
Chancroid (Soft chancre) (*Haemophilus ducreyi*)	Swab of pus or scrapings from lesions Dacron swab in 2SP CTM	Special culture PCR (Referred out to National Microbiology Lab)	CM
NOTES: **Culture requires special medium and is available only by special request. Please phone lab: 204–945–7204**. There is no optimal transport medium available, but Amies charcoal TM may be used. Transport to CPL immediately. Requests for molecular testing must include clinical background leading to suspicion of *H. ducreyi* infection in a patient, including any additional factors that may increase the probability of *H. ducreyi* infection. Swab samples for molecular testing require dacron swab.			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Chickenpox (Varicell) Shingles (Zoster) (Varicella-Zoster virus)	Vesicle fluid Base of lesion swabbed vigorously in UTM	NAAT Viral culture (requires approval) Rapid test – DFA – prior CPL approval needed	VD
	Clotted blood or serum or plasma	Serology	SE
NOTES: Immune stats: detection of IgG. Diagnosis: detection of specific IgM, presence indicates recent infection.			
Chlamydophila infections : respiratory *Chlamydophila psittaci*, C. pneumoniae Ornithosis Psittacosis Pneumonitis TWAR	Sputum or nasopharyngeal aspirate preferred Nasopharyngeal swab in 2SP Chlamydia TM is acceptable	PCR (Referred out)	CM
	Serum	IFA	SE
NOTES: *C. pneumoniae* is tested for IgM on only acute sample. Please specify suspected genus and species.			
Chlamydia infections: STI and others *Chlamydia trachomatis* Trachoma	Cervical swab Urethral swab Urine-first void (20–30 mL) (see 2.2)	NAAT (GenProbe Aptima)	CM
Inclusion conjunctivitis N.G.U. Infantile pneumonitis P.I.D. Prepubertal vaginitis	Tracheal secretions Nasopharyngeal secretions Rectal swab (anal columns) Throat swab	NAAT (GenProbe Aptima)	CM
	Conjunctival swab	NAAT (GenProbe Aptima)	CM
	Serum	IgM in neonatal infections Serology	SE
Lymphogranuloma venereum (LGV) (see Lymphogranuloma Venerium (LGV))			
NOTES: For NAAT testing by GenProbe Aptima, only cervix swabs, urethral swabs and urine are acceptable. If eye swabs are submitted for NAAT, results will be reported as "for investigational purposes only". Vaginal swabs are not appropriate. Please use the swabs provided in the kit, and place only the blue swab in the tube. Do not discard the liquid preservative in the tube. Positive GenProbe samples are retained for 3 weeks in event further testing is required. The presence of IgM-antibody is diagnostic.			
Cholera (*Vibrio cholera* including the El T or biotype)	Isolate Feces	Typing (Referred out) Microscopy and culture	CM
NOTES: Specify on requisition if cholera is suspected.			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Clostridium difficile (antibiotic-associated diarrhea, pseudomembranous colitis) (*Clostridium difficile* toxin)	Feces (10 mL)	Cytotoxin testing Special culture Rapid toxin test	CM
NOTES: Request *C. difficile* testing. Inappropriate specimens include swabs, stool in transport medium or fixative, and formed stools. *C. difficile* culture from stool is by special request only.			
Colitis (See *Clostridium difficile*)			
CJD (Creutzfeldt-Jakob disease) (Protein 14–3–3)	CSF (1 mL): - no visible blood - non-xanthochromic	EP-QuIC ELISA	VD
NOTES: Please contact lab before sending.			
Clonorchiasis (*Opisthorchis*) (*Clonorchis sinensis*), The Chinese liver fluke *Metorchis conjunctus* (Canadian liver fluke)	Feces in SAF	Microscopy for ova	PA
NOTES: Occurs in the Far East. May persist twenty years or more. In North America, mainly in Aboriginals. It is difficult to differentiate the ova of these and related species and when in doubt they are reported as 'opisthorchid' ova.			
Clostridial infections (see Anaerobic Infections and Gas Gangrene)			
CMV (see Cytomegalovirus)			
Coccidiomycosis (*Coccidiodes immitis*)	Clotted blood or Serum	Serology (Referred out)	SE
NOTES: Infection is generally contracted in arid areas of North America, especially California, therefore a travel history is helpful. Mark requisition clearly "Coccidioides suspected." Phone lab prior to transporting – 204–945–6805.			
Common cold or minor respiratory illness (rhinovirus)	NPA/NPS or Throat swab in UTM BAL, Throat, ETT, Nasal	Viral culture NAAT (NP, BAL, ETT only)	VD
NOTES: Laboratory confirmation rarely necessary. Testing only recommended as part of an outbreak investigation.			
Congenital adrenal hyperplasia (CAH)	Newborn screening card	MS/MS	NBS/ PHC
Congenital primary hypothyroidism	Newborn screening card	Fluoroimmunoassay for TSH	NBS/ PHC

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Congenital infections (Various including rubella, herpes, cytomegalovirus, toxoplasma, Listeria, Chlamydia, Group B *Streptococcus*)	EDTA plasma Body fluids (Urine, CSF, amniotic fluid, etc.) Tissues (biopsies) Clotted blood or serum	NAAT Viral culture Culture for bacteria Serology	VD CM SE
NOTES: See under the individual causative agents.			
Conjunctivitis (Many bacterial including Staphylococcus, Haemophilus spp., Streptococcus pneumoniae, Moraxella spp., Neisseria gonorrhoeae, Chlamydia trachomatis, and several viruses, including Herpes simplex virus and Adenovirus)	Conjunctival swab in Amies charcoal TM Swab for chlamydia Swab in UTM Clotted blood and serum or plasma	Microscopy and culture NAAT (GenProbe Aptima) Viral culture NAAT Serology	CM VD SE
NOTES: Use Amies Charcoal transport medium for bacterial causal agents. Use NAAT for chlamydia. If specimen submitted for NAAT, results will be reported as "for investigational purposes only." Swabs to be cultured for viruses must be sent in UTM. Take specimens before using topical anesthetics which may be antimicrobial. Serology for Herpes.			
Contagious pustular dermatitis (see Poxvirus Infections)			
Coronavirus infections (229E/NL63 and OC43 only)	NP, BAL, ETT	NAAT	VD
Coryza (see Common colds)			
Cowpox (see Poxvirus Infections)			
Coxsackievirus infections (including aseptic meningitis, pleurodynia (Bornholm disease), febrile illness often with rash; Hand, foot and mouth disease; myocarditis, pericarditis, etc.) Herpangina (Coxsackievirus A, Types 1–24 Coxsackievirus B, types 1–6)	Feces Vesicle fluid, Throat swab in UTM CSF	Viral culture NAAT NAAT Viral culture NAAT	VD

