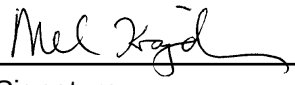
Name of Document: BCCDC Public Health Laboratory, PHSA Laboratories Guide to Programs and Services

Document Approvals:
The signature below indicates that the person signing has read, understood and accepted the document content and the document intentions.

Dr. Mel Krajden				November 18, 2016
Public Health Laboratory Director		Signature		Date
Amelia Trinidad				November 18, 2016
Manager, Laboratory Operations		Signature		Date

Document Ownership

GENERAL CONTACT INFORMATION

Address

655 12th Ave W.
Vancouver B.C. V5Z 4R4

Client Services

1-877-747-2522

Internet

http://lmlabs.phsa.ca/BCCDC PHL

After Hours Medical Emergencies

Medical On-Call during regular working hours (08:30 – 16:30 Monday - Friday) is provided by the Program Head listed for each of the Sections below.

For after hours medical emergencies, contact the Microbiologist On-Call at 604-661-7033.

BCCDC Security (24 hours)

604-707-2419
604-312-3150 (cell)

Change of Address

Report physician or clinic changes of address or status (e.g. retirement, inactive, etc.) via telephone (1-877-747-2522) or email (dbupdate@bccdc.ca).

Program	Name	Telephone	Fax
Public Health Laboratory Director	Mel Krajden, MD	604-707-2421	604-707-2603
Assistant to the Director	Rosalyn Wagner	604-707-2646	604-707-2603
Associate Director	Linda Hoang, MD	604-707-2618	604-707-2603
Director, Laboratory Operations	Gail Crawford	604-707-2634	604-707-2603
Manager, Laboratory Operations	Amelia Trinidad	604-707-2650	604-707-2603
Public Health Laboratory Surveillance & Outbreak Manager	Yin Chang	604-707-2632	604-707-2603
Healthy Water Program/EWQA	Cora Yee	604-707-2639	604-707-2603
Administrative Assistant	Yvonne Hardwicke	604-707-2627	604-707-2603
Biosafety Biosecurity Biohazard Containment			
Public Health Lead	Neil Chin	604-707-2614	604-707-2603
Advanced Bacteriology/Mycology			
Program Head	Linda Hoang, MD	604-707-2618	604-707-2604
Section Head	Ana Paccagnella	604-707-2610	604-707-2604
Main Laboratory		604-707-2617	604-707-2604
Mycology Laboratory		604-707-2621	604-707-2604

Central Processing & Receiving/Public Health Microbiology			
Public Health Program Head	Mel Krajden, MD	604-707-2619	604-707-2603
Director, Laboratory Operations	Gail Crawford	604-707-2634	604-707-2603
Manager, Laboratory Operations	Amelia Trinidad	604-707-2650	604-707-2603
High Volume Serology (Viral Serology)	Mel Krajden, MD/	604-707-2421	604-707-2603
High Volume Serology (Bacterial Serology)	Muhammad Morshed, PhD	604-707-2622	604-707-2602
Section Head, Microbiology	Annie Mak	604-707-2828	604-707-2407
Environmental Microbiology			
Program Head	Linda Hoang, MD	604-707-2618	604-707-2600
Section Head	Brian Auk	604-707-2608	604-707-2600
Water Laboratory		604-707-2620	604-707-2600
Water Results Line		604-707-2665	
Foodborne Disease	Frankie Tsang	604-707-2611	604-707-2600
GI Outbreak Notification Fax			604-707-2607
EWQA Provincial Coordinator	Natalie Prystajecky, PhD	604-707-2633	604-707-2603
Molecular Microbiology & Genomics			
Program Head	Mel Krajden, MD	604-707-2421	604-707-2603
Associate Head	Linda Hoang, MD	604-707-2618	604-707-2603
Section Head	Alan McNabb	604-707-2683	604-707-2603
Laboratory		604-707-2680	
Mycobacteriology/TB			
Program Head	Mel Krajden, MD	604-707-2421	604-707-2675
Section Head	Mabel Rodrigues, PhD	604-707-2615	604-707-2672
Laboratory		604-707-2630	604-707-2672
Parasitology			
Program Head	Linda Hoang, MD	604-707-2618	604-707-2603
Clinical Microbiologist	Muhammad Morshed, PhD	604-707-2622	604-707-2654
Section Head	Quantine Wong	604-707-2612	604-707-2654
Laboratory		604-707-2629	604-707-2654
Laboratory Support Services			
Program Head	Mel Krajden, MD	604-707-2421	604-707-2603
Associate Head	Linda Hoang, MD	604-707-2615	604-707-2603
Section Head	Mabel Rodrigues, PhD		604-707-2672
Virology Program			
Program Head	Mel Krajden, MD	604-707-2421	604-707-2603
Section Head	Alan McNabb	604-707-2683	604-707-2675
Laboratory		604-707-2623	604-707-2605
Virus Isolation Outbreak Fax			604-707-2605
Zoonotic Diseases & Emerging Pathogens			
Program Head	Muhammad Morshed, PhD	604-707-2622	604-707-2602
Section Head	Quantine Wong	604-707-2613	604-707-2602
Laboratory (Serology)		604-707-2628	604-707-2602
Laboratory (Molecular)		604-707-2626	604-707-2602
Supplies Fax			604-707-2606

HOURS OF OPERATION

Weekend and On Call service hours continue to expand at BCCDC PHL but we want to note that after regular hours, the following service hours apply:

Saturday/Statutory Holidays*	0800 - 1540 (Public Health Advanced Bacteriology/Mycology) 0830 -1630 (Environmental Microbiology Program) 1000 -1800 (Virology)
Sunday/Statutory Holidays*	0830 -1630 (Environmental Microbiology) 0830 -1630 (Virology)
Malaria On-Call	Available 24/7 (604) 871-3246
On-Call	Medical Microbiologist On-Call available 24/7 at 604-661-7033 including on call for: • High Volume Serology • Malaria Consultation • AFB Smear (On-Call available weekends/Statutory Holidays) • Virology Program

*STAT Exceptions may apply for some Programs: Easter Monday, Christmas Day and New Year's Day

REQUISITIONS

Public Health Laboratory Requisitions may found on our website at
http://www.bccdc.ca/health-professionals/professional-resources/laboratory-servicesor
http://lmlabs.phsa.ca/health-professionals/test-requisitions

Requests for testing must be submitted on a PHSA Laboratory requisition. Electronic requests through an **approved** Reference Laboratory interface are exempt. All requisitions must be filled out as described below.

It is the submitting client's responsibility to ensure that requisitions are **filled out completely, accurately** and **legibly**.

PHSA Laboratories will only forward "copy to" physician and client reports when mailing information on the requisition is complete.

Ensure that the following instructions are completed for each requisition:

✓ Provide two personnel identifiers (PHN and date of birth) if available unless there are public health reasons for not doing so.

✓ Provide a complete patient name (surname and given name) unless there are public health reasons for not doing so. BC Centre for Disease Control Public Health Laboratory (BCCDC PHL), PHSA Laboratories will provide non-nominal testing in the following circumstances:

- HIV testing
- Testing for donor programs
- Sample from patients whose names are not available to the referring physician (e.g. altered level of consciousness)
- Sexual abuse cases involving a minor
- Other cases deemed appropriate by public health workers (samples submitted by health units, public health or youth clinics, etc.)

✓ Provide patient's current address including city and postal code.

✓ Ensure the date of birth is in the correct format and the gender of the patient is provided.

✓ Always provide the full name and address of the ordering physician requesting the test. **If this physician is a locum, include the full name of the locum and the physician responsible for the locum. Reports will be sent attention to these physicians at the address unless the box "I do not require a copy of the report" is checked.**

✓ Provide the full name and address of the clinic or hospital requesting the test if applicable and include the PHSA Client Number.

✓ In the Additional Copies To area, provide the full name, address or MSC number up to a maximum of three additional physicians to receive copies of the results report.

- ✓ Include your sample/submitter's reference number if applicable.
- ✓ Always indicate collection date and time using the correct format indicated. For many tests the sample may be time-sensitive.
- ✓ Ensure that all remaining sections of the requisition are completed indicating **sample type**, **test requested** and any **relevant clinical/travel history**.

SAMPLE COLLECTION

Useful and reliable laboratory results depend largely on proper sample collection for the clinically appropriate test request, timely transport, and clear communications with the laboratory. For testing information or discussion of specific cases please call the appropriate Laboratory Section or Program Head (pgs 1-2). For after hours or emergencies, contact the Medical Microbiologist On-Call at 604-661-7033.

Please note the following requirements:

All samples submitted to BCCDC Public Health Laboratory must adhere to provincial and federal regulations and laws regarding packaging and transport including Transport of Dangerous Goods Regulations (TDGR) and the International Air Transportation Association (IATA) Dangerous Goods Regulations (DGR) where applicable.

It is the responsibility of the **shipper** of the sample to determine whether or not packages for transport meet the above requirements.

It is **illegal** to mail dangerous goods (which include infectious substances) via Canada Post.

For All Sample Types

- Complete requisition legibly. Include all mandatory information.
- Submit a separate requisition and sample for each test requested.
- Label the sample container clearly with two identifiers (examples include patient name (surname and given name) and date of birth, PHN, accession number, unique random number. Ensure these two identifiers match the completed requisition.
- Ensure sample containers are tightly closed to prevent leakage during transport. **Leaking samples may not be processed.**
- Put the sample **inside** the sealable biohazard bag, and then seal the bag. If the sample is liquid, place enough absorbent material in the bag to absorb the liquid should the container break or leak. Put the requisition in the **outer** pocket of the bag. **Do not allow the requisition to come in contact with the sample.**
- Refrigerate sample where appropriate prior to and during transport.
- **A dedicated sample is required for PCR testing**. Manipulation of samples prior to sending for testing may result in false negative or positive results.

Unacceptable Samples – General

- Unlabelled samples
- Leaking samples
- Patient name on the sample does not match name on requisition
- Samples accompanied by undecipherable, blank or no requisitions
- Sample collected in wrong container

Failure to:

- Use the correct BCCDC Public Health Laboratory requisitions
- Provide mandatory information
- Use the correct collection container
- Ship safely

is a breach of PHSA Laboratories policies and procedures and is a serious patient safety issue.

SAMPLE COLLECTION KITS

Sample collection kits are issued upon request. Orders are placed using the Sample Container Order Form (DCQM_Q07_4101F_1.00 VER_3.0).

Orders can be emailed to kitorders@hsssbc.ca using the 'Submit Form' button on the online form or faxed to 604-707-2606. **Telephone orders are only accepted in emergencies.**

Laboratory	Requisition Form	Collection Kit
Public Health Advanced Bacteriology/Mycology Bacterial pathogens ***excluding*** *Mycobacterium spp*. & *Bordetella pertussis*	BAM (DCBM_100_1001F)	BCCDC PHL Amies Charcoal Transport Medium, swab **(plastic shaft)**, Biohazard bag
Public Health Advanced Bacteriology/Mycology *Bordetella pertussis* PCR and Culture		BCCDC PHL Amies Charcoal Transport Medium, Swab **(wire shaft)**, **Pertussis Kit Instructions**, Biohazard bag
Public Health Advanced Bacteriology/Mycology *Chlamydia trachomatis* and *Neisseria gonorrhoeae* Nucleic Acid Testing (NAT)		BCCDC PHL Unisex Swab Specimen Collection Kit for Endocervical and Male Urethral Swab specimens:

		One white Cleaning Swab, One collection swab (blue shaft), One sample transport tube, Biohazard bag
Public Health Advanced Bacteriology/Mycology *Chlamydia trachomatis* and *Neisseria gonorrhoeae* Nucleic Acid Testing (NAT)		BCCDC PHL Urine Sample Collection Kit: Transfer pipette, Urine Transport tube, Biohazard bag
Public Health Advanced Bacteriology/Mycology Culture of urethral & eye samples for bacterial pathogens		BCCDC PHL Amies Charcoal Transport Medium, Swab **(wire shaft)**, Biohazard bag
Public Health Advanced Bacteriology/Mycology Eye samples for Chlamydia NAT		BCCDC PHL Dry swab, Sample transport tube, Biohazard bag
Public Health Advanced Bacteriology/Mycology Enteric Bacteria		BCCDC PHL Feces vial, Biohazard bag
Public Health Advanced Bacteriology/Mycology Gonorrhea, Trichomonas, Bacterial Vaginosis & Yeast		BCCDC PHL 2 plain glass slides in plastic holder, Biohazard bag
Public Health Advanced Bacteriology/Mycology Mycology		BCCDC PHL 100 mL sterile plastic container, Biohazard bag
Public Health Advanced Bacteriology/Mycology Organisms for identification		No outfit
Central Processing & Receiving/Lane Level Serology Screening (Hepatitis, HIV, Prenatal Panel, Rubella, Syphilis, *Helicobacter pylori*, other virus serology)	SER (CPSE_100_1001F)	BCCDC PHL SST (gold top) blood tube, Biohazard bag
Environmental Microbiology Food Poisoning	Incident Summary (DCFP_100_1001F) FP - Requisition (DCFP_100_1001F2)	BCCDC PHL Food Microbiology Jar
Environmental Microbiology Food Quality	FQ (DCFP_101_0001f)	BCCDC PHL Food Microbiology Jar
Environmental Microbiology Gastrointestinal Outbreak Investigation	Fax Form (DCFP_102_1001F) GIOB (DCFP_102_1001F2)	BCCDC PHL 6 vials for feces, 2 dry sterile plastic vials for vomitus, Biohazard bag
Environmental Microbiology Water Bacteriology	Water Bacteriology (PHWB_100_1001F)	BCCDC PHL Treated plastic bottle, Ziploc bag
Mycobacteriology/TB Sputum, urine & other body fluids (all Mycobacteria)	TB (PHTB_100_1001F)	BCCDC PHL 100 mL sterile plastic container, Biohazard bag
Mycobacteriology/TB Stomach washings (all Mycobacteria)		BCCDC PHL Treated 250 cc sterile glass jar, Biohazard bag
Parasitology Blood & Tissue Parasites	PARA (DCPA_100_1001F)	BCCDC PHL EDTA (purple top) blood tube, Biohazard bag Tissue & Body Fluid – sterile container
Parasitology		BCCDC PHL SAF feces vial, Biohazard

Ova & Parasites		bag Kit orders must be approved by the Parasitology Section
Parasitology Parasite for Identification (ticks, other arthropods, worms, proglottids)		Clean container (slightly moistened cotton for ticks)
Parasitology Pinworm Examination		BCCDC PHL Sticky Paddle, Biohazard bag Kit orders must be approved by the Parasitology Section
Parasitology **Special Tests (refer to Parasitology Program):** ***Strongyloides* Concentration/Isolation** **ELISA (Amoebiasis)** ***Schistosoma* Hatch Test for Viability**		BCCDC PHL sterile plastic container for faeces or urine, Biohazard bag
Virology Stool for EIA/EM	VI (DCVI_100_1001F)	100 mL sterile plastic container, Biohazard bag
Virology Culture/PCR		BCCDC PHL Virus swab and transport medium. Biohazard bag
Virology Influenza Outbreak Investigation Unless authorized, maximum order is 50 kits per season	DCVI_100_1001F2	BCCDC PHL Virus swab and transport medium. Biohazard bag
Zoonotic Diseases & Emerging Pathogens Arboviruses (West Nile), Hanta virus, Rickettsia, Ehrlichia/Anaplasma, Leptospira, Referred Zoonotic Testing.	ZEP (DCZP_100_0001f)	BCCDC PHL SST (gold top) blood tube, Biohazard bag
Zoonotic Diseases & Emerging Pathogens ASOT, AntiDNase B, Brucella, Borrelia, Toxoplasma, Tularemia, Parasitic Serology, Bartonella, Cryptococcus, Referred Bacterial, Fungal & Parasitic Testing		BCCDC PHL SST (gold top) blood tube, Biohazard bag
Zoonotic Diseases & Emerging Pathogens *H. pylori* Feces Antigen		Sterile vial
Zoonotic Diseases & Emerging Pathogens Non-Blood samples (CSF for syphilis, tissue, genital swabs)		No outfit
Zoonotic Diseases & Emerging Pathogens Syphilis – Darkfield, DFA		BCCDC PHL Capillary Tubes, Wax Sealer, FA slide biohazard bag

SAMPLE PACKING INSTRUCTIONS

To ensure the safety of our staff, leaking or improperly packaged samples, may not be processed.
Note: these instructions are based on IATA packing instructions 650.

1. Use the container (primary container) provided in the collection kit or as indicated in this guide. See individual sections for specific collection and labeling instructions. If capped, ensure it is fully closed to prevent leakage.

2. Place the securely sealed primary container into plastic 'biohazard bag' (secondary container). Wrap the primary container or place enough absorbent material (this is not supplied with collection kits, e.g. paper towel, clean gauze or tissue paper) in the bag to totally absorb sample should the primary container leak or break (**Figure 1**). One sample per biohazard bag is preferred, but multiple samples of the **same container type** may be placed in the bag **if coming from the same patient.** Cushioning should be provided to prevent breakage.

3. If breakage occurs, this will likely contaminate all other samples grouped together in one biohazard bag. Ensure that the patient name and additional identifier is on each container to allow matching to its corresponding requisition.

Figure 1.

Figure 2.

4. Fill out the correct BCCDC Public Health Laboratory requisition and individual sections for instructions and insert it into the **side** pouch of the biohazard bag. **Do not place it inside** with the sample (in case of leaks). Fold the requisition so that the front is visible and place it in the pouch so that the requisition can be read (**Figure 2**).

5. Place the secondary container inside a third (outer) package for protection from physical damage and water while in transit. This may be a plastic cooler, a fiberboard box or other container that is designed, constructed, filled and closed so that under normal conditions of handling and transport, there will be no discharge, emission or escape of the dangerous goods that could constitute a danger to public safety.

Multiple secondary containers may be included. When possible, please group samples by collection kit type. Health Units use waterproof containers to transport samples to PHSA Laboratories, BCCDC Public Health Laboratory via courier.

These are general rules that apply to most samples submitted to PHSA Laboratories, BCCDC Public Health Laboratory via Health Units, courier or authorized persons.

TRANSPORTATION OF SAMPLES

- **By courier or authorized persons:**
  Samples may be delivered to BCCDC Public Health Laboratory or CPR-LL, (deliveries received at the rear of building), 655 West 12th Avenue, Vancouver.

  All samples must be in acceptable sample collection containers and properly packaged as per Transport Canada, Transport of Dangerous Goods Regulations.

- **By Health Units:**
  Public Health courier service is available through regional Health Units.

  All samples must be in acceptable sample collection containers and properly packaged as per Transport Canada, Transport of Dangerous Goods Regulations.

STAT/EMERGENCY SAMPLES

To expedite STAT testing (generally results available in less than 4 hours; some tests take longer), the following guidelines must be followed:

1. Consult with the Program (Medical Microbiologist) or Section Head of the program or services (page 5) before submitting the sample for emergency testing.
   - Some cases require consultation with the Program Head/Medical Microbiologist who lead their Program (as noted under each area, pages 1-2) before samples will be tested.
   - For after-hours emergencies, the Program Medical Microbiologist On-Call may be reached at 604-661-7033.
   - Provide the following information (clinical history, sample type, test required) to the appropriate Section Head or Program Head **before** submitting the sample.

2. Other information required includes
   - Patient information (name, date of birth, PHN, etc.);
   - Method of transport (including the name of the courier/airline and waybill numbers);
   - Approximate time of departure/arrival;
   - Name of the contact person and their telephone number (for telephoned results). Fax number is also required.

3. **Clearly label the package (interior and exterior) with "STAT" including attention to the appropriate Section or Program Head.** Ensure that the name of the contact person at BCCDC Public Health Laboratory is also on the requisition.

4. **Do not package STAT samples together with regular samples.**

5. If after hours, the Medical Microbiologist On-Call 604-661-7033 will agree on details of sample delivery and receipt.

GENERIC/MISCELLANEOUS REQUESTS

For testing requests that are not covered by this Guide, the following guidelines must be followed:

1. Consult with the Program Head (Medical Microbiologist) of the program or services (pages 1-2) to obtain approval **before collecting and submitting the sample(s) for testing**.
   - Provide the following information: clinical history, sample type/volume, test required.

2. The Program Head will provide test consultation and provide the following information:
   - Details on sample to collect (including volume and handling procedures) as needed
   - Details on requisition form to complete
   - Where to ship to including BCCDC PHL contact details for the package
   - Special transport requirements

   (The Program Head will inform the appropriate Section Head(s) with this information.)

3. Following agreement on the test conditions, the Requestor will provide the following information:
   - Provide transport details: name of the courier/airline and waybill numbers, approximate time of departure/arrival.
   - Results reporting (for telephoned results): name of the contact person and their telephone number. Ensure that the name of the contact person is also on the requisition.

4. **Complete the appropriate requisition form and clearly label the package (interior and exterior), with attention to the appropriate BCCDC PHL Program as provided by the Program Head.**

5. **If samples are to be tested STAT, do not package samples together with regular samples.**

6. If after hours, the Medical Microbiologist On-Call 604-661-7033 will agree on details of sample delivery and receipt.

BIOSAFETY BIOSECURITY BIOHAZARD CONTAINMENT (BBBC) PROGRAM

The Biosafety, Biosecurity, Biohazard Containment (BBBC) Program is responsible for laboratory biological and chemical safety, facilities management, biological containment services and biological security, services crucial to the functioning of the BCCDC PHL.

The Biosafety, Biosecurity, Biohazard Containment Program is a provincial and national leader in biosafety, biosecurity and biohazard containment. The public health laboratory BBBC Program also works with other microbiology laboratories province-wide, as well as with the Ministry of Health, Emergency Planning, Ministry of Healthy Living and Sports, the National Microbiology Laboratory at the Canadian Public Health Laboratory Network and the PHAC Centre for Biosecurity.

Our certified and trained public health laboratory staff operates 3 unique Containment Level 3 facilities, as well as directs the receipt of processing and testing, of Containment Level 2 samples for the safety of our workers and the residents of British Columbia. A team of BCCDC PHL staff led by BBBC is available for emergency response for Containment Level 4 spills (Emergency Response Assistance Plan, ERAP).

For any inquiries regarding biological and laboratory safety, contact the Biosafety Biosecurity Biohazard Containment (BBBC) Program.

Neil Chin
Public Health Lead, BBBC

Telephone: 604-707-2614
Fax: 604-707-2603
Pager: 604-320-3866
Email: neil.chin@bccdc.ca

References:

1. Transportation of Dangerous Goods Regulations (TDGR)

2. International Air Transport Association (IATA) Dangerous Goods Regulations, 47th Edition

3. National Standard of Canada CAN/CGSB-43. 125-M90. Packaging of Infectious Substances and Diagnostic Sample

4. Emergency Response Assistance Plan for Infectious Substances Affecting Humans, Risk Group 4, Office of Biosafety, Laboratory Centre for Disease Control, Health Protection Branch, Health Canada.

PUBLIC HEALTH ADVANCED BACTERIOLOGY/MYCOLOGY PROGRAM

The Public Health Advanced Bacteriology/Mycology Program offers reference and public health related diagnosis for bacterial pathogens including enteric, sexually transmitted, respiratory, and health care acquired bacterial pathogens, and fungi, province-wide. This Program provides consultations to physicians and works closely with public health officials in outbreak investigations and for ongoing network surveillance. Services in the Bacteriology and Mycology Program include Enteric Bacteriology, Sexually Transmitted Infections, Reference Bacteriology, Reference Mycology, Healthcare Associated Infections, outbreak surveillance and detection, and Containment Level 3 Pathogens. It is active in the Canadian Laboratory Response (agents of concern)

Useful and reliable laboratory results depend largely on proper sample collection for the clinically appropriate test request, timely transport, and clear communications with the laboratory. For testing information or discussion of specific cases please call Dr. Linda Hoang at 604-707-2618 or, after hours, the Medical Microbiologist On-Call at 604-661-7033.

Unacceptable Samples

- See table on the following pages for rejection criteria for each sample type.

SAMPLE COLLECTION
Enteric Bacteriology

Sample Type	Container Type	Requisition	Instructions
Feces sample	BCCDC PHL Feces Vial, Biohazard bag	Bacteriology & Mycology	1. Complete requisition and label the vial. Symptoms and travel history are important. 2. Pass Feces into a dry, clean container, or as follows: a) Lift the toilet seat. b) Place plastic wrap (e.g. Saran) over the toilet bowl, and push down slightly in the centre to form a depression. c) Use the toilet seat to secure the plastic wrap. d) Pass Feces on to the plastic wrap. Avoid contamination with urine or water from the toilet. Do not use toilet paper. It may contain barium salts which inhibit some bacteria. e) Using the spoon in the cap, from the vial, select portions of the Feces containing blood, mucus or pus and transfer into the vial. Fill up to the line indicated. Two grams is sufficient. A teaspoons worth. f) Replace and tighten cap. 3. Close the vial by screwing the cap tightly to prevent leaking during transport. 4. Keep specimens refrigerated at 4^0C. Transport specimens in a cooler with ice pack to the laboratory promptly and within 3 days of collection. Do not

SAMPLE COLLECTION
Enteric Bacteriology

Sample Type	Container Type	Requisition	Instructions
			freeze specimens. One Feces sample for bacterial pathogen work up is sufficient in most cases. 5. **Dry rectal swabs are NOT processed for enteric bacteria.** 6. **Specimens submitted in SAF are not culturable.**
Urine – only for culture of *Salmonella* species in contact and follow up investigations	BCCDC PHL Feces Vial, Biohazard bag	Bacteriology & Mycology	1. Complete requisition and label the vial. Symptoms and travel history are important. 2. Fill approximately 2/3 full with **clean catch**, midstream urine. 3. Close the vial by screwing the cap tightly to prevent leaking during transport. For best results, urine samples should be transported to the laboratory within hours of collection. If this cannot be done, keep the sample at 4-8°C and deliver within 3 days of collection.
Referred-In Enteric Bacteria for identification	Please refer to instructions	Bacteriology & Mycology	1. Complete the requisition and label the vial. 2. The organisms/isolates should be submitted as pure, fresh slant cultures in a leak-proof tube, accompanied by a requisition. 3. For all organisms indicate the source of the isolate, gram stain reaction, suspected identity, preferred growth conditions and examinations requested. 4. *Campylobacter, Arcobacter,* and *Helicobacter* should be submitted in NCD Amies Charcoal medium with charcoal if the sample will be more than one day in transit. 5. For *Aeromonas, Plesiomonas* and *Vibrio* species the preferred medium is blood agar based.

SAMPLE COLLECTION
Chlamydia and Gonorrhea Testing

Sample Type	Container Type	Requisition	Instructions
Endocervical samples (for culture of *Neisseria gonorrhoeae)*	BCCDC PHL Amies Charcoal Transport Medium, Swab, **(plastic shaft)**, Biohazard bag	Bacteriology & Mycology	1. Complete the requisition and label the vial. 2. Use a speculum moistened with warm water. 3. Wipe the cervix clean to remove vaginal secretions. Collect discharge from the endocervix using a swab and a ringing motion to help force exudates from the endocervical glands. 4. Do not use transport medium if dried, expired or liquefied. 5. Collect sample with swab. 6. Insert the swab into the tube ensuring that the tip is submerged in the transport medium. 7. Send the sample to the laboratory immediately. If delayed, refrigerate until dispatched and ship to the laboratory in a cooler containing

SAMPLE COLLECTION
Chlamydia and Gonorrhea Testing

Sample Type	Container Type	Requisition	Instructions
			icepacks. 8. Sample must be received in laboratory within 3 days of collection.
Endocervical and Urethral samples for CT/GC (Chlamydia trachomatis/Neisseria gonorrhoeae) Nucleic Acid Testing (NAT)	Urethral Swab specimens: One white Cleaning Swab, One collection swab (blue shaft), One specimen transport tube, Biohazard bag	Bacteriology & Mycology	Complete the requisition and label the vial. **For Endocervical Samples** 1. Remove excess mucus from the cervical os and surrounding mucosa using the cleaning swab (white shaft) **Discard this Swab.** 2. Insert the sample collection swab (blue shaft) into the endocervical canal. 3. Gently rotate the swab clockwise for 10 to 30 seconds in the endocervical canal to ensure adequate sampling. 4. Withdraw the swab carefully; avoid any contact with the vaginal mucosa 5. Remove the cap from the swab sample transport tube and immediately place the sample collection swab into the transport tube. 6. Carefully break the swab shaft at the scoreline; use care to avoid splashing of contents 7. Re-cap the swab sample transport tube tightly. **For Urethral Samples** 1. The patient should not have urinated for at least one hour prior to sample collection. 2. Insert the sample collection swab (blue shaft) 2 to 4 cm into the urethra. 3. Gently rotate the swab clockwise for 2 to 3 seconds in the urethra to ensure adequate sampling. 4. Withdraw the swab carefully 5. Remove the cap from the swab sample transport tube and immediately place the sample collection swab into the transport tube. 6. Carefully break the swab shaft at the scoreline; use care to avoid splashing of contents. 7. Re-cap the swab sample transport tube tightly. **If there is more than one swab or any other swabs other than the blue swab provided, the sample will be rejected.** After collection, transport and store swab sample transport tube at room temperature (2°- 30°C). Test within 60 days of collection. If longer storage is needed, store at -20°C or -70°C for up to 90 days.
Male urethral samples culture for *Neisseria gonorrhoeae*	BCCDC PHL Amies Charcoal Transport Medium, Swab **(wire shaft)**, Biohazard bag	Bacteriology & Mycology	1. Complete the requisition and label the vial. 2. Retract the prepuce from the glans penis and, if necessary, wipe the meatus with sterile gauze. Digitally strip “milk” the penile urethra to obtain sufficient exudates. 3. Use a swab to collect exudates. If no discharge is obtained, insert a thin **wire shaft** swab approximately 2 cm into the urethra and rotate gently. 4. Do not use transport medium if dried, expired or liquefied. 5. Collect sample with swab.

SAMPLE COLLECTION
Chlamydia and Gonorrhea Testing

Sample Type	Container Type	Requisition	Instructions
			6. Insert the swab into the tube ensuring that the tip is submerged in the transport medium. 7. Send the sample to the laboratory immediately. If delayed, refrigerate until dispatched and ship to the laboratory in a cooler containing icepacks. 8. Sample must be received in laboratory within 3 days of collection.
Urine samples for CT/GC (*Chlamydia trachomatis*/*Neisseria gonorrhoeae*) Nucleic Acid Testing (NAT)	BCCDC PHL Urine Sample Collection Kit: Transfer pipette, Urine Transport tube, Biohazard bag	Bacteriology & Mycology	1. Complete the requisition and label the vial. 2. The patient should not have urinated for at least one hour prior to sampling. 3. Direct patient to provide first-catch urine (approximately 20 to 30 mL of the initial urine stream into a urine collection cup. Collection of larger volumes of urine may reduce test sensitivity. Female patients should not cleanse the labial area prior to providing the sample. 4. Remove the cap and transfer 2 mL of urine into the urine sample transport tube using the disposable pipette provided. The correct volume of urine has been added when the fluid level is between the black lines on the urine sample transport tube label. **If sample is not within the two lines the sample will be rejected** 5. Re-cap the urine sample transport tube tightly. This in now known as the processed urine sample. 5. After collection urine samples must be transferred from the collection cup to the transport tube within 24 hours. 6. Store and transport urine transport tube at room temperature (2°-30°C). Test within 30 days of collection
Anal samples (culture for *Neisseria gonorrhoeae*)	BCCDC PHL Amies Charcoal Transport Medium, Swab **(plastic shaft)**, Biohazard bag	Bacteriology & Mycology	1. Complete the requisition and label the vial. 2. Insert the swab approximately one inch into the anal canal. If the swab is stained with feces, use another swab to obtain the sample. 3. Move the swab from side to side in the anal canal to sample crypts: allow several seconds for absorption of organisms to the swab. 4. Do not use transport medium if dried, expired or liquefied. 5. Insert the swab into the tube ensuring that the tip is submerged in the transport medium. 6. Send the sample to the laboratory immediately. If delayed, refrigerate until dispatched and ship to the laboratory in a cooler containing icepacks. 7. Sample must be received in laboratory within 3 days of collection.