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Creutzfeldt-Jakob disease (See CJD)			
Croup (Parainfluenza virus Influenza virus, Respiratory syncytial Virus (RSV) and *Bordetella pertussis*)	NPS, NPA or Throat swabs in UTM NPS/NPA, BAL or ETT NPS, NPA or NP swab in Amies charcoal medium	Viral culture IMA (where applicable) NAAT Pertussis Culture PCR	VD VD CM
NOTES: NP swabs for Pertussis PCR must be collected using swabs with non-toxic tips such as dacron or nylon.			
Cryptosporidium Speciation	Feces in SAF Feces without Preservative	Microscopy (Referred out)	PA
NOTES: Cryptosporidium must be specifically requested on the requisition. Upon approval, speciation will be referred out for public health purposes.			
Cyclospora cayetanensis	Feces in SAF	Microscopy	PA
Cysticercosis (*Taenia solium*)	Clotted blood or serum	Serology (Referred out)	SE
Cystitis (see Urinary Tract Infections)			
Cytomegalovirus infections (Cytomegalovirus)	Urine Throat wash, biopsy Autopsy material in UTM Bone marrow aspirate EDTA blood* *see 4.2.1 for collection instructions Clotted blood, serum or plasma	Viral culture PCR Serology	VD SE
NOTES: Send urine in sterile bottle, URGENTLY. (Do not freeze, 4°C is optimal). In urine, CMV is very labile at 25°C. It is also slow growing, culture may take 20 days or more. Prolonged excretion of virus in urine and saliva may occur in both congenital and acquire infection. Blood may be collected at any time during the illness.			
Dengue (see Arbovirus infections)			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Diarrhea, bacterial (see also Cholera; *Food poisoning; Paratyphoid fevers; Typhoid fever) (Numerous bacterial species including *Salmonella, Shigella Escherichia coli* (enteropathogenic and verotoxin producing strains), *Yersinia enterocolitica, Campylobacter, Plesiomonas shigelloides, Aeromonas spp.* and *Vibrio spp.*	Feces – 30 mL/10g. Fill container minimum 1/3 full and no more than ½ full. No fixative.	NAAT Culture E. coli Verotoxin, *C. Difficile* Toxin FBI Investigation, Outbreak Investigation	CM
	Clotted blood or serum	Serology (Referred out for Yersinia)	SE
NOTES:	Send material containing blood or mucus if these are present. Feces is always preferable to a rectal swab but if fecal specimen unobtainable, send rectal swab in TM. Acute diarrhea requires one stool. No transport media or preservative. Chronic diarrhea: submit stool on three separate days. Outbreaks should be noted on the requisition. Contact the regional MOH to establish outbreak or FBI status and obtain outbreak code for clinical specimens.		
Diarrhea, Infantile (see also Diarrhea, viral) (*Campylobacter spp. Aeromonas spp.*)	Feces – fill container minimum 1/3 full and no more than ½ full. No fixative.	Culture Verotoxin testing	CM
Diarrhea, parasitic (See also Giardiosis, *Cryptosporidium, Cyclospora,* Balantidiasis, Ascariasis, Hookworm disease, Dysentery, amebic Diphyllobothiasis Microsporidiosis Teniasis, Trichostrongyloidiasis, Trichinosis, Trichuriasis, Worm infections)	Feces in SAF Segments of worm in feces	Microscopy for ova and parasites Antigen detection test	PA
	Clotted blood or serum	Serology (Referred out)	SE
NOTES:	Multiple stool specimens are usually required to adequately rule out parasitic diarrhea. Three specimens collected on separate days is recommended.		

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Diarrhea, viral (Rota, Noroviruses, Sapovirus, Astrovirus, Enteroviruses (echo- and coxsackieviruses)), Enteric Adeno (Type 40–41), reoviruses	Feces (Fill container no more than ½ full). No fixative.	Viral culture	VD
		NAAT	VD
NOTES: Fecal swab is a suboptimal specimen. Outbreaks should be noted on requisition. Contact the regional MOH to establish outbreak or FBI status and obtain code for clinical specimens.			
Diphyllobothrium (*Diphyllobothrium species* (fish tape worm))	Feces, in SAF Segments of worm in feces	Microscopy for ova and segments	PA
NOTES: Treatment of infected individuals is recommended.			
Diphtheria (Corynebacterium diphtheriae)	Isolate	Confirmation and Toxigeniicty	CM
	Throat swab NPS, Ear swab Swab from skin lesion in TM	Culture	
	Clotted blood or serum	Serology	SE
NOTES: If symptoms are suggestive of *C. diphtheriae* infection, please indicate on requisition "suspect *C. diphtheriae*". Toxigenicity tests are performed on all *C. diphtheriae* isolated. Serology for immune status testing only.			
Deodenal and gastric Ulceration	Gastric Biopsy Clotted blood or serum	Culture Serology	CM SE
NOTES: Submit biopsy material in a wide-mouthed, screw-capped, sterile container with sufficient sterile saline to keep moist. Transport ASAP. If a delay is anticipated, transport with ice packs. For serology, please note on requisition if patient is on treatment. Pre- and 6–12 months post-bloods will be tested together.			
Dysentary, amebic (*Entamoeba histolyica*)	Feces in SAF	Microscopy for trophozoites and cysts	PA
	Clotted blood or serum	Serology (Referred out)	SE
NOTES: IHA serology relevant only for extraintestinal amebiasis.			
Dysentery, bacillary (see also Shigellosis) (*Shigella spp.*)	Isolate Feces	Speciation/typing NAAT Culture	CM
NOTES: Submit feces or rectal swab. Send material containing blood or mucus if these are present. Outbreak should be noted on the requisition. Contact the Regional MOH to establish outbreak or FBI status and obtain outbreak code for clinical specimens. Refrigerate if delay in transport.			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Ear infections Otitis externa Acute otitis media, Otomycosis (Several species of bacteria and fungi)	Ear swab in TM Pus aspirated through intact eardrum	Microscopy and culture	CM
NOTES: Place swab in transport medium. Mixed cultures generally occur; only pathogenic bacteria are reported unless a special request is made.			
Eastern equine encephalitis (see Arbovirus infections)			
EBV (Epstein Barr Virus) See Infectious Mononucleosis			
Echinococcosis (*Echinococcus granulosus, E. multiocularis*)	Serum	Serology (Referred out)	SE
NOTES: Sensitivity of test will vary depending on size, integrity and location of cyst.			
Echovirus infections Aseptic meningitis, Rash, Diarrhea, Upper respiratory infection (Echoviruses, types 1–34)	Throat swab in UTM, feces, NP, BAL, ETT CSF	Viral culture NAAT NAAT	VD
NOTES: See Coxsackie infections			
Ectoparasites (Arthropods) See also Scabies	Parasite Hair with nits	Identification Microscopy and/or visual	PA
NOTES: Send in alcohol, if possible.			
Encephalitis, viral, including epidemic, sporadic, and post- infectious types (Many viruses including arbo- herpes- myxo-, paramyxo-, entero-, and poxviruses)	Throat swab in UTM Biopsy material (brain) Autopsy material in TM Feces CSF	Viral culture NAAT	VD
NOTES: Biopsy material of brain may be sent in suspected herpes encephalitis. Consult with the laboratory before submitting brain biopsies. Never place the brain biopsy in formalin.			
Enteric fever (see Typhoid fever)			
Entamoeba histolytica (*see Dysentery, amebic, Amebic encephalitis, Amebic hepatitis*)			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Enterobiasis (*Enterobis vermicularis*)	Clear sticky tape applied to peri-anal region	Microscopy for ova	PA
NOTES:	Pinworm ova are collected by pressing sticky side of clear cellophane (Scotch) tape against the peri-anal skin first thing after waking. The tape is then pressed onto a glass slide and sent for microscopic examination. Repeat exams may be necessary.		
Enterococcus colonization Entercoccus (VRE) (See below)	Swabs from rectum or ostomy, wounds, open skin lesions and/or line or device sites in TM Isolate	VRE Screen Typing	CM
NOTES:	VRE or suspected VRE isolates may also be forwarded to CPL for genetic typing (Van A, , C), and/or pulsed-field gel electrophoresis (PFGE).		
Enterococcus infection (*Enterococcus faecalis, E. faecium*, and other species) (See above)	Swab from wound in TM Infected body fluid	Culture	CM
Enterocolitis (*Yersinia*) (See Diarrhea, bacterial and *Yersinia* infections)			
Enterovirus infections (see also Coxsackievirus infections; Echovirus infections; Poliomyelitis)	NP swab in UTM Feces CSF, NP, BAL, ETT	Culture NAAT	VD
Epidemic Keratoconjunctivitis (see Adenovirus Infections and Conjunctivitis)			
Epidemic myalgia or pleurodynia (see Coxsackie virus Infections)			
Epiglottitis, acute (*Haemophilus Influenzae*)	Nasopharyngeal swab in TM Throat swab in TM	Culture	CM
NOTES:	Rapidly progressive, often fatal disease. Take respiratory tract specimens only after intubation. Mark requisition as "suspected epiglottitis" to ensure appropriate processing in the lab.		
Epstein Barr Virus (EBV) (See Infectious Mononucleosis)			
Equine encephalitis, Eastern, Western or Venezuelan forms (see Arbovirus infections)			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Erysipelas (see Streptococcal infections)			
Erysipeloid (*Erysipelothrix rhusiopathiae*)	Inject saline into lesion and re-aspirate Biopsy	Culture	CM
NOTES: History of animal or fish contact is usual in this cutaneous disease, usually of the hand and fingers. Clean and disinfect skin before sampling.			
Erythema infectiosum (5th disease) (Parvovirus B_{19})	Clotted blood, serum or plasma EDTA blood	Serology IgM & IgG NAAT (referred out)	SE VD
ESBL (Extended-Spectrum Beta lactamase) (*E. coli, Lebsiella spp.*)	Isolate Screening Rectal swab	EBL confirmation Culture	CM
Fasciola (*Fasciola gigantica* *F. hepatica*)	Feces in SAF	Microscopy	PA
Fetal neural defects, trisomy 21 or 18 and SLOS (Maternal serum screening, AFP) (see also Quad Test)	Clotted blood or serum between 15–18 weeks gestation Amniotic fluid (AFP only)	Chemiluminescent immunoassay	NBS/ PHC
NOTES: Submit with the fully completed maternal serum screening requisition.			
Filariasis (see also Loiasis; Onchocerciasis) (*Wuchereria bancrofti*)	Blood smear, thick or think or Blood with anti-coagulant Clotted blood or serum	Microscopy for microfilariae Serology (Referred out)	PA SE
NOTES: Some specimens are periodic so optimal collection times may vary. Consult with Parasitology at CPL at 204–945–7825.			
Food poisoning, acute bacterial, viral and toxic forms (see also Botulism) (*Staphylococcus aureus, Salmonella spp., Clostridium perfringens,Listeria spp., Shigella spp., Vibrio spp., Bacillus cereus Yersinia spp.*, Verotoxin Norovirus and other enteric viruses	Feces – fill container minimum 1/3 full and no more than ½ full. No fixative Isolate Clotted blood or serum	NAAT, Culture, tests for toxin where indicated Typing as indicated Serology (Referred out for Yersinia) Culture NAAT	CM SE VD
NOTES: Outbreaks should be noted on the requisition. Contact Regional MOH to establish outbreak or FBI status and obtain outbreak code for clinical specimens.			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Galactomannan antigen	Serum, BAL	Ag detection, EIA (Referred out)	SE
Galactosemia and galactosemia variants	Newborn screening card	Spectrophotometry	NBS/ PHC
Gas Gangrene (*Clostridium perfringens, C. septicum, C. novyi* and other species)	Swabs from lesions in TM Necrotic tissue	Microscopy and culture	CM
NOTES: Anaerobic streptococci may cause similar lesions			
Gastritis, peptic ulcers (see Duodenal and Gastric Ulceration)			
Gastroenteritis (see Diarrhea – bacterial, infantile, parasitic and viral. Food poisoning)			
German measles (see Rubella)			
Giardia (*Giardia lamblia*)	Feces in SAF	Microscopy for trophozoites and cysts	PA
NOTES: Examination of duodenal aspirates may be helpful			
Gonorrhea (*Neisseria gonorrhoeae*)	GenProbe Aptima swab of urethra, cervix, prepubertal vagina, conjunctiva	NAAT	CM
	Urine (first void 20–30 mL) (see section 2.2)	NAAT	
	Swab of throat, rectum, ovaries and fallopian tubes, vagina in charcoal TM Joint aspirate Isolate	C&S Typing and sensitivity	
NOTES: For GenProbe Aptima unisex swab collection kits, immerse blue swab in the provided preservative. Do not discard liquid or swab. Positive GenProbe samples are retained for 3 weeks in the event further testing is required. Conjunctival swabs in charcoal transport media for culture are preferred, if transport time is less than 48 hours. If eye swab submitted for NAAT, results will be reported as "for investigational purposes only."			
Group B Streptococcus galactiae (prenatal screen) (see Streptococcal infections)			
Guillain-Barre syndrome (Echo, Coxsackie, EBV, WNV, *Campylobacter*)	NP swab in UTM Feces CSF Feces	Viral culture NAAT NAAT Culture	VD CM