SAMPLE COLLECTION
Trichomonas and Bacterial Vaginosis

Sample Type	Container Type	Requisition	Instructions
Vaginal samples (for examination for other bacteria, yeast and *Trichomonas*	BCCDC PHL 2 plain glass slides in plastic holder, Biohazard bag	Bacteriology & Mycology	1. Complete the requisition and label the vial. 2. Use a speculum. 3. Collect vaginal secretions with a swab 4. Use only glass slides with frosted ends provided in the collection kit. Label the sample with the patient's name and sample source on the frosted end with a lead pencil. 5. Collect material on the swab as for culture, and by gently rolling the swab in one direction, place to non-overlapping rolls side by side in the middle of a clean slide. 6. Allow slides to air dry. Do not heat or place moist slides together. 7. Submit vaginal smears for examination for *Trichomonas,* yeast and Bacterial Vaginosis. 8. If both *Trichomonas* and Bacterial Vaginosis are requested, submit two vaginal smears. **Note:** Cervical smears are no longer examined for gonorrhea. Please submit a cervical swab for gonorrhea culture in Amies Charcoal Transport Medium or submit specimen as for Nucleic Acid Testing (NAT).
Eye samples for *Chlamydia trachomatis*	BCCDC PHL Dry swab, Sample Transport Tube Biohazard bag	Bacteriology & Mycology	1. Complete the requisition and label the vial. 2. Apply a topical proparacaine-based anesthetic to the eye or eyes (optional). 3. If pus or discharge is present, use a sterile Dacron swab (not provided) to clean the area. Do not scrape the conjunctiva while cleaning the eye(s). Discard the cleaning swab. 4. Thoroughly swab the inner surface of the lower, then the upper eyelid. If samples are taken from both eyes, use the swab on the less affected eye first to avoid further contamination of that eye. 5. Insert the swab into the tube 6. Send the sample to the laboratory immediately.

SAMPLE COLLECTION
General Bacteriology

Sample Type	Container Type	Requisition	Instructions
Nasopharyngeal/Pernasal samples for *Bordetella pertussis*	BCCDC PHL Amies Charcoal Transport Medium, Swab **(wire shaft)**, **Pertussis Kit Instructions**, Biohazard bag	Bacteriology & Mycology	1. Complete the requisition and label the vial. 2. Collect pernasal/nasopharyngeal swab samples as per Pertussis Collection Kit Instructions 3. Refrigerate as soon as possible in a cooler containing ice packs and transport to BCCDC PHL
Respiratory Secretions, Body Fluids, Tissue, other	BCCDC PHL 100 mL sterile plastic container, biohazard bag	Bacteriology & Mycology	1. Complete the requisition and label the vial. 2. Submit in sterile, leak-proof tubes or other sterile leak-proof containers. 3. Refrigerate as soon as possible in a cooler containing ice packs and transport to BCCDC PHL.
Referred-In Organisms for Identification	Please refer to instructions	Bacteriology & Mycology	1. The pure organisms/isolates should be submitted as fresh slant cultures in a leak-proof container, accompanied by a requisition. 2. For all organisms indicate the source of the isolate, gram stain reaction, suspected identity, preferred growth conditions and examinations requested. 3. *Campylobacter, Arcobacter,* and *Helicobacter* should be submitted in Amies Charcoal medium if the sample will be more than one day in transit. 4. For *Aeromonas, Plesiomonas* and *Vibrio* species the preferred medium is blood agar based.
Samples for culture for anaerobic bacteria	Please refer to instructions	Bacteriology & Mycology	Submit in appropriate anaerobic collection kits. **Note:** If sample will not reach the laboratory immediately, refrigerate at 4°C and ship sample to the laboratory in a cooler containing icepacks
Samples for culture for *Leptospira*.			**BCCDC Public Health Laboratory no longer performs culture for *Leptospira*.** For NAT testing See: Zoonotic Diseases & Emerging Pathogens

SAMPLE COLLECTION
Mycology

Sample Type	Container Type	Requisition	Instructions
Fungal cultures for identification	Please refer to instructions	Bacteriology & Mycology	1. Complete requisition and label the vial. 2. Submit a pure culture. Contaminated plates delay identification and reporting. 3. Cultures should be submitted on Sabouraud dextrose agar slants. 4. **For *Nocardia* submit a pure culture on a blood agar slant or plate** 5. Indicate the source of the sample, and the patient's travel history. 6. **Do not submit cultures for identification in transport media.**
Feces for fungal examination			**Not Processed. Feces samples not appropriate for examination for deep mycoses.**
Blood for fungal examination	Please refer to instructions	Bacteriology & Mycology	1. Consult the Medical Microbiologist at 604-707-2618. 2. Complete requisition and label the vial. 3. At the patient's bedside draw 5 mL of whole blood and transfer it aseptically to the vacutainer containing SPS anti-coagulant. If SPS is not available, either heparin or citrate is acceptable. 4. Submit to the laboratory the same day, or incubate at 37°C (room temperature if an incubator is not available). **Clotted blood is unacceptable for fungal examination.**
Bone marrow for fungal examination	Please refer to instructions	Bacteriology & Mycology	1. Consult the Medical Microbiologist at 604-707-2618. 2. Complete requisition and label the vial. 3. Aspirate 3-5 mL of bone marrow, and place it in the sterile container. SPS or heparin can be used as anticoagulant. 4. Submit to the laboratory the same day (Incubate at 37°C if unable to deliver the sample).
Buffy coat sample for Histoplasmosis	Please refer to instructions	Bacteriology & Mycology	1. Consult the Medical Microbiologist at 604-707-2618. 2. Complete requisition and label the vial. 3. Collect two tubes of whole blood with anticoagulant – **Not EDTA.** 4. Submit to the laboratory the same day before 3:00 pm, or incubate at 37°C. 5. For further information consult the Mycology Laboratory [604- 707-2621]. 6. **Do not refrigerate the sample.**
Body fluids for fungal examination	Please refer to instructions	Bacteriology & Mycology	1. Consult the Medical Microbiologist at 604-707-2618. 2. Complete requisition and label the vial. 3. Collect body fluid aseptically. 4. Add anticoagulant and close the jar tightly.
Biopsies for fungal examination	Please refer to instructions	Bacteriology & Mycology	1. Consult the Medical Microbiologist at 604-707-2618. 2. Complete requisition and label the vial. 3. Collect sample aseptically and add saline. 4. Close the jar or vial tightly. 5. **Do not add formalin.**

SAMPLE COLLECTION
Mycology

Sample Type	Container Type	Requisition	Instructions
Exudate, Pus and Abscess Drainage for fungal examination	Please refer to instructions	Bacteriology & Mycology	1. Consult the Medical Microbiologist at 604-707-2618. 2. Complete requisition and label the vial. 3. Using sterile needle and syringe, aspirate material from the abscess. 4. Place the material in the sterile glass jar.
Cerebrospinal Fluid (CSF) for fungal examination	Please refer to instructions	Bacteriology & Mycology	1. Consult the Medical Microbiologist at 604-707-2618. 2. Complete requisition and label the vial. 3. Collect the sample aseptically. 4. **Do not submit supernatant.** CSF supernatant is acceptable for examination for cryptococcal antigen only. 5. A separate sample should be submitted for a cryptococcal antigen test along with separate requisition filled in for this test (carried out in Zoonotics Diseases and Emerging Pathogens Program). 6. Submit whole uncentrifuged CSF for culture and microscopic examination for *Cryptococcus* 7. All CSF samples are examined by Calcofluor white for fungi.
Skin and Nail Scrapings, Hair and Scalp Scrapings) for fungal examination			**BCCDC Public Health Laboratory no longer performs routine testing for dermatophytes.** **Please consult with community or hospital laboratories.**
Sputum, Bronchial Washings, Tracheal and Sinus Aspirates for fungal examination	BCCDC PHL TB plastic vial	Bacteriology & Mycology	1. Complete requisition and label the vial. 2. Collect the sample aseptically. 3. Close the sample container tightly. 4. To avoid contamination, always collect a separate sample for each test required. 5. **Saliva is not an acceptable sample.** Instruct patients to take a deep breath and cough directly in to the container. Ensure sample containers are closed properly. 6. **Samples that leak in transit or are not properly identified will not be processed.** 7. **Nose swabs will not be processed. Submit sinus aspirates samples**
Urine for fungal examination Urine samples are only processed for specific fungal pathogens. For routine culture including yeast requests please consult with community or hospital laboratories.	BCCDC PHL TB plastic vial	Bacteriology & Mycology	1. <u>Urine for Histoplasma Antigen:</u> Test is carried out in Zoonotic and Emerging Pathogens Laboratory. Urine should be accompanied by patient history as well as a serum sample. 2. Complete requisition and label the vial. 3. Collect one clean catch early morning urine sample. 4. Close the container tightly to avoid leakage.
Swabs, (Ear, Throat, Urogenital, Eyes, etc.) for fungal	Please refer to instructions	Bacteriology & Mycology	1. Complete requisition and label the vial. 2. Collect material from the infected area. 3. Place it in the swab container.

SAMPLE COLLECTION
Mycology

Sample Type	Container Type	Requisition	Instructions
examination			4. **Do not use Amies Charcoal Transport Medium.** 5. **Nose swabs will not be processed. Submit sinus aspirates samples**

Enteric Bacteriology Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
Campylobacter gastroenteritis ***Campylobacter jejuni*** See also: Diarrhoea, bacterial	*Campylobacter* spp.	Feces Isolates	BCCDC PHL Feces Vial, Biohazard bag	Culture Identification Speciation	3-10 2-10
Cholera	*Vibrio cholerae* 01 *Vibrio cholerae* 0139	Feces	BCCDC PHL Feces Vial, Biohazard bag	Culture Identification Speciation	2-5
		Pure Culture	Slant	Serogrouping	
Diarrhoea, bacterial See also: *C. difficile* Cholera Food poisoning Hamburger disease Paratyphoid fever Typhoid fever Salmonellosis Shigellosis Yersinia infections See also: Environmental Microbiology (Foodborne Disease)	*Aeromonas* *Arcobacter* *Campylobacter* *E. coli* *Helicobacter* *Plesiomonas* *Salmonella* *Shigella* *Vibrio* *Yersinia*	Feces	BCCDC PHL Feces Vial, Biohazard bag	Culture Identification	4-12
		Pure Culture	Slant	Serotyping and/or Biotyping, Molecular Typing as appropriate	1-6
Enteric fever See: Typhoid fever					
Escherichia coli: Enterohaemorrhagic Shiga toxin producing *E. coli*	*Escherichia coli* 0157	Feces	BCCDC PHL Feces Vial, Biohazard bag	Molecular Culture Identification, Serotyping Molecular Typing	4-14 days

Enteric Bacteriology Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
Enteroadherent	*Escherichia coli* spp	Feces	BCCDC PHL Feces Vial, Biohazard bag	Referral to National Microbiology Laboratory for further testing if required	
Enteroinvasive	*Escherichia coli* spp	Feces	BCCDC PHL Feces Vial, Biohazard bag		
Enterotoxigenic See also: Diarrhoea, bacterial	*Escherichia coli* spp	Feces	BCCDC PHL Feces Vial, Biohazard bag		
Hamburger disease See also: *E. coli O157*					
Hemolytic Uremic Syndrome See also: *E. coli O157*					
Gastroenteritis See also: Diarrhoea, bacterial See also: Environmental Microbiology (Foodborne Disease)					
Paratyphoid fevers	*Salmonella* Paratyphi A *Salmonella* Paratyphi B *Salmonella* Paratyphi C	Feces	BCCDC PHL Feces Vial, Biohazard bag	Culture Identification Serotyping	2-3
		Pure Culture	Slant	Serotyping Molecular Typing	2-3
Referred In Cultures	*Escherichia coli* *Salmonella* *Yersinia* Other *Enterobacteriaceae* *Vibrio* *Aeromonas* *Plesiomonas*	Pure Culture	Slant	Culture Identification Speciation Molecular Typing Serotyping and/or Biotyping where applicable Referral to National Microbiology Laboratory for further testing if required	1-5 1-3

Enteric Bacteriology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
	Campylobacter *Arcobacter* *Helicobacter*	Pure Culture	Amies Charcoal medium	Culture Identification Speciation Molecular Typing	1-5
Salmonellosis See also: Typhoid fever Paratyphoid fever	*Salmonella*	Feces	BCCDC PHL Feces Vial, Biohazard bag	Culture Identification Serotyping Referral to National Microbiology Laboratory for further testing if required	2-3
		Pure culture	Slant	Serotyping Molecular typing Referral to National Microbiology Laboratory for further testing if required	2-3
Shigellosis	*Shigella* species	Feces	BCCDC PHL Feces Vial, Biohazard bag Slant	Culture Identification Serotyping Referral to National Microbiology Laboratory for further testing if required	2-3
		Pure Culture		Serotyping Referral to National Microbiology Laboratory for further testing if required	2
				Molecular Typing	2-3
Typhoid fever **Enteric fever** **Typhus abdominalis**	*Salmonella* Typhi	Feces	BCCDC PHL Feces Vial, Biohazard bag	Culture Identification Serotyping Referral to National Microbiology Laboratory for further testing if required	2-3
		Urine	BCCDC PHL TB plastic vial	Culture Identification Serotyping	2-3
		Pure Culture	Slant	Serotyping Molecular Typing	2-3
Verotoxin/Shiga Toxin See also: *E.coli*					
Vibrio Infections	*Vibrio* species	Feces	BCCDC PHL Feces Vial, Biohazard bag	Culture Identification Speciation	2-5

Enteric Bacteriology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
		Pure Culture	Slant	Identification Serotyping Referral to National Microbiology Laboratory for further testing if required	
Yersinia infections See also: Environmental Microbiology Zoonotic Diseases & Emerging Pathogens (serologic testing)	*Yersinia* species	Feces	BCCDC PHL Feces Vial, Biohazard bag	Culture Identification	4-12
		Pure culture	Slant		3-5

Non-Enteric Bacteriology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
Anthrax Submit samples only after consulting with the Medical Microbiologist (604-707-2618).	*Bacillus anthracis*	2 Swabs from Skin Lesion	BCCDC PHL Amies Charcoal medium, swab **(plastic shaft)**	Culture	7 – 14
		Feces	Sterile Container		7 – 14
		Positive Blood Culture			≤ 14
		Pure Culture	Slant	Identification	7
Bacterial Vaginosis See: Vaginitis					
Brucellosis Consult with the Bacteriology Laboratory (604-707-2610) before submitting samples or isolates. For serologic testing see also: Zoonotic Diseases &	*Brucella abortus* *Brucella* species	Positive Blood Culture	Positive Blood Culture vial	Culture	≤ 28
		Bone Marrow	Sterile Container	Culture	≤ 10
		Exudative Material			
		Infected Tissue			

Non-Enteric Bacteriology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
Emerging Pathogens		Fluids (CSF, Pleural, Peritoneal)			
		Pure Culture	Slant	Identification	≤ 4
Candidiasis	*Candida albicans* *Candida* species	Vaginal Smears	BCCDC PHL 2 plain glass slides in plastic holder	Microscopic Examination	≤ 1
Cat-scratch Disease Culture not performed. Identification by 16S rRNA sequencing Consult with the Bacteriology Laboratory (604-707-2610) before submitting samples or isolates. For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Bartonella henselae* *Afipia felis*	Positive commercial blood culture bottles (confirmed by acridine orange)	Blood culture bottle	Identification	≤ 5
		Pure Culture	Slant	Identification	
Cervicitis See: Chlamydia infection Gonococcal infection See also: Virology					
Chancroid (soft chancre)	*Haemophilus ducreyi*	Swab and Smears from Base of Purulent Ulcer, Inguinal Abscess,	BCCDC PHL Amies Charcoal medium, swab **(plastic shaft)**	Culture	5
		Pure Culture	Slant	Identification	≤ 4
Chlamydial infection See also: Lymphogranuloma Venereum	*Chlamydia trachomatis*	Swabs from Urethra, Cervix, Rectal, Throat Vagina if hysterectomy	BCCDC PHL Unisex Swab Specimen Collection Kit for Endocervical and Male Urethral Swab specimens	Chlamydia NAT	1 – 2
		Urine (20 mL)	BCCDC PHL Urine Sample Collection Kit	Chlamydia NAT	1 – 2
		Swabs from Conjunctiva	BCCDC PHL Dry swab	Chlamydia NAT	1 – 2

Non-Enteric Bacteriology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
		Nasopharyngeal, or Tracheobronchial Aspirates (Neonatal)	BCCDC PHL Dry swab	Direct FA Testing	≤ 1
Chlamydiophila Legionella, Mycoplasma (Community Acquired Pneumonia) **Consult Medical Microbiologist** Submit samples only after consulting with the Medical Microbiologist (604-707-2618).	Chlamydophila pneumoniae, Legionella pneumophila, Mycoplasma pneumoniae	Consult Medical Microbiologist for appropriate sample	Consult Medical Microbiologist for appropriate container	Molecular	1-7
Clostridium difficile (Antibiotic Associated Colitis, *C. difficile* Associated Disease (CDAD) **Note:** *C. difficile* testing must be approved by the Medical Microbiologist 604-707-2618. In an emergency, contact the Medical Microbiologist On-Call (604-661-7033). **Investigation of clusters or outbreaks of Health Care Acquired Infections** are carried out on approval of Public Health Advanced Bacteriology/Mycology Program Head (604-707-2618) Medical Microbiologist On-Call, (604-661-7033), after hours.	*C. difficile*	Feces	BCCDC PHL Feces vial	Culture	4 – 7
		C. difficile isolate in pure culture	Anaerobic Transport Tube	Fingerprinting [1] Use Pulsed Field Gel Electrophoresis Approval (PFGE) form	1-4
				Toxin gene detection	2-3
Conjunctivitis, bacterial See: Chlamydia Infection Eye Infection Gonococcal Infection					
Diphtheria Submit samples only after consulting with the Medical Microbiologist (604-707-	*Corynebacterium diptheriae*	Swabs from Throat, Nose, Ear, Skin Recovery of *C. diphtheriae* is enhanced by culturing both nose and throat samples	BCCDC PHL Amies Charcoal medium, swab **(plastic shaft)**	Culture	3 – 10

Non-Enteric Bacteriology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
2618). For serologic testing see also: Zoonotic Diseases & Emerging Pathogens		Pure Culture	Slant	Identification	3
				Toxigenicity Testing Referral to National Microbiology Laboratory	3 – 5
Enterococcal Infections	Vancomycin Resistant Enterococci (VRE)	Pure Culture	Slant	Identification	4
				PCR for Vancomycin Resistance Genes	2 – 5
				Fingerprinting [1] Use Pulsed Field Gel Electrophoresis Approval (PFGE) form	
Eye Infections, Bacterial See: Chlamydia infection Gonococcal infection					
Gonococcal Infection	*Neisseria gonorrhoeae*	Swabs of Endocervical, Rectal, Pharyngeal or other exudates	BCCDC PHL Amies Charcoal medium, swab **(plastic shaft**)	Culture	3
		Swabs of Urethra, and Eye	BCCDC PHL Amies charcoal medium, Swab **(wire shaft)**	Microscopic Examination	≤ 1
		Smears of urethral, vaginal and eye (Except Pharyngeal and Cervical)	BCCDC PHL 2 plain glass slides in plastic holder	Nucleic Acid Testing (NAT)	3
		Swabs of female Endocervical, Male Urethral	BCCDC PHL Unisex Swab Specimen Collection Kit for Endocervical and Male Urethral Swab specimens	Nucleic Acid Testing (NAT)	3
		Urines male and female	BCCDC PHL Urine Sample Collection Kit	Nucleic Acid Testing (NAT	1-2
		Pure Culture	Slant	Susceptibility Testing	2 - 7
Haemophilus Infection	*Haemophilus*	Pure Culture	Slant	Identification	≤ 4

Non-Enteric Bacteriology Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	species				
				Typing	≤ 4
Legionnaire's Disease See also: Environmental Microbiology Zoonotic Diseases & Emerging Pathogens	*Legionella* species	Sputum	Sterile Container	Culture	≤ 7
				Molecular	1-7
		Bronchial Washings	Sterile Container	Culture	≤ 7
				Molecular	1-7
		Tracheal Aspirates		**Direct Fluorescent Antibody Exam of Sample Smear is no longer being offered**	
		Lung Tissues	Sterile Container	Culture	≤ 7
		Fluid (pleural, pericardial, etc.) When collecting samples for *Legionella*, use sterile, non-bacteriostatic water rather than saline (saline may be inhibitory		Molecular[3] **Direct Fluorescent Antibody Exam of Sample Smear is no longer being offered**	1-7
		Pure Culture	Slant	Identification	≤ 6
Leptospirosis Culture not performed. For NAT testing See: Zoonotic Diseases & Emerging Pathogens					
Listeriosis See also: Environmental Microbiology	*Listeria monocytogenes*	Positive Blood Culture	Blood Culture	Culture	≤14
		CSF	Sterile Tube		≤ 7
		Vaginal Swab or products of conception Approval from Medical Microbiologist required	BCCDC PHL Amies Charcoal medium, swab **(plastic shaft)**		≤ 7
		Feces (in outbreaks only) Submit samples only after consulting with the Medical Microbiologist (604-707-2618).	Sterile Container		≤ 35
		Pure Culture	Slant	Identification	5

Non-Enteric Bacteriology Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
Lymphogranuloma Venereum See also: Chlamydia infections Virology	*Chlamydia trachomatis serovars* L1, L2, L3	Swab from urethra, rectum, vagina, cervix, inguinal node	BCCDC PHL Unisex Swab Specimen Collection Kit for Endocervical and Male Urethral Swab specimens	NAT test for *C. trachomatis* Sequencing of NAT positives to detect LGV serovars	1 – 2 Ref
Melioidosis For serologic testing see also: Zoonotic Diseases & Emerging Pathogens Submit samples only after consulting with the Medical Microbiologist (604-707-2618).	*Burkholderia pseudomallei* (previously known as *Pseudomonas pseudomallei*)	Sputum	Sterile Container	Culture	≤ 7
		Swab from Abscesses, Skin Lesions	BCCDC PHL Amies Charcoal medium, swab **(plastic shaft)**		≤ 14
		Pure Culture	Slant	Identification	≤ 7
Meningitis, bacterial See: Meningococcal Infections					
Meningococcal infections Including meningitis, meningococcemia	*Neisseria meningitidis*	Pure culture	Slant	Identification	1
				Grouping,	1
				Fingerprinting by PFGE Susceptibility Testing	2 - 7
Mycoplasma infections Consult Medical Microbiologist Submit samples only after consulting with the Medical Microbiologist (604-707-2618). See: Virology Serology	*Mycoplasma pneumonia*				1-4
Non-Specific urethritis, bacterial See also: Chlamydial infection	*N. gonorrhoeae* *C. trachomatis*	Urethral Swab	BCCDC PHL Amies charcoal medium, Swab **(wire shaft)**	Culture	2-4
			BCCDC PHL Unisex Swab Specimen Collection Kit for Endocervical and Male Urethral Swab specimens	NAT	1-2
Pasteurella infections	*Pasteurella*	Pure Culture	Slant	Identification	≤ 7

Non-Enteric Bacteriology Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
	multocida				
Pertussis See: Whooping Cough	*Bordetella pertussis* *Bordetella parapertussis*	Nasopharyngeal (Pernasal) Swabs	BCCDC PHL Amies Charcoal medium, Swab **(wire shaft)**, **Pertussis Kit Instructions**	Culture	4 – 7
				PCR	1 – 3
Plague Submit samples only after consulting with the Medical Microbiologist (604-707-2618). For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Yersinia pestis*	Aspirate from Buboes	Sterile Tube	Culture	≤ 10
		Sputum	Sterile Container		≤ 10
		Positive Blood Culture	Positive Blood Culture bottle		≤ 6
		Pure Culture	Slant	Identification	≤ 4
Pharyngitis See: Gonococal infections Streptococcal infections	*Neisseria gonorrhoeae* *Streptococcus pyogenes (Group A)*	Pharyngeal swab	BCCDC PHL Amies Charcoal medium, swab **(plastic shaft**	Culture	1-3
				Identification	
Pneumonia, bacterial [1] See also: Legionnaire's Disease Mycoplasma Chlamydophila Investigation of clusters or outbreaks are carried out on approval of Public Health Advanced Bacteriology/Mycology Program Head (604-707-2618) Medical Microbiologist On-Call, (604-661-7033), after hours. See also: Mycobacteriology					
Rat-bite Fever (Haverhill)	*Streptobacillus moniliformis*	Exudate from Primary Lesion	BCCDC PHL Amies Charcoal medium, swab **(plastic shaft)**	Culture	≤ 18
		Citrated Blood	Sterile Tube with Anticoagulant		
		Pure Culture	Slant	Identification	≤ 12
Referred-In Cultures	Aerobic and Anaerobic Bacteria	Pure Culture	Slant	Identification, Further	7 – 12

Non-Enteric Bacteriology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
				Characterization where Applicable	
Staphylococcal infections (Toxic Shock Syndrome) See also: Environmental Microbiology (Foodborne Disease)	*Staphylococcus aureus* *Staphylococcus* species	Pure Culture	Slant	Enterotoxin Typing	3 – 6
				mecA Gene (Nucleic Acid Test – NAT)	2 – 5
				Fingerprinting [1] Use Pulsed Field Gel Electrophoresis Approval (PFGE) form Investigation of clusters or outbreaks of Health Care Acquired Infections are carried out on approval of Public Health Advanced Bacteriology/Mycology Program Head (604-707-2618) Medical Microbiologist On-Call, (604-661-7033), after hours.	2 – 5
				Detection by PCR for Confirmation of MRSA Isolates	2–5
				PVL Toxin detection by PCR	
Streptococcal Infections For serologic testing see also: Zoonotic Diseases & Emerging Pathogens (Serology) Pharyngitis	*Streptococcus pyogenes* *Streptococcus* species *Streptococcus pneumoniae*	Pure Culture	Slant	Identification	1 – 10
				Emm Typing on invasive isolates only	Ref
				Pneumococcal Serotyping on invasive isolates only	Ref
Tetanus (Lockjaw) Submit samples only after	*Clostridium tetani*	Pure Culture	Anaerobic Transport Kit	Culture	7 - 10

Non-Enteric Bacteriology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
consulting with the Medical Microbiologist (604-707-2618). For serologic testing see also: Zoonotic Diseases & Emerging Pathogens					
Trichomoniasis	*Trichomonas vaginalis*	Vaginal Smear	BCCDC PHL 2 plain glass slides in plastic holder	Microscopic Examination	≤ 1
Tularemia Submit samples only after consulting with the Medical Microbiologist (604-707-2618). For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Franciscella tularensis*	Biopsy from Edge of Lesion	Sterile Container	Culture	≤ 7
		Lymph Node Aspirate			
		Sputum			
		2 Conjunctival Swabs	BCCDC PHL Amies charcoal medium, Swab **(wire shaft)**		
		2 Throat Swabs	BCCDC PHL Amies Charcoal medium, swab **(plastic shaft)**		
		Pure Culture	Slant	Identification	1 - 7
Urethritis, bacterial See: Chlamydia infection Gonococcal infection Non-specific urethritis					
Vaginitis **Vulvovaginitis** **Bacterial vaginosis**	*Trichomonas* Bacterial vaginosis Yeast	Vaginal Smear	BCCDC PHL 2 plain glass slides in plastic holder		≤ 1
Whipple's Disease Submit samples only after consulting with the Medical Microbiologist (604-707-2618).	*Tropheryma whipplei*	For Gastroenteritis: duodenal, gastric or colonic biopsy. For Neurologic infection: CSF, brain tissue and in some rare cases blood (not considered a reliable specimen)	Tissues: preferred frozen in sterile screw top culture bottle/jar. Fluid: Minimum of 2 mL in sealed screw top tube. Blood: Minimum of 2 mL of unspun whole blood in sealed EDTA collection	PCR	Ref.

Non-Enteric Bacteriology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
			vial. Transport time should be 48 hours from collection time to receipt at National Microbiology Laboratory (Winnipeg)		
Whooping Cough See: Pertussis					
Yersinia Infections Submit samples only after consulting with the Medical Microbiologist (604-707-2618). See: Plague					

Mycology Fungal Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
Aspergillosis For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Aspergillus fumitgatus* *Aspergillus* species	Sputum Ear Swabs Other	For Mycology samples please consult Sample Collection section Fungal Workup for specifics for each type of sample.	Calcofluor Culture	1 – 3 21 – 42
Athletes Foot See: Dermatophytosis					

Mycology
Fungal Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
Blastomycosis, European See: Cryptococcosis					
Blastomycosis, North American Submit samples only after consulting with the Medical Microbiologist (604-707-2618). For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Blastomyces dermatitidis*	Scrapings from Lesions Exudate from Skin Lesions Aspirate from Abscesses Sputum Biopsy Material CSF	For Mycology samples please consult Sample Collection section Fungal Workup for specifics for each type of sample.	Calcofluor Culture	1 – 3 28 – 42
Candidiasis (Candidiosis) See also: Bacteriology	*Candida albicans* *Candida* species	Sputum or Bronchial Washings Mouth, Throat or Vaginal Swabs Body Fluids	For Mycology samples please consult Sample Collection section Fungal Workup for specifics for each type of sample.	Calcofluor Culture	1 – 3 7 - 21
Chromoblastomycosis	*Phialophora verrucosa* *Fonsecaea compacta* *Fonsecaea pedrosoi* *Cladosporum carionii* *Rhinocladiella aquaspera* *Rhinocladiella cereophilium*	Scales from Skin Lesions Pus Sputum Biopsy Material	For Mycology samples please consult Sample Collection section Fungal Workup for specifics for each type of sample.	Calcofluor Culture	1 – 3 28 – 42
Chromomycosis	*Phialophora verrucosa* *Fonsecaea compacta* *Fonsecaea pedrosoi* *Wangiella dermatitidis*	Scales from Lesions Pus Sputum Biopsy Material	For Mycology samples please consult Sample Collection section Fungal Workup for specifics for each type of sample.	Calcofluor Culture	1 – 3 28 – 42

Mycology
Fungal Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
Cladosporiosis	*Cladosporium bantianum*	Biopsy Material of Pus from Brain Abscesses Exudate from Skin Lesions	For Mycology samples please consult Sample Collection section Fungal Workup for specifics for each type of sample.	Calcofluor Culture	1 – 3 28 – 42
Coccidioidomycosis (Coccidioidal granuloma, Valley Fever) Consult with the Mycology Laboratory (604-707-2621). For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Coccidioides immitis*	Sputum or bronchial washings Body fluids Biopsy material CSF	For Mycology samples please consult Sample Collection section Fungal Workup for specifics for each type of sample.	Calcofluor Culture	1 – 3 28 – 42
Cryptococcosis (European blastomycosis, Torulosis) Consult with the Mycology Laboratory (604-707-2621). For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Cryptococcus neoformans* *Cryptococcus gattii*	CSF Pus or Aspirate from Skin Lesions Body Fluids Sputum or Bronchial Washings Biopsy Material	For Mycology samples please consult Sample Collection section Fungal Workup for specifics for each type of sample.	Calcofluor Culture	1 – 2 7 – 21
Dermatophytosis	**Send to local clinical laboratories for testing.**				
Favus See: Dermatophytosis					
Fungal infections See: Dermatophytosis Individual fungal infections					