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Hand-food-and-mouth disease (Coxsackie group A viruses, especially types 16 and 9)	Vesicle fluid or swabs Feces NP swabs in UTM	Viral culture	VD
Hantavirus (Muert canyon virus_ (Sin Nombre virus)	Clotted blood or serum Tissue	Serology Referred out to Federal lab	SE VD
Helicobacter pylori (see Duodenal and gastric ulcerations)			
Hemolytic uremic syndrome (HUS) (Verotoxin producing *Escherichia coli, Shigella*)	Feces – fill container minimum 1/3 full no more than ½ full.	Direct fecal Verotoxin test (FVT) VT fro Colony Sweeps (VT/PECTS)	CM
NOTES: Send refrigerated stool as soon as possible without transport medium or fixative.			
Hepatitis A (Infectious hepatitis) (Hepatitis A virus)	Clotted blood Serum or (EDTA) plasma	Serology	SE
NOTES: Anti-HAV IgM is present in patients with acute hepatitis A infections. Presence of Anti-HAV IgG indicates immunity			
Hepatitis B (Serum hepatitis) (Hepatitis B Virus)	Clotted blood Serum or (EDTA) plasma	Serology Viral load	SE
NOTES: HBsAg is present in patients with acute or chronic hepatitis. For interpretation of other tests, contact the laboratory.			
Hepatitis C (Hepatitis C Virus)	Clotted blood, serum or EDTA plasma	HCV antibody, LIA, HCV antigen, Viral load Genotyping	SE
NOTES: Hepatitis C accounts for a large proportion of cases of what was previously known as Non A-Non B Hepatitis.			
Hepatitis D, E	Clotted blood, serum or EDTA plasma	Serology (Referred Out) Molecular detection and genotyping by RT-PCR (Referred out)	SE
Herpangina (Coxsackie A viruses)	Swab from lesions Throat swabs in UTM Feces	Viral culture	VD
NOTES: Infrequently isolated in tissue culture.			
Herpes B Virus (*simian* herpes) (See Cercopithecine herpes virus)			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Herpes simplex virus infections (including herpes encephalitis, neonatal herpes, eczema herpeticum, genital herpes) (Herpes virus type I and II)	Cerebrospinal fluid Vesicle fluid Base of lesion swabbed vigorously in UTM Throat swab, Biopsy material, Autopsy material or urethral swab in UTM	NAAT Viral culture (requires Medical Director approval) DFA (with ID approval)	VD
	whole blood (EDTA)	NAAT (referred out) requires medical director's approval	VD
	Clotted blood and serum or plasma	Serology	SE
NOTES: For herpes encephalitis, brain biopsy may be sent after consultation with CPL Virology Section. A positive serum HSV IgM test is suggestive of a recent infection.			
Herpes zoster (see Chickenpox)			
Heterophyiasis (*Heterphyes heterphyes Metagonimus yokogawai Opisthorchis*)	Feces in SAF	Microscopic examination for ova	PA
NOTES: Occurs in Middle and Far East and Southern Europe.			
Histoplasmosis (*Histoplasma capsulatum*)	Clotted blood serum	Serology (Referred out)	SE
NOTES: Histoplasma capsulatum may be present in soil contaminated by birds and bats. Consult with the Lab & clearly mark requisition "Histoplasma suspected". Phone lab prior to transporting – 204–945–6805.			
Hookworm disease, ancylostomiasis (see also Trichostrongyliasis) (*Ancylostoma duodenale, Necator americanus, Trichostrongylus species*)	Feces in SAF	Microscopy examination for ova and larvae	PA
Hydatid Disease (see Echinococcosis)			
Hymenolepiasis (*Hymenolepsis nana H. diminuta*)	Feces in SAF	Microscopy examination for ova	PA
Impetigo (*Streptococcus Pyogenes, Staphylococcus aureus*)	Swabs from lesions in charcoal TM	Culture	CM
	Clotted blood or serum	Serology (streptococcal)	SE
NOTES: Nephritis is occasionally associated with impetigo. Culture is most indicated during outbreaks.			
Infantile diarrhea (see Diarrhea, Infantile)			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Infectious hepatitis (see Hepatitis, A, B, C, D, E)			
Influenza (Influenza viruses types A and B)	Nasopharyngeal swab or aspirate in UTM Throat swab or washing in UTM Autopsy material (lung) In UTM, BAL, Tracheal aspirates	Viral culture NAAT	VD
NOTES: Outbreaks should be noted on the requisition. Contact the regional MOH to establish outbreak and obtain code for clinical specimens			
Kala Azar (see Leishmaniasis, visceral form)			
Keratoconjunctivitis, viral (see Adenovirus infections; herpes simplex infection)			
Laryngitis, bacterial and acute laryngotracheo-bronchitis (croup) (*Corynebacterium diphtheria, Haemophilus influenza, Streptococcus pyogenes* and other organisms)	Throat swab in TM Aspirated respiratory secretion	Culture	CM
NOTES: The majority of cases are caused by viruses. When submitting swabs, clearly indicate on requisition if *Haemophilus influenza* is suspected.			
Laryngitis, viral and acute laryngotracheo-bronchitis (croup)	NPA, NPS Throat swab in UTM	Viral culture	VD
(Several viruses, including adeno-, parainfluenza, measles, respiratory syncytial, influenza, rhino- and echoviruses)	NP, BAL, ETT	NAAT	VD
NOTES: Send specimens for viral isolation on a cold pack. DO NOT FREEZE.			
Legionnaires' disease (*Legionella pneumophila*)	Sputum Lung biopsy Bronchoscopy Specimens Tracheal secretions or aspirates	Culture DFA	CM
	Isolate Urine	Typing Antigen detection	
	Paired clotted blood or serum 21 days apart	Serology	SE
NOTES: May mimic viral pneumonia. DFA not done on sputum. Transport specimens in sterile dry containers. Add a small amount of sterile non-bacteriostatic, distilled water to prevent desiccation if necessary. Do not add saline due to its inhibitory effect. Refrigerate in transit.			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Lesishmaniasis, cutaneous form (*Leishmania tropica*)	Biopsy from edge or base of lesions in skin Smear from edge of base of lesion	Microscopy Culture/PCR (Referred out)	VD PA
	Clotted blood or serum	Serology (Referred out)	SE
Leishmaniasis, mucocutaneous form (Espundia) (*L. bransiliensis, L. mexicana*)	Skin biopsy	Culture/PCR (Referred out)	PA
	Smear from edge or base of lesion	Microscopy	
	Clotted blood or serum	Serology (Referred out)	SE
Consult the laboratory before sending for culture/PCR. Special transport media required. NOTES: Occurs in Mexico, Central and South America			
Leishmaniasis, visceral form (Kala Azar) (*L. donovani*)	Bone marrow films Biopsy material (spleen, liver, lymph nodes)	Microscopy PCR (Referred out) Culture (Referred out)	PA SE
	Clotted blood or serum	Serology (Referred out)	SE
Consult the laboratory before sending for culture/PCR. Special transport media required.			
Leprosy (*Mycobaterium leprae*)	Biopsy of tissue affected, usually skin nods. Nasal scrapings	Microscopy (Referred out)	CM
NOTES: *M. leprae* cannot usually be culture in vitro. Diagnosis is essentially a pathologic or clinical one, supported by demonstration of acid-fast bacilli in the specimen. Referred to HSC TB lab. For further information, call HSC TB lab at 204–787–7652.			
Leptospirosis (*Leptospira ictero-haemorrhagiae, L. canicola, L. Pomona* and others)	Blood, Urine Autopsy material (liver, kidneys), CSF	PCR (Referred out)	CM
	Clotted blood or serum	Serology (Referred out)	SE
NOTES: Consult the laboratory before sending for PCR. Most infections are diagnosed serologically.			
Listeriosis (*Listeria monocytogenes*)	Blood, CSF, Vaginal swab, Amniotic fluid, placenta	Microscopy and culture	CM
	Isolate	Typing	
NOTES: May cause meningitis, or granulomatous disease in the newborn or fetal death. Please indicate "possible Listeriosis" on requisition. Stools may be appropriate specimens during an outbreak investigation			
Loiasis (*Loa loa*)	Thick and think blood films, blood with anti-coagulant	Microscopy examination for microfilariae	PA
Lung fluke disease (see Paragonimiasis)			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Lyme Disease (*Borrelia burgdorferi*)	Biopsy of tissue, CSF	Molecular testing (Referred out)	CM
	Clotted blood or serum		SE
NOTES: Molecular testing by prior arrangement only. Serology may be negative during first stage erythema chronicum migrans. Lyme CSF serology for IgG (referred out) available by special request. Consult laboratory for specific requirements.			
Lymphocytic choriomeningitis (LCM) (Lymphocytic choriomeningitis virus)	EDTA Blood (early), Urine Cerebrospinal Fluid (late)	Referred out	VD
	Serum	Referred out	SE
NOTES: Provide patient history and onset of illness.			
Lymphogranuloma venereum (LGV) (Chlamydia trachomatis Serovars L1, L2, L3) (see also Chlamydia infections)	Dacron swab of: Bubo Anogenital ulcers (rectal, vaginal, urethral) If no ulcers – cervical, urethral, rectal swabs Fluid aspirate	PCR (Referred out)	CM
	Serum	Referred out	SE
NOTES: Place swabs in UTM and transport as soon as possible. Also submit GenProbe Aptima urine, urethral or cervical swab for routine Chlamydia testing (see: Chlamydia Infections). Routine Chlamydial testing will not specifically confirm LGV and is not a substitute for the required specimens outlined above. A positive result for Chlamydia trachomatis by NAAT testing is required prior to PCR for LGV being done for any given specimen source. Relevant clinical information is required before testing will be performed. Consult CPL at 204–945–7184 prior to collection.			
Malaria (*Plasmodium vivax P. malariae, P. ovale, P. falciparum) P. Knowlesi*	Thick and thin blood films on separate slides or EDTA – whole blood	Microscopy examination for parasites	PA
	Clotted blood or serum	Referred out (only if microscopy is negative)	SE
NOTES: Take films at 6–18 hour intervals for 3 days. Air-dry blood films without heat.			
Measles, including diseases associated with the measles virus; giant cell pneumonia; encephalitis; subacute sclerosing panencephalitis (SSPE) (see also Panencephalitis) (Measles virus)	Throat swab, NP swab Autopsy material (lung, brain) in UTM Cerebrospinal fluid (Referred out) Urine	NAAT-STAT basis (needs prior CPL approval)	VD
	Clotted blood or serum	Serology	SE
NOTES: Presence of IgM is diagnostically significant Consult the CPL Virology section prior to sending culture specimens.			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Meliodosis (*Burkholderia pseudomallei*)	Sputum Swab of abscesses in TM	Culture	CM
NOTES: Endemic in South-East Asia and Northern Australia. Travel history is helpful as it is found in tropical and sub-tropical areas worldwide. Mark requisition clearly if Meliodosis is suspected. Phone lab prior to transporting – 204-945-6805.			
Meningitis, bacterial (see also Meningococcal infections) (*Neisseria meningitides, Haemophilus influenza, Streptococcus pneumoniae, Listeria monocytogenes*, and in the newborn, coliform organisms and Group B streptococci)	CSF, Skin lesions, Swab in TM Isolate	Microscopy and culture Typing	CM
NOTES: Send specimens by most rapid means of transport. If delay in transport is anticipated, send a smear and up to 3 mL of CSF in pediatric blood culture bottle. Transport ASAP.			
Meningitis, viral (*Aseptic meningitis*) coxsackie A and B, echo, mumps, measles, Less common causes are: lymphocytic choriomeningitis, poliomyelitis, herpes simplex, EBV, varicella-zoster, rubella, arboviruses, influenza, adenoviruses	NP swab in UTM Autopsy material in UTM (brain, spinal cord, intestinal contents) Feces Cerebrospinal fluid	Viral culture NAAT	VD
NOTES: Consult with the CPL virology Section prior to collection of brain biopsy. Clinical and epidemiological history must be provided.			
Meningococcal infections, including meningitis and meningococcemia (*Neisseria meningitides*)	CSF Blood culture Swabs from petechial lesions in TM Isolate	Microscopy and culture PCR (consult with laboratory (Referred out) Typing	CM
NOTES: Send specimens by most rapid means of transport. If delay in transport is anticipated, send a smear and up to 3 mL of CSF in pediatric blood culture bottle. Transport ASAP. PCR should not replace culture.			
MERS CoV	NP, BAL, Throat ETT, nasal	NAAT (referred out)	VD
Metapneumovirus infections	NP, BAL, ETT	NAAT	VD
Methicillin-resistant *Staphylococcus aureus* (MRSA) (see Staphylococcus colonization and Staphylococcus infections)			
Microsporidiosis	Feces in SAF	Microscopy for spores	PA
NOTES: Requires special request on requisition for special staining.			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Molluscum contagiosum (see Poxviruses)			
MRSA (See Staphylococcus colonization and Staphylococcus infections)			
Mumps, including complicating meningoencephalitis, pancreatitis or orchitis (Mumps virus)	Buccal swab CSF, Saliva Urine if orchitis present Clotted blood or serum	Viral culture NAAT-STAT basis (needs prior CPL approval) Serology	VD SE
NOTES: Presence of IgM is diagnostically significant.			
Myalgia, epidemic (see Coxsackievirus infections)			
Mycobacteria, atypical (see also Tuberculosis) (*Mycobacterium kansasaii, M. scrofulaceum, M. avium-intracellulare M. marinum (balnei), M. fortuitum*, and others)	Sputum Swabs of skin lesions or pus in Tm Stool, Blood, Body fluids, Tissue, Bone Marrow	Referred out to HSC	CM
NOTES: Please specify that examinations for these organisms are required. Referred to the HSC TB lab. For further information call the HSC TB lab at 204–787–7652.			
Mycoplasma infections (*Mycoplasma pneumoniae*) Mycoplasma pneumonia IgM	Sterile fluids, tissue Respiratory secretions Clotted blood or serum	PCR (Referred out) Serology	CM SE
NOTES: *M. pneumonia* causes primary atypical walking pneumonia. *M. pneumonia* is tested for IgM on only acute samples.			
Mycoplasma Infections – Genital Mycoplasmas (Mycoplasmas hominis, Ureaplasma urealyticum) M. genitalium	Sterile fluids and tissue – neonates and children Plaental swab, amniotic fluid Respiratory secretions (neonates and children) – NOT SPUTUM Urethral/cervical swab*	PCR (Referred out)	CM
*Relevant history required for processing.			
Myocarditis (Coxsackie B and other enteroviruses)	NP swab in UTM Feces Pericardial fluid	Viral culture	VD
Necrotizing fasciitis (Group A *Streptococcus*)	Swab in TM Tissue Isolate	Culture Typing (Referred out)	CM