Mycology
Fungal Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
Geotrichosis	*Geotrichum candidum*	Sputum or Bronchial Washings	For Mycology samples please consult Sample Collection section Fungal Workup for specifics for each type of sample.	Calcofluor Culture	1 – 3 7 – 21
Histoplasmosis Submit samples only after consulting with the Medical Microbiologist (604-707-2618). Consult with the Mycology Laboratory (604-707-2621). For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Histoplasma capsulatum* *Histoplasma duboisii*	Sputum Gastric Washings Urine (must provide clinical history) Swab or Scrapings from Ulcer Bone Marrow (in saline) Blood with Citrate (buffy coat) Biopsy Material (lymph nodes) CSF	For Mycology samples please consult Sample Collection section Fungal Workup for specifics for each type of sample.	Calcofluor Culture	1 – 3 28 -42
Keratomycosis	*Fusarium* species *Acremonium* species *Aspergillus* species Other opportunistic pathogens	Corneal Scrapings	For Mycology samples please consult Sample Collection section Fungal Workup for specifics for each type of sample.	Calcofluor Culture	1 – 3 21 - 42
Murcormycosis See: Zygomycosis					
Mycetoma, actinomycotic (Aerobic actinomycetes)	*Nocardia* species *Streptomyces* species	Exudate from Draining Sinuses	For Mycology samples please consult Sample Collection	Hank's Stain Culture	2 – 3 14 – 21

Mycology
Fungal Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
			section Fungal Workup for specifics for each type of sample.		
Mycetoma, euomycotic	*Pseudoallescheria boydii* *Acremonium falciforme* *Madurella grisea* *Madurella mycetomii* *Exophiala jeanselmei* Other filamentous (mould type) fungi	Aspirated Material from Fluctuant Areas Biopsy Material from Draining Sinuses	For Mycology samples please consult Sample Collection section Fungal Workup for specifics for each type of sample.	Calcofluor Culture	1 – 3 28 – 42
Mycotic (fungal) infections See: Dermatophytosis Individual fungal infections					
Nocardiosis	*Nocardia* species	Sputum Pleural Fluid Material from Abscesses Urine	For Mycology samples please consult Sample Collection section Fungal Workup for specifics for each type of sample.	Hank's Stain Culture	2 – 3 14 – 21
Onychomycosis See also: Dermatophytosis	*Scopulariopsis* species *Aspergillus* species *Penicillium* species	Nail Clippings	For Mycology samples please consult Sample Collection section Fungal Workup for specifics for each type of sample.	Calcofluor Culture	1 - 3 21 – 28
Otomycosis	*Aspergillus niger* *Aspergillus* species *Candida* species *Mucor* species *Rhizopus* species	Debris from Ear Canal or Swabs	For Mycology samples please consult Sample Collection	Calcofluor Culture	1 - 3 14 – 28

Mycology Fungal Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
			section Fungal Workup for specifics for each type of sample.		
Paracoccidioidomycosis (South American blastomycosis) For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Paracoccidioides brasiliensis*	Mouth or Lip Swab Mouth or Lip Scrapings Skin (facial) Swab Skin (facial) Scrapings Pus Sputum Biopsy Material (lymph nodes)	For Mycology samples please consult Sample Collection section Fungal Workup for specifics for each type of sample.	Calcofluor Culture	1 – 3 28 – 42
Penicilliosis For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Pencillium marneffei*	Liver Biopsy Sputum or Bronchial Washings	For Mycology samples please consult Sample Collection section Fungal Workup for specifics for each type of sample.	Calcofluor Culture	1 – 3 28 – 42
Petriellidosis See: Mycetoma For serologic testing see also: Zoonotic Diseases & Emerging Pathogens					
Pityriasis versicolor	*Malassezia furfur*	Skin Scrapings or Scales	For Mycology samples please consult Sample Collection section Fungal Workup for	Calcofluor	1 – 3

Mycology Fungal Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
			specifics for each type of sample.		
Sporotrichosis For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Sporothrix schenckii*	Pus from Ulcerated Lesions Aspirate from Subcutaneous Abscesses Sputum or Bronchial Washings	For Mycology samples please consult Sample Collection section Fungal Workup for specifics for each type of sample.	Calcofluor Culture	1 – 3 28 – 42
Thrush See: Candidiasis					
Tinea (ringworm) See: Dermatophytosis					
Tinea versicolor See: Pityriasis versicolor					
Torulopsis	*Torulopsis glabrata* *Torulopsis candida*	Sputum or Bronchial Washings	For Mycology samples please consult Sample Collection section Fungal Workup for specifics for each type of sample.	Calcofluor Culture	1 – 3 7 – 14
Torulosis See: Cryptococcosis					
Trichomycosis axillaris **Trichomycosis pubis**	*Corynebacterium tenuis*	Hair Shaft with Concretions from Axilla and Groin	For Mycology samples please consult Sample Collection section Fungal Workup for specifics for	Calcofluor	1 – 3

Mycology Fungal Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
			each type of sample.		
Verrucous dermatitis See: Chromoblastomycosis					
Zygomycosis	Fungi in the class of Zygomycetes, especially *Absidia* species *Mucor* species *Rhizopus* species *Mortierella* species *Basidiobolus* species *Cunninghamella* species	Nasal Scrapings Paranasal Sinus Scrapings Orbital Scrapings Sputum Skin Scrapings Biopsy Material	For Mycology samples please consult Sample Collection section Fungal Workup for specifics for each type of sample.	Calcofluor Culture	1 – 3 28 - 42

Patient Samples for Commonly Suspected Fungi

Blood	*Candida, Cryptococcus, Histoplasma, Torulopsis*
Bone/bone marrow	*Blastomyces, Cryptococcus, Histoplasma*
Brain	*Aspergillus, Candida, Cryptococcus, Mucor, Torulopsis*
CSF	*Candida, Coccidioides, Cryptococcus, Histoplasma*
Corneal scrapings	*Aspergillus, Candida, Fusarium*
Ear (auditory canal debris)	*Aspergillus, Candida, Mucor*
Hair	*Microsporum, Piedra, Trichophyton, Trichosporon*
Joint fluid	*Blastomyces, Coccidioides, Sporothrix*
Mucocutaneous tissue	*Candida, Paracoccidiodes*
Nails	*Aspergillus, Candida, Microsporum, Scopulariopsis, Trichophyton,* other opportunistic pathogens

Nasal tissue	*Absidia, Aspergillus, Mucor, Rhinosporidium, Rhizopus*
Prostate fluid	*Blastomyces, Coccidioides*
Skin	*Blastomyces, Candida, Cladosporium, Coccidioides, Cryptococcus* (rare), *Epidermophyton, Fonsecaea, Histoplasma, Malasseza, Microsporum, Phialophora, Prototheca* (alga), *Pseudoallescheria, Trichophytron*
Sputum or bronchial washings	*Aspergillus, Blastomyces, Candida, Coccidioides, Cryptococcus, Geotrichum, Histoplasma, Mucor Paracoccidioides, Rhizopus, Prototheca* (alga), *Sporothrix*
Subcutaneous tissue or abscesses	*Blastomyces, Cladosporium, coccidioides, Cryptococcus, Exophiala, Fonsecaea, Histoplasma, Loboa, Phialophora, Sporothrix*
Urine	*Candida, Cryptococcus, Histoplasma, Torulopsis*
Vagina	*Candida*

Mycology Reporting Procedures

1. Preliminary (Stained Smear) Report:

A Calcofluor White stained smear report will be sent out 24 - 72 hours after the sample is received by in the Bacteriology and Mycology.

2. Culture Report Turnaround Times:

No Growth:

Skin Swabs	3 - 5 days
All other samples	4 weeks

Growth:

Yeast and yeast-like organisms	1-3 weeks
Black yeasts and mould	4-6 weeks
Other opportunistic pathogens	3-6 weeks

ENVIRONMENTAL MICROBIOLOGY PROGRAM

The Environmental Microbiology Program is an integrated area with a focus on food and water analysis for public health purposes (food poisoning, food quality, drinking water, recreational water and waste water). Staff provide expert consultation and Core Function work including: testing of a wide spectrum of environmental and human samples for waterborne or foodborne infections, testing and analysis for public health surveillance purposes, monitoring for public health audits, consultation to public health and health care workers, data analysis, and other work for the detection, investigation and management of gastroenteritis outbreaks or clusters of disease. It performs and supports testing to meet legislated requirements.

Waterborne Outbreaks & Surveillance

Laboratory staff supports the key Core Public Health Functions. Testing for Total Coliforms and *E. coli,* which are microbial indicators of drinking water quality, is carried out, as well as testing of select recreational and waste water samples.

Investigations of bacterial, parasitic or viral waterborne outbreaks are done after approval by the Section Head, (604-707-2608), the Public Health Laboratory Surveillance Outbreak Manager (604-707-2632) or by the Program Head (Medical Microbiologist) at 604-707-2619.

Its experts support the Provincial Health Officer's Enhanced Water Quality Assurance Program (EWQA) for public health testing of drinking water. The EWQA Coordinator may be contacted at 604-707-2647.

Special Requirements

- Samples must be collected in sterile water or ice bottles issued by BCCDC Public Health Laboratory.

Unacceptable Samples

- Drinking water samples with holding time exceeding 30 hours
- Sample not received in sterile container provided by BCCDC PHL
- Insufficient sample (less than 100 mL)
- Sample received frozen
- Sample with insufficient identification

SAMPLE COLLECTION
Water for Bacteriological Examination

Sample Type	Container Type	Requisition	Instructions
Water from tap without attachments	BCCDC PHL Treated plastic bottle	Environmental Microbiology - Water Bacteriology	1. Run water for 2 to 3 minutes before sampling 2. With full aseptic precautions, fill without rinsing to 200 mL fill line or to within 2.5 cm of top. Replace cap securely at once. 3. Complete the sample bottle label and requisition (Form PHWB 100 1001F). **Print clearly. Client contact** information and **date/time** of collection must be filled in. Indicate required tests and check 2 consecutive test volumes for sewage/pollution sample. 4. Ship promptly early in the week, and ship under refrigeration if samples cannot reach the laboratory within six hours of collection. **Samples exceeding 30 hours holding time will not be tested.**
Water from mixing faucet	BCCDC PHL Treated plastic bottle	Environmental Microbiology - Water Bacteriology	1. Remove faucet attachments such as aerators, filters, hoses, screen or splash guard, run hot water for 2 min, then cold water for 2-3 min before sampling. 2. Refer to collecting sample, completing requisition/label and shipping sample as above.
Water from well	BCCDC PHL Treated plastic bottle	Environmental Microbiology - Water Bacteriology	1. Pump for about 5 to 10 min before sampling, or collect directly from well by means of sterilized bottle fitted with a weight at the base, taking care to avoid contact with surface scum. 2. Refer to collecting sample, completing requisition/label and shipping sample as above.
Surface water (pond, lake, stream, spring, river, and reservoir)	BCCDC PHL Treated plastic bottle	Environmental Microbiology - Water Bacteriology	1. Collect samples where water is deep enough to avoid sediment. Hold bottle near base; plunge mouth of bottle under surface of water and fill by turning neck slightly upward and directing mouth upstream or forward away from sampler. 2. Refer to collecting sample, completing requisition/label and shipping sample as above.

Collection of Water for Outbreak Investigation

Consultation with the Section Head (604-707-2608) or the Program Head/Medical Microbiologist (604-707-2619) is required.

Water samples from suspected waterborne outbreaks, must be submitted by staff of official public health agencies.

Larger water samples are required for testing outbreak-implicated bacterial pathogens. One litre of appropriate sample should be collected in each of 5 water bacteriology bottles or in a large, single, sterile, leak-proof container.

Waterborne outbreaks of parasitic etiology (*Giardia, Cryptosporidium*) will only be investigated after consultation with the Medical Microbiologist/Program Head (604-707-2619). Specialized sample collection, transportation and equipment are required.

A completed BCCDC Public Health Laboratory requisition with mandatory information on the site of outbreak, date and location of collection must accompany each request.

Environmental Microbiology Diseases & Infections (Waterborne)					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
Routine Surveillance and Public Health Audits	Total Coliforms, *E. coli* and Enterococci	Drinking water: community, public and private water systems, 200 mL	BCCDC PHL Treated plastic bottle	Total Coliform, *E. coli* Heterotrophic Plate Count (HPC)[1]	1 - 5
		Ice, 200 mL	BCCDC PHL Treated ice glass jar	Total Coliform *E. coli*	1 – 5
		Pools, 200 mL	BCCDC PHL Treated plastic bottle	Total Coliform, Heterotrophic Plate Count (HPC) [1]	2 – 5
		Bathing beaches (marine), 200 mL	BCCDC PHL Treated plastic bottle	Enterococci	1 – 4
		Other water (freshwater): surface water (pond, lake, stream, spring, river, reservoir), 200 mL Industrial waste water and sewage, 200 mL	BCCDC PHL Treated plastic bottle	*E. coli* [2] Total Coliform, *E. coli* [2]	1 – 4 1 - 5
Aeromonas/ Plesiomonas[3]	*Aeromonas hydrophila* *Plesiomonas shigelloides*	Drinking water, at least 1L	BCCDC PHL Treated plastic bottle	Culture	1 – 4
***Campylobacter* enteritis**[3]	*Campylobacter* species	Drinking water, at least 1L	BCCDC PHL Treated plastic bottle	Culture	4 – 7
Cholera[3]	*Vibrio cholera*	Drinking water, at least 1L	BCCDC PHL Treated plastic bottle	Culture	2 – 5
Cryptosporidiosis[3] See also: Parasitology	*Cryptosporidium* species	Special filters for large volumes of suspected contaminated water, raw: max 50L; treated: max 1000L		Detection of oocysts	2
Gastroenteritis Pathogenic *Escherichia coli*[3]	Enteroinvasive, enterohaemorr-hagic, and enterotoxigenic strains of *E. coli*	Drinking water, at least 1L	BCCDC PHL Treated plastic bottle	Culture	2 – 7

Environmental Microbiology Diseases & Infections (Waterborne)					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
Giardiasis[3] See also: Parasitology	*Giardia* species	Special filters for large volumes of suspected contaminated water, raw: max 50L; treated: max 1000L		Detection of cysts	2
Legionnaire's disease[3] See also: Bacteriology ZoonoticDiseases & Emerging Pathogens (serologic testing)	*Legionella species*	Water from air conditioning cooling tower, at least 1L Swabs from various fixtures (e.g. shower heads)	BCCDC PHL Treated plastic bottle	Culture	10 - 14
***Pseudomonas aeruginosa* infections**[3]	*Pseudomonas aeruginosa*	Water from pool and hot tub, at least 1L	BCCDC PHL Treated plastic bottle	Culture	3 – 5
Salmonellosis[3]	*Salmonella species*	Drinking water, at least 1L	BCCDC PHL Treated plastic bottle	Culture	3 – 5
Shigellosis[3]	*Shigella* species	Drinking water, at least 1L	BCCDC PHL Treated plastic bottle	Culture	3 - 5
Yersiniosis[3]	*Yersinia enterocolitica*	Drinking water, at least 1L	BCCDC PHL Treated plastic bottle	Culture	3 - 5

NOTES

1. Heterotropic Plate Counts (HPC) tests are done on request, and only if the sample is received within 6 hours of collection.

2. Indicate two consecutive test volumes and test required on requisition/report from the Water Bacteriology Requisition (PHWB_100_1001F) by checking the appropriate boxes.

3. Consult with the Section Head (604-707-2608) or Medical Microbiologist/Program Head (604-707-2619) before submitting samples.

Food Poisoning & Gastroenteritis Outbreak Investigation

Environmental Microbiology staff work with Regional Health Authorities and other public health workers to investigate food poisoning incidents, including botulism. Staff also detect, identify, and confirm causative agents of epidemiologically-implicated foodborne outbreaks and assist public health workers in determining the food vehicle and the route of transmission. Services allow appropriate interventions for prevention of further spread of disease.

This Program carries out testing for the diagnosis of botulism (including infant botulism). Investigations for botulism are done only after approval of the Medical Microbiologist Program Head (604-707-2619) or if after hours, the Medical Microbiologist On-Call (604-661-7033). Samples are examined for *Clostridium botulinum types* A, B and E and/or its toxins.

Food and clinical samples are routinely examined for *Staphylococcus aureus, Clostridium perfringens, Bacillus cereus, Salmonella,* and *Shigella* species.

If approved by the Program or Section Head and depending on clinical details provided, selected samples are examined for *Campylobacter* species, pathogenic *Escherichia coli, Yersinia enterocolitica, Aeromonas hydrophila, Listeria monocytogenes,* or *Vibrio parahaemolyticus.*

Feces and/or vomitus are examined to investigate gastroenteritis outbreaks. Norovirus, the most frequent agent causing gastroenteritis, is tested for by a RT-PCR procedure. Approval by the Medical Microbiologist Program Head (604-707-2619) or after regular hours, by the Microbiologist On-Call (604-661-7033), is required for Norovirus testing under special circumstances in non-outbreak situations.

Special Requirements

1. For botulism investigations, medical microbiologists must be consulted (Environmental Microbiology Program, 604-707-2619 or On Call, 604-661-7033). Collect four vacutainers of whole, clotted blood (30 mL) to yield 15 mL of serum **before anti-toxin is administered.** Label requisition STAT: Botulism and notify the Environmental Microbiology laboratory of transport details.

2. Include remains of suspect meal and clinical sample (e.g. Feces, vomitus).

3. Collect food samples and clinical sample as soon as possible after food poisoning incidents.

4. For foodborne outbreaks (2 or more cases linked epidemiologically) and suspected viral gastroenteritis outbreaks, contact the BCCDC PHL GI Outbreak Coordinator (604-707-2611) for advice and additional outbreak kits.

SAMPLE COLLECTION
Food Poisoning Investigation

Sample Type	Container Type	Requisition	Instructions
Food Samples	BCCDC PHL Food microbiology jar	Environmental Microbiology - Food Poisoning	1. Collect all remnants of the meal, or at least 200 gram (8 oz) of food. 2. Take representative samples aseptically with sterile implements (knife, spoon, tongs, spatula, etc.) and place them in sterile Food Microbiology Jars. 3. If possible, collect packaged foods (commercial products) in their original containers. 4. Complete requisitions (Form DCFP_100_1001F, Form DCFP_100_1001F2). 5. Keep specimens refrigerated at 4^0C. Transport specimens in a cooler with ice pack to the laboratory promptly. Do not freeze specimens unless they are already frozen. Deliver to the laboratory by the most expeditious route. Shipping by mail is **not** recommended.
Feces Samples	BCCDC PHL Enteric pathogens vial	Environmental Microbiology - Food Poisoning	1. Pass feces into a dry, clean container, or as follows: a. Lift the toilet seat b. Place plastic wrap (e.g. Saran) over the toilet bowl, and push down slightly in the centre to form a depression. c. Use the toilet seat to secure the plastic wrap d. Pass stool on to the plastic wrap or aluminum foil. Avoid contamination with urine or water from the toilet. e. Using a sterile implement, collect portions of the feces containing blood, mucus, or pus and transfer into the vial. Fill up to the line indicated. f. Replace and tighten the cap. 2. For infant botulism investigations, pooled enema sample in an Enteric Pathogens Vial may be submitted. 3. Complete requisition (Form DCFP_100_1001F2) and label the sample container legibly. 4. Keep specimens refrigerated at 4^0C. Transport specimens in a cooler with ice pack to the laboratory promptly and within 3 days of collection. Do not freeze specimens. Deliver to the laboratory by the most expeditious route. Shipping by mail is **not** recommended.
Vomitus / Gastric Contents	BCCDC PHL Vomitus vial	Environmental Microbiology - Food Poisoning	1. Collect at least 100 mL of vomitus. 2. Collect sample aseptically in sterile food microbiology jar. 3. Keep sample refrigerated. 4. Complete requisition (Form DCFP_100_1001F2) and label the sample container legibly 5. Keep specimens refrigerated at 4^0C. Transport specimens in a cooler with ice pack to the laboratory promptly and within 3 days of collection. Do not freeze specimens. Deliver to the laboratory by the most expeditious route. Shipping by mail is **not** recommended.

Food Quality Check (FQC) Program

The Environmental Microbiology Program works with Environmental Health Officers to provide public health testing and data analysis/interpretation to support food protection by the assessment of the sanitary quality of ready-to-eat food from food service establishments. FQC is an educational program in partnership with all Health Authorities.

Food samples are scheduled for testing then submitted by Environmental Health Officers. Samples are tested for four indicators: Total aerobic bacteria, Total Coliform bacteria, Fecal Coliform bacteria, and *Escherichia coli.* If appropriate, pH and water activity are also measured and pathogenic food poisoning organisms cultured.

Requirements

1. Submit all food samples according to the prearranged schedule.
2. Consult with the Food Laboratory (604-707-2611) before submitting unscheduled or additional samples.
3. Consult with the Food Laboratory (604-707-2611) before submitting sample for pH, water activity and culture for pathogenic food poisoning organisms.
4. A completed requisition must accompany every sample.

SAMPLE COLLECTION
Food Quality Check Testing

Sample Type	Container Type	Requisition	Instructions
Food Samples	BCCDC PHL Food microbiology jar	Environmental Microbiology – Food Quality Check Sample	1. Take representative samples aseptically with sterile implements (knife, spoon, tongs, spatula, etc.) and place them in sterile food microbiology jars or other sterile, leak-proof containers. 2. Label the sample container legibly. 3. Fill in the Food Quality Sampling Program requisition (Form DCFP_101_0001f). 4. Keep sample refrigerated. 5. Ship sample in a refrigerated cooler promptly. Do not freeze samples unless they are already frozen. Deliver to the laboratory by the most expeditious route. Shipping by mail is **not** recommended.

Environmental Microbiology Diseases & Infections (Foodborne)

Disease or Infection	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
Foodborne Disease Bacterial - Infection/intoxication See also: Enteric Bacteriology General Bacteriology	*Aeromonas/Plesiomonas*[2] *Bacillus cereus* *Campylobacter* species[2] *Clostridium perfringens* *Escherichia coli* O157:H7[2] Other pathogenic *E.coli*[1] *Listeria monocytogenes*[1] *Salmonella* species *Shigella* species *Staphylococcus aureus* *Vibrio* species[2] *Yersinia enterocolitica*[2]	Remnants of meal, 200g	BCCDC PHL Food microbiology jar or original container	Culture	2 - 7
		Feces, at least 25g	BCCDC PHL Enteric pathogens vial		(Listeria 6 – 15)
		Vomitus/ stomach contents, at least 100g	BCCDC PHL Vomitus vial		
	Staphylococcus aureus Enterotoxin	Leftover foods, 200g	BCCDC PHL Food microbiology jar or original container	Detection of bacterial toxins	2
	Clostridium perfringens Enterotoxin	Vomitus with undigested food, at least 100g	BCCDC PHL Vomitus vial		
		Feces, at least 25 g	BCCDC PHL Enteric pathogens vial		
Botulism[1] (Foodborne) **Consultation is required**	*Clostridium botulinum*[2]	Suspected food, 200g	BCCDC PHL Food microbiology jar or original container	Culture, botulinum toxin assay and typing	4 – 13
		Feces, at least 25g	BCCDC PHL Enteric pathogens vial	Culture, botulinum toxin assay and typing	4 – 13
		Vomitus/ stomach contents, at least 100g	BCCDC PHL Vomitus vial		
		Autopsy material (especially liver and contents of gut), at least 100g	BCCDC PHL Vomitus vial		
		Blood, clotted, 30 mL Separated serum, 15 mL	Vacutainer without anti-coagulant	Botulinum toxin assay and typing	4
Infant Botulism[1]	*Clostridium botulinum*	Feces (pool minute samples), at least 25g	BCCDC PHL Enteric pathogen vial	Culture, botulinum toxin assay	4 – 13

Environmental Microbiology Diseases & Infections (Foodborne)					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
				and typing	
		Pooled enema samples, at least 25g	BCCDC PHL Enteric pathogen vial		
		Suspected food, 200g	BCCDC PHL Food microbiology jar or original container		
Food Quality Testing	(Indicators) Total aerobic bacteria Total coliform bacteria Fecal coliform bacteria/ *Escherichia coli* *Staphylococcus aureus*[4]	Ready-to-eat food, 200g	BCCDC PHL Food microbiology jar or original container	Culture	2 – 5
Outbreak[3] Investigations (2 or more cases linked epidemiologically)	See: *Diarrhea,* bacterial *Diarrhea,* parasitic *Diarrhea,* viral	Feces (collect within 24 hrs of onset), at least 10g/vial	BCCDC PHL GI outbreak kit	RT-PCR, EIA, enteric culture, ova and parasites	2 - 7
	Foodborne Disease - Bacterial	Vomitus, at least 100g	BCCDC PHL GI outbreak kit	Culture,	2 - 7
	Infection/Intoxication	Suspected food, 200g	BCCDC PHL Food microbiology jar or original container	Detection of bacterial toxins	2
				Culture	2 - 7

NOTES

1. Botulism testing is a bioassay using mice. It is performed only after consultation with public health Medical Microbiologist/Program Head (604-707-2619) or after regular hours, the Medical Microbiologist On-Call (604-661-7033).

2. Tests for foodborne infections are performed on food and clinical samples on the basis of history, type of sample and initial culture, after consultation with the Environmental Microbiology Food Poisoning Laboratory (604-707-2611).

3. Contact the Environmental Microbiology Food Poisoning Laboratory (604-707-2611) during regular hours before submitting samples.

4. Not a routine test, but may be performed upon consultation with the Environmental Microbiology Food Poisoning Laboratory (604-707-2611) and approval.

LABORATORY SURVEILLANCE & OUTBREAK COORDINATION

Requests for assistance in outbreak investigation must be made through the Public Health Laboratory Surveillance and Outbreak Manager (604-707-2632) or through the Program Heads (Medical Microbiologists).

Isolates relating to a possible Health Care Acquired Infection (HCAI) must be identified as both epidemiologically and phenotypically related before consulting with BCCDC Public Health Laboratory. First point of contact for the laboratory will be the Medical Microbiologist, Program Head for Public Health Advanced Bacteriology/Mycology (Dr. Linda Hoang, page 1). After approval by the PHABM Program Head (or other Medical Microbiologist), fresh isolate cultures should be batched and sent to BCCDC Public Health Laboratory specifically labeled, e.g. "Attention: Public Health Advanced Bacteriology/Mycology Program – PFGE Typing for Outbreak Investigation".

If a suspected outbreak or cluster is being considered, genotypic fingerprinting (DNA Sequencing, subtyping by PCR, SNA Analysis) and phenotypic characterization (MLST, Pulsed Field Gel Electrophoresis (PFGE)) molecular testing can be done at BCCDC Public Health Laboratory. Please contact the Program associated with the test in question (pages 1-2) or if in doubt, the Public Health Laboratory Surveillance and Outbreak Manager (604-707-2632).

MOLECULAR MICROBIOLOGY & GENOMICS PROGRAM

This Program provides leadership for all other Program staff for trouble-shooting and optimizing molecular microbiology services. Staff support the development, validation and implementation of state-of-the -art molecular testing for the BCCDC Public Health Laboratory.

Molecular microbiology based services are carried out in all Program areas.

Urgent requests are often needed for outbreak/cluster investigations, as well as reference microbiology; Molecular Microbiology & Genomics staff also lead Quality Assurance for molecular tests and educational efforts, across all other Programs.

Consultations on technical molecular issues are managed by members of the Technical Scientific (TechSci) Working Group (A. McNabb, Chair, 604-707-2683).

All molecular testing not yet validated for routine use must be pre-approved by the Medical Microbiologist of each Program area, as listed below:

Dr. Linda Hoang Program Head, Public Health Advanced Bacteriology/Mycology	Telephone: Fax: Email:	604-707-2618 604-707-2603 linda.hoang@bccdc.ca
Dr. Linda Hoang Program Head, Parasitology, Environmental Microbiology	Telephone: Fax: Email:	604-707-2618 604-707-2603 linda.hoang@bccdc.ca
Dr. Mel Krajden Program Head, Mycobacteriology/Tuberculosis, Molecular Microbiology & Genomics	Telephone: Fax: Email:	604-707-2421 604-707-2675 mel.krajden@bccdc.ca
Dr. Mel Krajden Program Head, Virology Services	Telephone: Fax: Email:	604-707-2421 604-707-2420 mel.krajden@bccdc.ca
Dr. Muhammad Morshed Program Head, Zoonotic Diseases & Emerging Pathogens	Telephone: Fax: Email:	604-707-2622 604-707-2603 muhammad.morshed@bccdc.ca
Alan McNabb Section Head, Molecular Microbiology & Genomics Chair, TechSci	Telephone: Fax: Email:	604-707-2683 604-707-2603 alan.mcnabb@bccdc.ca
Dr. Natalie Prystajecky Molecular Coordinator	Telephone: Fax: Email:	604-707-2647 604-707-2600 natalie.prystajecky@bccdc.ca
Yin Chang Molecular Network Manager	Telephone: Email:	604-707-2632 yin.chang@bccdc.ca

Special Requirements:

1. Complete the requisition in full and label the vial with the patient's name and PHN.
2. Samples should be transported to the appropriate laboratory within several hours of collection using appropriate transport conditions (contact the Molecular Microbiology & Genomics Laboratory as required).

Note: In some cases, Nucleic Acid Amplification Testing may not be fully validated (a challenge when diseases are rare). Testing in these cases will only be carried out after approval of the Microbiologist as noted above. Results must be interpreted in context with the patient's clinical signs and symptoms by the physician ordering the tests and with the Public Health Microbiologist.

Molecular Network for Public Health

The Molecular Network for Public Health is governed through the Molecular Microbiology & Genomics Program. It focuses on molecular microbiology related to public health practices and has established, standard protocols to support molecular test validation and verification, including troubleshooting.

All requests for project work related to the Network, including validation/verification panels and implementation of BCCDC PHL molecular assays, should be made through the Network Manager, Yin Chang (yin.chang@bccdc.ca).

MYCOBACTERIOLOGY/TB PROGRAM

The Mycobacteriology/TB Program supports public health province-wide, as well as activities of the BCCDC TB Control (Clinical Prevention Services).

Experts in this specialty area also provide reference services province-wide, with links nationally. They work closely with all other BCCDC Public Health Laboratory areas in its state-of-the-art Containment Level 3 Lab.

This Program provides the following services:

- Consultation and advice on outbreak/cluster investigation, surveillance and patient cases.
- Examination and reporting of acid-fast smear results.
- Processing, examining and reporting of acid-fast culture results.
- Performing qPCR testing for *Mycobacterium tuberculosis complex* by special request and on all smear-positive samples for new cases.
- Identification of all isolated mycobacterial organisms by genetic methods, to the extent required for clinical diagnosis. This includes referred in acid-fast cultures grown in other laboratories across B.C.
- Performing antimicrobial susceptibility tests on:

    - New isolates of *Mycobacterium tuberculosis* (TB)
    - Repeat isolates of *M. tuberculosis,* on request
    - Pathogenic isolates of non-tuberculous mycobacterial isolates (NTM) on request

- Request for molecular assays to detect Mycobacterium species by direct testing on samples are available as follows:

    - TB qPCR (*Mycobacterium tuberculosis* Direct) performed on concentrated respiratory samples that are AFB smear-positive on new cases.
    - Direct Heat Shock Protein 65K (HSP65K) testing. Consult with the Program Head, Dr. Mel Krajden (604-707-2421, or for emergencies, the Medical Microbiologist On-Call (604-661-7033), for prior approval.