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Nephritis, acute glomerulo- (see also Streptococcal infections) (Sequelae of *Streptococcus pyogenes infections*)	Nose, throat or skin swabs in TM Clotted blood or serum	Microscopy and culture ASOT Anti-DNase B	CM SE
NOTES: Certain *emm* types (i.e. type 12) of *S. pyogenes* are associated with nephritis; strains isolated from invasive cases will generally be typed but results may not be available for several weeks.			
Nocardiosis (*Nocardia asteroids Nocardia spp.*)	Sputum Pleural fluid Pus in TM	Microscopy and culture	CM
NOTES: Grows slowly in culture. Specify on the requisition if nocardiosis is suspected.			
Non-specific urethritis (see *Trichomoniasis, Herpes simplex, Candidiasis, Mycoplasma, Chlamydia trachomatis*)			
SARS-COV–2 Virus (COVID 19)	Respiratory NP, BAL, ETT	NAAT	VD
Onchocerciasis (see also Filariasis; (*Onchocerca volvulus, Mansonella streptocerca*)	Biopsy of skin Aspirated material from skin nodules Excision of nodule.	Microscopy examination for microfilariae and search for adult worm	PA
Ophthalmia neonatorum (see Conjunctivitis)			
Orchitis, viral (see Mumps)			
Orf (see Poxvirus infections NOTES: Usually transmitted from sheep to man.			
Ornithosis (see Chlamydia infections: respiratory)			
Osteomyelitis, acute (see also Staphylococcal infections) (*Staphylococcus aureus* and other bacterial species)	Blood culture Purulent discharge from skin or other lesions in TM Aspirated pus in TM Swab from primary lesion in TM	Microscopy and culture	CM
Otitis media (see Ear infections)			
Pancreatitis, viral (Coxsackie B virus Mumps virus)	Stool for Coxsackie Buccal swab in UTM and urine for mumps	Viral culture NAAT-STAT basis (needs prior CPL approval)	VD

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Panencephalitis, subacute sclerosing (see also Measles) (Probably associated with measles virus infections)	Clotted blood or serum CSF, Brain biopsy Postmortem specimen	Serology Viral culture (Referred out) NAAT-STAT basis (needs prior CPL approval)	SE VD
NOTES: Consult the laboratory for brain biopsy culture.			
Papilloma virus (Wars-Epidermal (genital) Uterine Cervical Dysplasia, Carcinoma)	Tissue biopsy Exfoliated cervical cells from transformation zone	NAAT (Referred out)	VD
Paracoccidiomycosis (*Paracoccidiodes brasiliensis*)	Clotted blood or serum	Serology (Referred out)	SE
NOTES: Please indicate presumptive paracoccidiodomycosis on requisition.			
Paragonimiasis (*Paragonimus westermani*)	Feces in SAF	Microscopy examination for ova	PA
Parainfluenza virus infections including colds, pharyngitis, laryngitis, bronchiolitis, pneumonia (Parainfluenza viruses)	Nasopharyngeal aspirage, BAL, ear, ETT, ear Throat swab in UTM NP, BAL, ETT	Viral culture NAAT	VD VD
NOTES: Infection may give an anamnestic response to other paramyxoviruses, e.g. mumps.			
Paralytic illnesses caused by viruses (see also Encephalitis, viral, and individual viruses) (Several viruses, especially polio-coxsackie-, echo-, and herpesviruses, and as part of encephalomyelitis, or ascending myelitis syndromes) (Western Equin Ecephalitis) WEE, (St. Louis Encephalitis) SL (West Nile Virus) WNV	NP swab in UTM Biopsy material (brain, spinal cord) Autopsy material in UTM (brain or spinal cord) Cerebrospinal fluid Feces	Viral culture NAAT	VD
NOTES: Consult the CPL Virology section for culture of biopsy material. No serology test available for polio.			
Paratyphoid fever (*Salmonella paratyphi* A, B, or C)	Feces Urine Blood Isolate	NAAT, Culture Typing	CM
Parvovirus B[19] (see Erythema infectiosum)			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Pasteurella infections (see also *Yersinia* infections; Plague) (*Pasteurella multocida*)	Swab from wound in TM Sputum Blood culture	Culture	CM
NOTES: Often transmitted by bites of animals; also causes chronic respiratory infection especially in persons with prolonged contact with animals. Relevant clinical information very helpful.			
Pediculosis (*Pediculus humanus capitus, Pediculus humanus corporis, Phthirus pubis*)	Parasites or ova in hair or under-clothing	Microscopy identification	PA
NOTES: May be submitted in alcohol.			
Pemphigus (*Staphylococcus aureus*)	Swab of vesicle fluid in TM	Microscopy and culture	CM
Pericarditis, viral (Coxsackie B viruses)	Feces Pericardial fluid	Viral culture	VD
Pertussis (*Bordetella pertussis, B. parapertussis B.* holmesii)	NPS, NPA or Nasopharyngeal swab in TM	Culture PCR	CM
NOTES: Organisms are very fastidious, slow growing and difficult to isolate. Transport ASAP. NP swabs for Pertussis PCR must be collected using swabs with non-toxic tips such as dacron or nylon.			
Pharyngitis, bacterial (see also streptococcal infections; Diphtheria) (Several species of bacterial, especially *Streptococcus pyogenes, Corynebacterium diphtheriae, C. ulcerans*)	Throat swab in TM	Culture	CM
NOTES: Indicate any suspicion of diphtheria on requisition.			
Pharyngitis, viral (Many viruses)	NP swab in UTM Feces NP swab or aspirate	Viral culture NAAT	VD
Pinta (*Treponema carateum*)	Clotted blood or serum	Serology tests for syphilis	SE
NOTES: Antibodies to the treponemes of pinta are indistinguishable from those to the treponemes of syphilis by all serologic tests current use.			
Pinworm infection (see Enterobiasis)			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Plague (*Yersinia pestis*)	Pus from buboes in TM. Throat swab in TM, Sputum Blood culture Isolate Confirmation	Culture	CM
	Clotted blood or serum	Serology (Referred out)	SE
NOTES: Consult the laboratory if plague, which is endemic in the southwestern USA, is suspected. Label all specimens "SUSPECT PLAGUE". Phone lab prior to transporting – 204-945-6805.			
Pleurodynia, epidemic (see Coxsackievirus infections)			
Pneumonia, primary atypical (see Mycoplasma infections)			
Pneumonia, bacterial (Several bacterial species, especially *Streptococcus pneumoniae, Streptococcus pyogenes, Staphylococcus aureus, Klebsiella pneumoniae*, and *Haemophilus influenzae*)	Sputum Auger suction or transtracheal aspirate Lung aspirate Biopsy	Microscopy and culture	CM
Pneumonia, viral (Numerous viruses)	Nasopharyngeal swab or aspirate in UTM Autopsy material (lung) in UTM	Viral culture NAAT	VD
Poliomyelitis (Polioviruses, types 1, 2, and 3)	Feces Cerebrospinal fluid Autopsy material (brain, spinal cord, intestinal contents) in UTM	Viral culture NAAT	VD
Poxvirus infections (Poxviruses: cowpox, vaccina, contagious pustular dermatitis (Orf). Milker's nodes (paravaccinia), and molluscum contagiosum))	Vesicle fluid, Exudate from skin lesions, Skin crusts, Scrapings from skin lesion in UTM Lesion smear	Referred Referred	VD
Protein 14-3-3 (see CJD)			
Psittacosis (see Chlamydophila infections: respiratory)			
Puerperal fever (Usually haemolytic streptococci)	High vaginal swab in TM Nose and throat swab in TM from mother Umbilical swab in TM from baby	Culture	CM
NOTES: If haemolytic streptococcal infection is suspected, take nose and throat swabs from the mother, and umbilical swab from baby.			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Pyoderma (Streptococcus pyogenes Staphylococcus aureus)	Swab in TM	Culture	CM
Pyrexia of unknown origin (PUO) (Infection due to various bacteria and other agents)	Feces, Urine	Culture	CM
	Clotted blood or serum	Serologic tests for enteric fever, brucellosis, tularemia and other infections	SE
Q fever (*Coxiella burnetii*)	Clotted blood or serum	Serology (Referred out)	SE
Quad Test (AFP/uE3/HCG/DIA)	Clotted blood or serum	Chemiluminescent immunoassay	NBS/PHC
Rabies (Rabiesvirus)	Clotted blood or serum	Serology (Referred out)	SE
	Biopsy material	Referred out	VD
NOTES: Rabies serology only for post vaccine immune status testing. Consult with CPL in advance to arrange biopsy collection and transport.			
Reiter's syndrome (see Non-specific urethritis)			
Relapsing fever, louse or tick-borne (*Borrelia spp.*)	Blood films Blood in citrate		
	Serum		
Reovirus infections including upper respiratory infections and diarrhea (Reoviruses, types 1, 2, and 3)	Feces Throat swab in TM	Viral culture	VD
Respiratory infections, acute bacterial (see also under individual syndromes and diseases) (Several bacterial species; especially *Corynebacterium diphtheriae, Streptococcus pneumoniae*, and *Haemophilus influenzae*)	Sputum Auger suction Throat swab in TM	Microscopy and culture	CM