- The following must be considered before requesting direct genetic testing:

    - Culture is still the optimum method for establishing the viability of *M. tuberculosis* or other mycobacteria as well as the most sensitive method of detection of Mycobacterium species.

For consultation or discussion of specific cases or investigations, contact the Program Head (Medical Microbiologist), Dr.Mel Krajden (604-707-2421.

Special Requirements

- Ensure that the sample container is tightly closed. **Leaking sputum or urine samples will not be processed.**
- All samples except blood and bone marrow should be refrigerated before and during transport. Blood tube and bone marrow should be held at 37°C before transport.
- Fill in a brief summary of patient history and findings for **all** sample types. This may be important for the assessment of significance of NTM isolates.
- All samples must be packaged according to **Transport of Dangerous Goods** regulations. Under these regulations, *Mycobacterium tuberculosis* is considered a **Category A** organism.

  Cultures of *Mycobacterium tuberculosis* require **Category A** type packaging. Diagnostic specimens or samples suspected of containing *Mycobacterium tuberculosis* must be transported as **Category B** packaging. For more detailed information, see the **Transport of Dangerous Goods** regulations.
- All samples, except bloods and bone marrow, should be refrigerated if transit time is delayed.
- Do not add alcohol, formalin, or other preservatives to any sample.
- All Mycobacteriology/TB samples, regardless of type, must be submitted in sterile, screw-cap **leak-proof** containers.

Unacceptable Samples

- Swabs are not recommended for TB qPCR and the isolation of mycobacteria (limited material). They are acceptable ***only*** if a sample cannot be collected by other means.
- Blood collected in EDTA, (inhibits mycobacterial growth even in trace amounts)
- Coagulated blood
- Sample submitted in formalin, alcohol or other preservatives
- Gastric lavages that have not been neutralized
- Frozen Feces sample
- Leaking urine/sputa
- Urine from catheter bag or NOT first morning void urine samples (as they are too dilute).
- Saliva
- 24-h pooled urine and sputum samples
- Supernatant or centrifuged CSF

SAMPLE COLLECTION
Mycobacteriology / TB

Type of Sample	Container Type	Requisition	Instructions
Sputum	BCCDC PHL TB plastic jar in sealable biohazard bag	Mycobacteriology / TB	• Collect three samples collected at least one hour apart, preferably including at least one early morning sample • A volume of 5-10 mL is adequate for each sample. • Do not add alcohol or other preservatives. • Keep samples refrigerated until transported. • Instruct all patients to close containers tightly and package separately. **Leaking sputum samples will not be processed.** • **Saliva is not an acceptable sample.** Instruct the patient **not to spit** into the sample container, but to take a deep breath and cough directly into the container. • Sputum is the preferred sample for pulmonary mycobacterial disease. However, some patients may have problems producing sputum. In these cases other techniques that can be used include induction of cough and sputum by inhalation of warmed, sterile hypertonic saline aerosol (**Please indicate on the requisition if the sputum was induced),** bronchoscopes, gastric washing and auger suction. **Specific Instructions for Patients** **Note:** Sputum is mucous (phlegm coughed up from your lungs). It is **not** saliva (the water from your mouth). 1. Take a deep breath through your mouth and cough up some mucous into the sample jar. Be careful not to get any on the outside of the jar. 2. Put the lid back on the jar, and **close it tightly, so that it does not leak.** 3. Keep each jar in the refrigerator until you can return them all to the Clinic or Lab.
Stomach/ Gastric washing*	BCCDC PHL TB treated glass jar in sealable biohazard bag	Mycobacteriology / TB	• Collect three fasting early morning samples taken on consecutive days. • Use **only** TB treated glass jars, containing buffer salts to neutralize stomach acid. • A volume of a least 1 mL is adequate for each sample. • Close containers tightly to prevent leakage. *** Glass jars for stomach/gastric washings collection should be requested from BC PHMRL Mycobacteriology Laboratory 2 weeks prior to anticipated collection ***

SAMPLE COLLECTION
Mycobacteriology / TB

Type of Sample	Container Type	Requisition	Instructions
Urine	BCCDC PHL TB plastic vial in sealable biohazard bag	Mycobacteriology / TB	• Three **first mornings**, clean catch midstream samples on consecutive days – **not** 24 hour pooled samples. • A volume greater than or equal to 50 mL to 100 mL is adequate for each sample • Any sample less than 20 mL will not be processed • Close containers tightly and package separately. • Use only Tuberculosis plastic sample containers, which are supplied by the BCCDC Public Health Laboratory and are less likely to leak. • Urines submitted in plastic containers which have **leaked will not be processed.**
			Note: It is important that these samples be first morning samples or samples from catheterized patients only. Mycobacteria, if present will accumulate in the bladder overnight. Samples taken at any other time of day will be too diluted, and therefore, unsuitable.
Body fluids Bronchial washings Other fluid samples	BCCDC PHL TB plastic jar or in sealable biohazard bag	Mycobacteriology / TB	• Do not submit samples in aspiration tubes, which often leak. • Do not send sample in a syringe. • Close containers tightly to prevent leakage. • Submit as much quantity of sample as possible.
	BCCDC PHL SPS vial (yellow top blood tube) in sealable biohazard bag		• Add **sodium polyanethole sulfonate** (SPS) to those body fluids likely to clot such as pleural fluids or bone marrow aspirates. SPS is the preferred anticoagulant, as it enhances growth of mycobacteria. Sodium citrate or Heparin is also acceptable. However, **do not** use EDTA, as it inhibits growth of mycobacteria. • A volume of 3mL is adequate for each sample. • See for SPS vial description: https://www.bd.com/vacutainer/pdfs/plus_plastic_tubes_wallchart_tubeguide_VS5229.pdf •
CSF	BCCDC PHL TB plastic jar in sealable biohazard bag	Mycobacteriology / TB	• Submit sample in a sterile screw-cap leak-proof container. • Submit at least 3 mL if possible. Send the maximum volume attainable. • Do **not** submit supernatant. Submit un-centrifuged CSF.
Tissue Biopsy material	BCCDC PHL TB plastic jar in sealable biohazard	Mycobacteriology / TB	• Collect samples aseptically. • Submit as much quantity of sample as possible. • Indicate site material was collected from on requisition. • Keep tissues moist by adding a few drops of sterile saline or water. • Do **not** add tissue fixatives or preservatives.

SAMPLE COLLECTION
Mycobacteriology / TB

Type of Sample	Container Type	Requisition	Instructions
	bag		• Refrigerate, but do not freeze, until transporting.
Blood	BCCDC PHL SPS vial (yellow top blood tube) in sealable biohazard bag	Mycobacteriology / TB	• Cultured only on patients who are HIV positive or are known to be immunocompromised. • Samples **must** be submitted in yellow top blood tubes with anticoagulant. The preferred anticoagulant for *Mycobacteria* is SPS, but citrate or heparin is acceptable; do **not** use EDTA. • The required volume of blood is 5 mL. Minimum pediatric volume is 3 mL. • Submit blood tubes to the laboratory immediately. If delayed, do not refrigerate. Hold at 37°C.
Bone marrow	BCCDC PHL SPS vial (yellow top blood tube) in sealable biohazard bag	Mycobacteriology / TB	• Samples **must** be submitted in yellow top blood tubes with anticoagulant. The preferred anticoagulant for *Mycobacteria* is SPS, but citrate or heparin is acceptable; do **not** use EDTA. • A volume of 3 mL is adequate for each sample. • One sample is the norm. • Submit sample tubes to the laboratory immediately. If delayed, do not refrigerate. Hold at 37°C.
Feces/Stool	BCCDC PHL TB plastic jar in sealable biohazard bag	Mycobacteriology / TB	• Not routinely accepted. • Cultured only if a suggestive patient history is provided. • Samples from HIV positive patients are smeared first, and are cultured only if the smear is positive. • Submit samples in a TB plastic jar, or other leak-proof, sterile screw-cap container. Do **not** add any preservatives. • A volume of 5 mL is adequate for each sample.

Mycobacteriology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required[2]**	**Container Type**	**Test Performed**	**TAT (Working Days)**
Leprosy	*Mycobacterium leprae*	Biopsy of Tissue Affected, Usually Skin Nodes Nasal Scrapings	BCCDC PHL TB plastic jar in sealable biohazard bag *Note: Swabs[1], Unacceptable	*Mycobacterium leprae* can be identified only by microscopic morphology or molecular identification by hsp65 sequencing. It does not grow in culture. However, the sample can be cultured in order to rule out other mycobacterial infections.	Smears: 1-2
Tuberculosis (TB)	*Mycobacterium tuberculosis* Mycobacterium bovis	Sputum Bronchial or Lung Washing	BCCDC PHL TB plastic jar in sealable biohazard bag	Smear and culture*	Smears: 1-2 Negative Cultures: 30 (6 weeks)
		Gastric Washing	BCCDC PHL TB treated glass jar in sealable biohazard bag	**Note:** TB qPCR test is performed on <u>new</u> positive concentrated AFB respiratory and non-respiratory samples. Direct genetic probe available by specific request. Prior consultation is necessary. Culture is still the most sensitive method for detection.	Positive Cultures: 20-50 (4-10 weeks) Referred Cultures: 25 (5 weeks) TB qPCR: 1-3
		Urine Body Fluid Joint Fluid Aspirated Material[5] Exudate CSF Biopsy Tissue Curetting	BC TB plastic jar in sealable biohazard bag		

Mycobacteriology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required[2]**	**Container Type**	**Test Performed**	**TAT (Working Days)**
		Bone[3,4] Marrow	BCCDC PHL SPS vial (yellow top blood tube) in sealable biohazard bag	***TB Susceptibilities**	***First line TB Susceptibilities 20-35 (4-7 weeks)**
		Blood[3,4]			
		Feces	BCCDC PHL TB plastic jar in sealable biohazard bag		
NTM infection at pulmonary or extra-pulmonary site	MOTT (Mycobacteria other than tuberculosis) NTM (non-tuberculous mycobacteria) Examples: *Mycobacterium avium* complex *Mycobacterium kansasii* *Mycobacterium fortuitum* *Mycobacterium chelonae* *Mycobacterium marinum*	Sputum	BCCDC PHL TB plastic jar in sealable biohazard bag	Smear and culture* ***NTM Susceptabilities** (by special request)	***First line TB Susceptibilities 20-35 (4-7 weeks)**
		Bronchial or Lung Washing			
		Gastric Washing	BCCDC PHL TB treated glass jar in sealable biohazard bag		
		Urine	BCCDC PHL TB plastic jar in sealable biohazard bag		
		Body Fluid			
		Joint Fluid			
		Aspirated Material[5]			
		Exudate			
		CSF			
		Biopsy Tissue			
		Curetting			
		Bone[3,4] Marrow	BCCDC PHL SPS vial (yellow top blood tube) in sealable biohazard bag		
		Blood[3,4]			
		Feces	BCCDC PHL TB plastic jar in sealable biohazard bag		

Reporting Procedures

1. Preliminary Reports:

During weekdays, results of AFB smears are reported within 24 hours of receipt of the sample in the laboratory. Examination of STAT samples is available after regular working hours (8:00 am – 4:00 pm Monday – Friday). If a TB qPCR test has been requested and approved on a sample that is positive on smear, the results of qPCR test will be reported on the same day qPCR is done.

The TB qPCR test is used as an adjunct for evaluating AFB smear-positive samples from new patients.

2. Subsequent Reports: (dependent on growth in culture):

a. No growth:
A **final report** is sent when there is no growth after six weeks of incubation.

b. Growth:
An **interim report** is sent as soon as growth of mycobacteria is first detected. Depending on the type of growth medium used, this may take, on average, 3 to 5 weeks after receiving the sample. Identification follows.

An **interim report** is sent when type or species of mycobacterium is identified. *M tuberculosis* normally takes 1 – 2 weeks following the interim report. Non-tuberculous Mycobacteria (NTM) may take, on average, 2 – 6 weeks following the interim report.

3. Susceptibility Testing Reports:

- **For new cases of *M. tuberculosis*** – reports of results are sent when susceptibilities using primary drugs are completed, 1 – 3 weeks following the interim report. Pyrazinamidase is automatically performed on Isoniazid and/or Rifampin-resistant *M. tuberculosis* isolates.

- **For cases of Non-tuberculous mycobacterial (NTM) *M. avium* complex –** reports on results are sent when a request is made and minimum inhibitory concentrations (MIC's) are completed, normally 2 – 3 weeks. (Clarithromycin only). Other drugs need to be requested separately and require approval by Medical Microbiologist on call.

- **For other pathogenic non-tuberculous mycobacterial (NTM) isolates** – reports on results are sent when a request is made and testing completed, normally 2 to 3 weeks.

Note:

Because there is a wide variety in growth rates of the many different species of mycobacteria, with most mycobacterial species being slow-growing organisms, turnaround times (TATs) for positive culture results may vary significantly. Growth is most often observed after weeks, rather than days.

NOTES

1. Swabs are not recommended for isolation of mycobacteria. They are acceptable ***only*** if a sample cannot be collected by other means. Do not use Charcoal Transport Media.

2. Do not add alcohol, formalin, or other preservatives to samples.

3. All samples, except blood and bone marrow, should be refrigerated before and during transport. Blood or bone marrow (SPS vials) tubes should be held at 37°C before transport.

4. Due to the high cost of the individual bottles of liquid medium, these bottles will not be sent out for clients to keep on hand. Blood or bone marrow will be inoculated into the liquid culture medium at the Mycobacteriology Laboratory. To eliminate any delay in taking and culturing blood or bone marrow samples, submit these directly in yellow top blood tubes as described on the Sample Collection Table for Blood**.**

5. Do not submit samples in aspiration tubes, which are prone to leak. Transfer the sample into a sterile, leak-proof screw-cap container.

PARASITOLOGY PROGRAM

The Parasitology Program experts provide laboratory services for public health as well as hospital and community parasitology laboratories across British Columbia (BC). Our experts also work to detect and investigate outbreaks of parasitic diseases. Its medical and technical staff also provides reference diagnostic services for the morphological identification of intestinal, blood and tissue parasites found in humans. Reference service includes STAT On-Call for possible cases of malaria, a life threatening illness.

Medical Parasitology is a challenging microbiology discipline, requiring many years of experience to obtain required reference expertise. It integrates culture, microscopic, molecular and serological tools to determine etiologies of rare diseases.

The technical staff teaches and provides education to staff in other laboratories across BC as well as to public health workers, under-graduate and post-graduate medical students.

The Parasitology Program also provides reference diagnostic services for the identification of ectoparasites, (including West Nile virus mosquito vectors) of medical importance to humans.

> ***Note:*** **Malaria is a medical emergency.** Thick and thin smears and EDTA blood must be submitted STAT to clinical laboratories for diagnosis. After hours, the BCCDC PHL Medical Microbiologist On-call may be reached at 604-661-7033 for clinical consultations. Technical BCCDC PHL Laboratory experts will be paged for reference testing if a malaria sample is received in the Central Process & Receiving Laboratory at BCCDC PHL outside of regular working hours (Mon-Fri 0750-1630) and on STAT holidays.

For discussion of individual cases or specific investigations, contact:

1. Program Head's Executive Assistant (604-707-2646)
2. Program Head (Telephone 604-707-2618/pager 604-977-2569)
3. For after hours medical emergencies, page the Medical Microbiologist On-Call (604-661-7033).