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Respiratory infections, acute viral (see also under individual syndromes and diseases) (Numerous viruses, especially adeno-, rhino-, coxsackie-, influenza, and respiratory syncytial virus)	NPA, NPS NP swab, Autopsy material (lung) in UTM BAL, ETT	Viral culture NAAT	VD
Respiratory syncytial virus infections (Respiratory syncytial virus)	Nasopharyngeal aspirate in UTM NPS,ETT, BAL, Nasal Autopsy material (lung) in UTM	Viral culture NAAT (NP, BAL, ETT only) Culture only	VD
NOTES: Virus unstable and specimens should NOT BE FROZEN, but should be kept cool (i.e. on cold pack). Transport to CPL as soon as possible after collection.			
Rheumatic fever (see also Streptococcal infections) (A sequelae to infection with *Streptococcus pyogenes*)	Throat swab in TM Clotted blood or serum	Culture Serology (ASOT, Anti-DNase B)	CM SE
Rhinovirus infections (see common cold)			
Rickettsial infections, Louse-borne typhus, Rocky Mountain Spotted Fever, Rickettsial pox Scrub typhus (see also Q fever) (*Rickettsia prowazekii* *R. typhi, R. rickettsia* *R. Akari, Orientia Tsutsugamushi* Various other species)	Clotted blood or serum	Serology (Referred out)	SE
Ringworm (see Dematophytosis)			
Rocky Mountain Spotted Fever (See Rickettsial infections)			
Rotavirus	Feces	NAAT	VD
Rubella, German measles (Rubella virus)	Clotted blood, serum or plasma Aborted material Placenta Throat swab in UTM Urine	Serology (Rubella IgG avidity – referred out) Viral culture NAAT (Referred out)	SE VD

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Rubella, congenital rubella syndrome (Rubella virus)	Urine Nasal swab, Throat swawb, Autopsy material (all organs) in UTM Cerebrospinal fluid	Viral culture NAAT (Referred out)	VD
	Clotted blood or serum	Serology	SE
NOTES: Infants with congenital rubella infection may excrete virus in the urine for many months after birth.			
Rubeola (see Measles)			
Salmonella (see also Typhoid fever, paratyphoid fever, and food poisoning) (*Salmonella spp.*, over 2000 named serotypes)	Feces, Blood culture Urine Isolate	NAAT Culture Typing	CM
NOTES: In suspected typhoid/paratyphoid fever, cultures of blood and urine are indicated. Outbreaks should be noted on requisition. Contact the regional MOH to establish outbreak or FBI status and obtain outbreak code for clinical specimens.			
Salpingitis (see Gonorrhea)			
SARS (Severe acute respiratory syndrome) (SARS coronavirus)	Clotted blood or serum Nasopharyngeal aspirate Stool	Serology (Referred out) Viral culture (Referred out) NAAT (Referred out)	SE VD
NOTES: SARS investigation referred to NML. Please contact CPL prior to submission of specimens.			
Scabies (*Sarcoptes scabiei*)	Scrapings of skin at edge of tracks	Microscopy examination for mites	PA
Scarlet fever, scarlatina (see Streptococcal infections)			
Schistosomiasis (*Schistosoma haematobium*, *Schistosoma japonicum*, *Schostoma mansoni*)	Urine, for S. haematobium Feces in SAF Clotted blood or serum	Microscopy examination for ova Serology	PA
Schistomal dermatitis (Swimmer's itch) (Trichobilharzia species)		No useful test	
NOTES: Common in lakes in North America. Notify regional MOH if suspected.			
Scrub typhus (see Rickettsial infections)			
Septicemia (Numerous bacteria)	Swabs of septic lesions in TM Urine	Culture	CM
NOTES: Cultures should be taken from any suspected focus of infection.			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Serum hepatitis (see Hepatitis B)			
Severe acute respiratory syndrome (SARS) (See SARS)			
Shigellosis (*Shigella flexneri, Shigella sonnei, S. dysenteriae, S. boydii*)	Feces Rectal swab in TM Isolate	NAAT Culture Typing	CM
Shingles, zoster (see Chickenpox)			
Sore throat (see Pharyngitis)			
Spotted fever (see Rickettsial infections)			
St. Louis encephalitis (see Arbovirus infections)			
Staphylococcus colonization (MRSA, Methicillin resistant *Staphylococcus aureus*) (See also Staphylococcus infections)	Swabs from nares, throat, rectum or ostomy, wounds, line or device sites in TM Isolate	MRSA Screen Confirmation	CM
NOTES: MRSA isolates may also be forwarded to CPL for pulsed-field gel electrophoresis (PFGE).			
Staphylococcus infections (*Staphylococcus aureus* and some members of the coagulase-negative Staphylococci) (See also Food poisoning) (See also Staphylococcus colonisation)	Wound or nasal swab in Tm Infected body fluids Urine CSF	Microscopy and culture	CM
NOTES: *Staphylococcus aureus* is commonly present in the nose and is reported in nasal swabs only if the requisition indicates that there is a lesion on the nasal passages or in the search for a carrier in relation to food poisoning or hospital outbreaks.			
Streptococcal infections including scarlet fever (scarlatina), erysipelas, epidemic streptococcal sore throat and streptococcal-related illnesses such as acute glomerulonephritis, rheumatic fever. Necrotising fasciitis, toxic shock syndrome (*Streptococcus pyogenes* and other groups of streptococci)	Throat swab in TM Exudate from infected area	Culture	CM
	Clotted blood or serum	Serology	SE
NOTES: The current serologic tests are the ASOT and the ADB titres. An ASOT result of 200 or greater is diagnostically significant. ADB is referred out.			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Group B Streptococcus agalactiae (prenatal screen)	Combination vaginal/rectal swab	Culture	CM
NOTES: Prenatal screen recommended at 35–37 weeks gestation. Culture performed only with clinical information indicating pregnancy. As this is a transient colonizer, a negative culture does not guarantee absence of GBS at time of labour. Please indicate on requisition if patient is penicillin allergic.			
Strongyloidiasis (*Strongyloides stercoralis*)	Feces in SAF	Microscopy examination for larvae	PA
	Clotted blood or serum	Serology	SE
NOTES: Single blood is adequate			
Subacute sclerosing panencephalitis (See Panencephalitis)			
Swimmer's itch (see Schistosomal dermatitis)			
Syphilis (*Treponema pallidum*)	Swab, CSF, (min 0.5 mL), whole blood (min. 0.5 mL) EDTA or tissue biopsy	PCR (Referred out)	SE
	Cerebrospinal fluid Clotted blood or serum	Serology (FTA-ABS on CSF – Referred out)	
NOTES: Note that certain other treponemal infections, notably yaws, cause positive reactionsin ALL the serologic tests used in the diagnosis of syphilis. Include relevant clinical signs or history for optimal testing. Placenta tissue may be submitted in cases of suspected congenital syphilis. Use Copan swabs in UTM to obtain specimens from the leading edge of the ulcer (serous exudate). Store and ship swabs, CSF and whole blood samples frozen if specimen cannot be forwarded to CPL the day of collection.			
Tapeworms (see Taeniasis and Diphyllobothriasis, Hymenolepiasis, Echinococcosis)			
Taeniasis (*Taenia saginata* *Taenia solium*)	Feces in SAF Worm, including segments	Microscopy examination for ova, and identification of segments	PA
NOTES: *T. saginata* – beef tapeworm. *T. solium* – pork tapeworm.			
Tetanus (*Clostridium tetani*)	Swabs from wounds and other lesions in TM	Microscopy and culture	CM
		Serology	SE
NOTES: See anaerobic culture for specimen submission details. Serology for immune status testing only.			
Throat infections (see Pharyngitis)			
Thrush (see Candidiasis)			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Toxocariasis (see Visceral larva migrans)			
Toxoplasmosis	Clotted blood or serum Biopsy Contact Parasitology lab	Serology Microscopy	SE PA
Trachoma (see Chlamydial Infections *Chlamydia trachomatis*)			
Trichinosis (*Trichinella spiralis*)	Biopsy of muscle Serum (Preferred)	Examination for larvae Serology (Referred out)	PA SE
NOTES: A single serum sample is adequate.			
Trichinosis (*Trichinella spiralis*)	Biopsy of muscle Serum (Preferred)	Examination for larvae Serology (Referred out)	PA SE
Trichostrongyliasis (see also Hookworm disease) (*Trichostrongylus species*)	Feces in SAF	Microscopy examination for ova	PA
NOTES: Occurs in Russia and the Orient.			
Trichuriasis (*Trichuris trichiura*, whipworm)	Feces in SAF	Microscopy examination	PA
Trypanosomiasis, African (*Trypanosoma rhodesiense, T. gambiense*)	Blood films, thick and think Lymph node aspirated Clotted blood or serum	Microscopy examination Serology (Referred out)	PA SE
NOTES: Occurs in Tropical Africa.			
Trypanosomiasis, American (See Chagas' disease)			
Tuberculosis (*Mycobacterium tuberculosis, M. Bovis*)	Sputum Fluids from body cavities, joints, etc. Biopsy material (tissue, lymph glands, uterine curettings) Gastric washings Cerebrospinal fluid Purulent exudate in TM Urine, three early morning specimens	Referred out to HSC	CM
NOTES: Send early morning sputa on three consecutive days. All specimens are referred to HSC TB lab for culture. Positive results are sent as soon as available, but negatives are held for 8 weeks prior to being reported. For patients without spontaneous sputum, induction of cough and sputum by inhalation of a warm sterile aerosol of saline is preferred to gastric aspiration. Submission of both induced sputum and gastric contents give the best results. For further information call the HSC TB lab at 204–787–7652.			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Tularemia (*Francisella tularensis*)	Clotted blood or serum	Serology (Referred out)	SE
	Swab from ulcer in TM Aspirated material from lymph nodes Blood culture Suspected isolate	Microscopy and culture	CM
NOTES: Culture examination only by special arrangement with the laboratory. Requisition should indicate "Suspect tularemia". Phone the lab prior to transporting – 204-945-6805.			
Typhoid fever (Enteric fever) (*Salmonella typhi*)	Feces Urine Blood	Culture	CM
Typhus fever (see Rickettsial infections)			
Undulant fever (see Brucellosis)			
Urethritis (see Gonorrhea, Candidiasis, Chlamydia, Trichomoniasis, Herpes simplex, Mycoplasma)			
Vaccina (see Poxvirus infections)			
Vaginitis (see Gonorrhea, Trichomoniasis, Streptococcal infections, Candidiasis, Chlamydia infections)			
Varicella (see Chickenpox)			
Vancomycin-resistant Enterococcus (VRE) (See Enterococcus colonization and Enterococcus infections)			
Venezuelan equine encephalitis (see arbovirus infections)			
Vibrio infections (Cholera is listed separately) (see also food poisoning, diarrhea, bacterial)	Blood culture Feces Wound	Microscopy and culture	CM
Vincent's angina (*Fusobacterium fusiforme* concomitant with *Borrelia vincenti*)	Air dried smear from gums	Microscopy	CM
Viral hepatitis (see Hepatitis A, B, C, D, E)			

Disease or Syndrome (Causal Agent(s))	Specimen Requirements	Tests / Examinations	Section
Visceral larva migrans (*Toxocara spp.*)	Clotted blood or serum	Serology (Referred out)	SE
NOTES: There are considerable cross-reactions in serologic tests with Toxocara and Ascaris antigens.			
Well's disease (see Leptospirosis)			
Western equine encephalitis (see Arbovirus infections)			
West Nile Virus (WNV) infections (See also Arbovirus infections)	Clotted blood or serum	Serology	SE
NOTES: Serum in all cases is the specimen of choice			
Whooping cough (see Pertussis)			
Worm infections (see also under individual parasites)	If possible send whole worm in saline Fix in 10% formalin	Identification	PA
Wound infections (Different species of aerobic and anaerobic bacteria)	Wound swab in TM	Microscopy and culture	CM
NOTES: See wound specimen collection.			
Yaws (*Treponema pertenue*)	Clotted blood or serum	Serological tests for syphilis	SE
NOTES: Antibodies to the treponeme of yaws are indistinguishable from those to the treponeme of syphilis by all the diagnostic tests in current use.			
Yellow fever (see also Arbovirus infections)	EDTA blood	PCR (Referred out)	SE
NOTES: For post-vaccine illness only.			
Yersinia infections (see also Diarrhea; Plague) (*Yersinia Enterocolitica, Y. pseudotuberculosis*)	Blood culture Feces, Swab from abscess in TM Excised mesenteric lymph nodes	Culture	CM
	Clotted blood or serum	Serology (Referred out)	SE
NOTES: May cause enteritis, terminal ileitis and mesenteric lymphadenitis or chronic enteritis.			
Zika	Molecular detection (Referred out) Serology (IgM/IgG) (Referred out)	Serum Urine Serum	
NOTES: Need date of onset of symptoms, clinical and travel history of patient. Please call CPL physician on call with questions.			
Zoster (see Chickenpox)			

8.0 FORMS AND REQUISITIONS

CPL forms and requisitions are available at: ***www.manitoba.ca/health/publichealth/cpl/forms***.

Requisitions are also available by faxing a Supplies Request Form (also available at this website) to 204–786–4770.

Cadham Provincial Laboratory

INFECTIOUS SPECIMEN TRANSPORT GUIDELINES

To see the current TDG regulations, visit:
https://ww.tc.gc.ca/eng/tdg/clear-menu–497.htm

NOTES:

1) Probable Level III and Level IV organisms require the shipper to notify CPL prior to shipment to CPL at 204–945–6805.
2) Level III and Level IV organisms should only be shipped during regular business hours and not on weekends or holidays.
3) If a specimen needs to be shipped after hours or on the weekend or holidays, please follow the callback procedure under General Guide to Laboratory Use.

BLUE TRANSPORT BOX OR COOLER PACKAGING DIRECTIONS:

When packaging ***DIAGNOSTIC SPECIMENS FOR TRANSPORT***:

MICROBIOLOGY and VIROLOGY specimens:

- Put diagnostic specimen into a sealable Ziploc® specimen bag with requisition in the outer pocket.
- Put tissue specimens for viral studies in viral transport media vials and into a sealable Ziploc® specimen bag with requisition in the outer pocket.
- Put tissue specimens for microbiology in sterile screw cap containers with a small amount of sterile saline into a sealable Ziploc® specimen bag with requisition in the outer pocket.
- Put bag, with specimen upright into the transport box or cooler, ensuring that white absorbent pads line the bottom of the blue transport box or cooler. Securely close transport box/cooler when finished.
- For large numbers (>10) of GC/chlamydia swabs, arrange swabs in a rack with corresponding requisitions in order. Place the rack in a large Ziploc® bag with absorbent pads. Place the requisitions in another Ziploc® bag. Place rack and requisitions in the transport box or cooler.

URINE and STOOL specimens:

- Put tightly closed specimen containers into a sealable Ziploc® specimen bag and seal.
- Place requisition in the outside pocket of the sealable Ziploc® specimen bag.
- Put bag, with specimen upright, into the transport box or cooler, ensuring that white absorbent pads line the bottom of the blue transport box or cooler.
- Securely close the transport box or cooler when finished.

DIAGNOSTIC BLOOD specimens in venipuncture tubes:

- Centrifuge all SST before shipping.
- For individual tubes, place specimen into a sealable Ziploc® specimen bag with requisition in the outer pocket.
- For large numbers (>10) of tubes, arrange tubes in a rack with corresponding requisitions in order.
- Place rack in a large Ziploc® bag with absorbent pads. Place rack in blue transport box or cooler.
- Place all requisitions in a large sealable Ziploc® bag and place in blue transport box or cooler.
- Securely close blue transport box or cooler when finished.

NEWBORN SCREENING COLLECTION CARDS:

- Ensure blood spot is air dry and each card's flap is folded over.
- Place card(s) in the main body of the box and NOT BETWEEN the box and the Styrofoam liner.
- Securely close transport box or cooler when finished.
- Ensure cards remain dry throughout transport and place in plastic bag if necessary.

Note: Ship transport box or cooler as per your facility protocol.

FROZEN specimens:

- Put diagnostic specimen into a sealable Ziploc® specimen bag. For large numbers (>10)s of specimens, arrange specimens in a rack with corresponding requisitions in order. Place the rack of specimens in a Ziploc® specimen bag.
- Put requisitions into a separate Ziploc® bag.
- Place this bag over coolpack/icepack and put both into a sealable Ziploc® specimen bag. Make sure that the ice pack is not in direct contact with the sample or requisition so it (requisition) does not get wet if it thaws.
- If crushed ice is used, place the crushed ice inside the Ziploc® specimen bag with the specimen in the outer pocket. Fold the bag so the specimen is wrapped round by the ice. Then place this in a second Ziploc® specimen bag with the requisition in the outer pocket.
- Put specimens and requisitions into transport box or cooler, ensuring that white absorbent pads line the bottom of the transport box or cooler.
- Securely close transport box or cooler when finished.

SPECIMENS FOR TRANSSHIPPING:

CYTOLOGY or HISTOLOGY specimens:

- Follow collection and specimen guidelines for the lab receiving the specimen.
- Securely close the specimen container and place in a sealable Ziploc® specimen bag and seal bag.
- Place requisition in the outside pouch of the sealable Ziploc® specimen bag.
- Put into blue transport box or cooler, ensuring that white absorbent pads line the bottom of the cooler.
- Securely close blue transport box or cooler when finished.

CADHAM PROVINCIAL LABORATORY

Manitoba Health