PARASITIC TELEPATHOLOGY

The Parasitology Program at BC Public Health Microbiology and Reference Laboratory (BCCDC PHL) offers parasitic telepathology services as another means to aid in the diagnosis of parasitic infections. Telepathology uses telecommunications technology to facilitate the transfer of image-rich pathology data between distant sites for the purposes of diagnosis, education and research. Digital images and a completed Parasitology requisition will be required

for diagnostic assistance and to receive a formal report. Digital images and the completed requisition can be emailed to the address below, which should include the following information:

- Clinical history (age, gender, clinical signs and symptoms, duration, past medical history)
- Contact person(s) and information (telephone, email)
- Type of specimen and if tissue, part under review
- Date specimen collected, stain used (if any), and magnification of the microscopic field captured
- Object/structures of interest noted and size measurements
- Suggested diagnosis, and differential diagnosis (list)

requisition https://bccdc.ca/Health-Professionals-Site/Documents/PHSA-Laboratories/ParaReq.pdf

email _BCCDC_TeleParasitology@ehcnet.phsa.ca

Unacceptable Samples

- Sputum requesting *Pneumocystis* examination
- Translucent and opaque tape requesting Pinworm examination
- Fecally contaminated sticky paddle requesting Pinworm examination
- Rectal swab requesting Ova and Parasite Services examination
- Sample that has leaked in transit. Consultation on some difficult-to-obtain patient samples is required in order to proceed with testing.
- Arthropods (eg. ticks) sent through Canada Post (arthropods will be damaged). Send ticks via courier or drop off at BCCDC (lane level).

SAMPLE COLLECTION
Parasitology

Sample Type	Container Type	Requisition	Information
Feces, preserved	BCCDC PHL SAF feces vial	Parasitology	1. Do not contaminate with urine, water or soil. With spoon (attached to lid of sample container), add 2 or 3 spoonfuls of fresh sample to the liquid (SAF preservative) in the container. 2. Mix well and screw lid on tightly.
Feces, unpreserved	Sterile container	Parasitology	For the following tests: 1. Stool antigen test if patient positive for *Entamoeba histolytica/dispar.*

			2. Specialized tests for *Strongyloides stercoralis*. 3. Hatch Test for *Schistosoma mansoni* or *Schistosoma japonicum* (Do not refrigerate).
Urine	Sterile container	Parasitology	1. Fill the sterile clean vial (no SAF preservative) with midstream to terminal urine (collected between 10:00 am and 3:00 pm). 2. Do not refrigerate if *Schistosoma haematobium* hatch test is requested.
Ticks and other arthropods	Sterile container	Parasitology or Zoonotic Diseases & Emerging Pathogens	1. All ticks: Submit with slightly moistened cotton. Live or dead ticks may be submitted for testing. 2. Other arthropods: Submit dry.
Worms and proglottids	Sterile container	Parasitology	1. Submit sample unpreserved in 0.85% NaCl. 2. If there is a delay in transit of 3 or more days, submit in 70% alcohol.
Pinworms **NOTE:** The ideal time for this procedure is early in the morning after arising and before emptying bowels.	BCCDC PHL Sticky paddle	Parasitology	1. Remove cap which has an inserted paddle with oneside coated with a non-toxic mildly adhesive material. This side is marked "sticky side". Do not touch this surface with the fingers. 2. Press the sticky surface against the perianal skin with moderate pressure.
	Vaseline paraffin anal swab		1. Remove cap which has an inserted Vaseline paraffin anal swab. 2. Press the anal swab against the perianal skin with moderate pressure.
	Transparent scotch tape preparation		1. Press the transparent scotch tape against the perianal skin with moderate pressure. 2. Place scotch tape on slide.
Blood and tissue	Refer to Diseases Table	Parasitology	Please refer to the pertinent parasite in the Diseases Table for appropriate collection materials. 1. Thin and thick blood smears prepared from newly drawn blood (at height of paroxysm and 8-16 hours later). Blood smears are required for Plasmodium species identification. 2. It is recommended that a minimum of 2 thick and 2 thin smears be submitted. 3. Malaria dipstick test is available. Submit EDTA blood. 4. Do not refrigerate EDTA blood. 5. Malaria Examination: Blood and smears should be submitted STAT to the laboratory.
Other samples	Refer to Diseases Table	Parasitology	1. Refer to the pertinent parasites in the **Diseases Table**. 2. Consult the Medical Microbiologist/Parasitologist (604-707-2619/2646) or the Parasitology Laboratory (604-707-2629) regarding the collection and submission of satisfactory samples.

Parasitology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
Acanthamoeba keratitis	*Acanthamoeba* species	Corneal biopsy or scrapings	Sample inoculated directly onto pre-lawned non-nutrient agar plates (supplied by Parasitology)	Culture Contact Parasitology Laboratory 604-707-2629 for non-nutrient agar plates **24 hours notification required**	Up to 31 for culture 7 for prelim-inary report
		Contact lenses	Contact lenses in contact lens case		
		Contact lens solution	Contact lens solution bottle		
African sleeping sickness See: Trypanosomiasis, African					
American trypanosomiasis See: Trypanosomiasis, American					
Amoebiasis[1] (amoebic dysentery, amoebic liver abscess) For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Entamoeba histolytica*	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5
		Unpreserved Feces Refrigerate immediately after collection and send to the Parasitology Laboratory within 24 hrs OR Freeze stool after collection and send.	Sterile container	O&P Stool antigen test if O&P positive for *E. histolytica/dispar*	2-3.5 1-3 after O&P exam

Parasitology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
		Also, submit SAF preserved feces sample to confirm presence of *E. histolytica/dispar.*			
		Aspirate	Split sample – half into BCCDC PHL SAF feces vial and half into sterile container	Identification	1-2
		Tissue (unpreserved)	Sterile container	Identification	1-2
Amoebic encephalitis[1] See: Amoebiasis PAME		CNS Material	Sterile container or tube	Contact Medical Microbiologist 604-707-2619/2646 or Parasitology Laboratory 604-707-2629	
Ancylostomiasis See: Hookworm disease					
Angiostrongyliasis[1]	*Angiostrongylus cantonensis*	CSF	Sterile tube	Contact Medical Microbiologist 604-707-2619/2646 or Parasitology Laboratory 604-707-2629	1-3
Arthropods See: Ectoparasites					
Ascariasis	*Ascaris* species (large roundworm)	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5
		Worm passed in Feces	Sterile containter - submit unpreserved in 0.85% NaCl, or if there is a delay in transit of three or more	Identification	1-3

Parasitology Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
			days, submit in 5% formalin or 70% alcohol.		
Babesiosis For serologic testing see also: Zoonotic Diseases & Emerging Pathogens		Freshly made Thick & Thin blood films Blood films from three different days (preferably during febrile episodes) must be examined before ruling out *Babesia* or performing serology.		Identification	1-2
		Unrefrigerated fresh blood with anticoagulant (EDTA)	BCCDC PHL EDTA (purple top) blood tube		
Balantidiasis	*Balantidium coli*	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5
Beef Tapeworm Infection See: Taeniasis					
Bilharziasis See: Schistosomiasis					
Blastocystosis	*Blastocystis hominis*	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5
Brugiasis See: Filariasis					
Chagas' Disease See: Trypanosomiasis, South American					
Chinese Liver Fluke Infection See: Clonorchiasis					

Parasitology Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
Clonorchiasis See also: Heterophyiasis Chinese liver fluke	*Clonorchis sinensis* (Chinese liver fluke) *Opisthorchis felineus* *Opisthorchis viverrini* *Metorchis conjunctus*	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5
		Fluke	Sterile containter - 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.	Identification	1-3
Coccidiosis (parasites)	*Isospora belli* *Sarcocystis hominis* *Sarcocystis suihominis* *Cyclospora cayetanensis* *Crytosporidium* spp.	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5
		Duodenal contents	BCCDC PHL SAF feces vial	O&P	
		Duodenal mucosa (biopsy, autopsy)	Sterile container	Identification	
Cryptosporidiosis See also: Environmental Microbiology	*Cryptosporidium* species	Feces	BCCDC PHL SAF feces vial		2-3.5
Cutaneous Larva Migrans See: Hookworm disease					
Cyclosporiasis	*Cyclospora cayetanensis*	Feces	BCCDC PHL SAF feces vial	O&P All community labs to inform Parasitology 604-707-2629 of positive *Cyclospora* cases (enhanced surveillance)	2-3.5
Cysticercosis See: Taeniasis					
Demodectic Mange	*Demodex folliculorum* *Demodex brevis*	Skin scrapings including hair follicles and sebaceous glands	Submit dry or mounted between two slides. Prior	Identification	1-3

Parasitology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
			consultation is advised.		
Dermatitis caused by parasites See: Hookworm disease					
Diarrhoea, parasitic See: Amoebic dysentery Balantidiasis Coccidiosis Cryptosporidiosis Dientamoebiasis Giardiasis Hookworm disease Strongyloidiasis Trichinosis					
Dientamoebiasis	*Dientamoeba fragilis*	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5
Diphyllobothriasis	*Diphyllobothrium* species (fish tapeworm)	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5
		Worm segments (proglottids)	Sterile containter - 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.	Identification	1-3
Dracontiasis See: Dracunculiasis					
Dracunculiasis[1]	*Drancunculus medinensis* (Guinea worm or Medina worm)	Biopsy of skin lesion	Sterile container	Identification	1-3
		Adult worm extracted from skin lesion	Sterile container - submit unpreserved in 0.85% NaCl, or if there is a	Contact Medical Microbiologist 604-707-2619/2646 or Parasitology Laboratory 604-707-2629	1-3

Parasitology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
			delay in transit of three or more days, submit in 5% formalin or 70% alcohol.		
Dysentery, amoebic See: Amoebic dysentery					
Echinococcosis[1] For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Echinococcus granulosus* (dog tapeworm) *Echinococcus multilocularis*	Aspirated fluid from cyst Cyst, excised Sputum (hooklets)	Sterile container	Identification Contact Medical Microbiologist 604-707-2619/2646 or Parasitology Laboratory 604-707-2629	1-2
Ectoparasites See also: Lyme disease	Arthropods (mites, ticks, fleas, lice, fly maggots etc.)	Arthropods (mites, ticks, fleas, lice, fly maggots, etc.)	Sterile/Clean container **Dead:** Submit Dry or in 70% Alcohol **Alive:** Submit with slightly moistened cotton	Identification	1-3
Elephantiasis See: Filariasis					
Encephalitis, amoebic See: Amoebic encephalitis PAME					
Enterobiasis	*Enterobius vermicularis* (pinworm)	Pinworm paddle applied to perianal region	BCCDC PHL Sticky paddle	O&P	1-3

Parasitology Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
		Vaseline paraffin anal swabs or transparent cellulose (**NOT** translucent or opaque) tape preparations *Note: Fecal samples are not acceptable*	Vaseline paraffin or Transparent cellulose tape		
Eosinophilic meningitis See: Angiostrongyliasis					
Espundia[1] See: Leishmaniasis, Mucocutaneous form				Contact Medical Microbiologist 604-707-2619/2646 or Parasitology Laboratory 604-707-2629	
Fascioliasis For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Fasciola gigantica* *Fasciola hepatica*	Feces	BCCDC PHL SAF feces vial Repeat after several days on a liver free diet if the initial exam is positive for the parasites.	O&P	2-3.5
Fasciolopsiasis	*Fasciolopsis buski*	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5
Filariasis[1] See also: Loiasis Onchocerciasis Mansonelliasis For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Wuchereria bancrofti*[2] *Brugia malayi*[3] *Mansonella perstans*[4] *Mansonella ozzardi*[5] *Loa loa*	Freshly made Thick & Thin blood films		Contact Parasitology Laboratory 604-707-2629 Identification	1-2
		Unrefrigerated fresh blood with anticoagulant (EDTA)	BCCDC PHL EDTA (purple top) blood tube		
Fish Tapeworm Infection See: Diphyllobothriasis					
Giardiasis	*Giardia lamblia*	Feces	BCCDC PHL	O&P	2-3.5

Parasitology Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
See also: Environmental Microbiology	*(duodenalis)*	Duodenal drainage	SAF feces vial		
Hepatitis, parasitic See: Amoebic dysentery Ascariasis Clonorchiasis Schistosomiasis Trypanosomiasis					
Heterophyiasis See: Clonorchiasis	*Heterophyes heterophyes* *Metagonimus yokogawai*	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5
Hookworm disease, Ancylostomiasis[1] See: Trichostrongyliasis	*Ancylostoma duodenale* *Necator americanus* *Ancylostoma brasiliense* *Ancylostoma caninum*	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5
		Skin scrapings from larval tracks[1] Sputum (migrating larva)	Sterile container	Identification Contact Parasitology Laboratory 604-707-2629	1-2
Hydatidosis See: Echinococcosis					
Hymenolepiasis	*Hymenolepis nana* *Hymenolepis diminuta*	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5
Isosporosis	*Isospora belli*	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5
Kala Azar[1] See: Leishmaniasis, visceral form For serologic testing see also: Zoonotic Diseases & Emerging Pathogens				Contact Medical Microbiologist 604-707-2619/2646 or Parasitology Laboratory 604-707-2629	
Larva Migrans, cutaneous See: Hookworm disease					
Larva Migrans, visceral See: Toxocariasis					

Parasitology Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
Leishmaniasis, cutaneous form[1] **Old World** Oriental sore, Baghdad boil, Delhi boil, Biskra button, Aleppo evil **New World** uta (Peru), dicera de Baurid (Brazil),chiclero ulcer or bay sore (Mexico), pian bois or forest yaws (Guyana), American Cutaneous Leishmaniasis (CL)	**Old World** *Leishmania tropica* *L. major* *L. aethipica* complexes *L. infantum* (rare) **New World** *L. guyanensis* complex *L. mexicana* complex *L. braziliensis* complex	Biopsy from edge or base of skin lesions Lesion should be cleaned before the sample is collected, to reduce the chances of contamination with fungi or bacteria.	Sterile container	Contact Medical Microbiologist 604-707-2619/2646 or Parasitology Laboratory 604-707-2629 Culture	Up to 31 for culture 7 for prelim-inary report
Leishmaniasis, mucocutaneous form[1] **New World** Espundia	**New World** *Leishmania brasiliensis* complex	Biopsy material	Sterile container	Contact Medical Microbiologist 604-707-2619/2646 or Parasitology Laboratory 604-707-2629 Culture	Up to 31 for culture 7 for prelim-inary report
Leishmaniasis, visceral form[1] **Old World** Kala Azar, Dumdum Fever **New World** American Visceral Leishmaniasis (VL) For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	**Old World** *Leishmania donovani* *L. infantum* *L. tropica* **New World** *L. chagasi*	Freshly made Thick & Thin blood films Bone marrow films Unrefrigerated fresh blood with anticoagulant (EDTA) Biopsy material (spleen, liver, lymph noted)	 BCCDC PHL EDTA (purple top) blood tube Sterile container	Contact Medical Microbiologist 604-707-2619/2646 or Parasitology Laboratory 604-707-2629 Identification Culture	 1-2 Up to 31 for culture

Parasitology Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
					7 for prelim-inary report
Liver abscess See: Amoebic dysentery Ascariasis					
Loiasis[1] See: Filariasis	*Loa loa (*African eye worm)	Urine Sputum Blood vessel biopsy Autopsy biopsy	Sterile container	Contact Medical Microbiologist 604-707-2619/2646 or Parasitology Laboratory 604-707-2629 Identification	
		CSF Cervicovaginal smears	Sterile tube		1-2
Lyme disease	Ticks potentially carrying *Borrelia burgdorferi*	Tick	Sterile/Clean container **Dead:** Submit Dry or in 70% Alcohol **Alive:** Submit with slightly moistened cotton	Identification **Only ticks potentially carrying *Borrelia burgdorferi* will be forwarded to the Zoonotic Diseases & Emerging Pathogens Section for PCR**	1-3
Malaria[7] For serologic testing see also: Zoonotic Diseases & Emerging Pathogens **Malaria is considered a MEDICAL EMERGENCY. Thin and thick smears and EDTA blood must be submitted STAT to a clinical diagnostic laboratory.**	*Plasmodium vivax* *Plasmodium malariae* *Plasmodium ovale* *Plasmodium falciparum* *Plasmodium knowlesi*	Thick & Thin blood films from finger blood (at height of paroxysm and 8-16 hours later) **SUBMITTED STAT**		Identification **Laboratory experts will be paged if a malaria sample is received outside of regular working hours (Mon-Fri 0750-1630)and on STAT holidays.** **After hours, medical experts may be reached at 604-661-7033 for clinical consultations.**	<1
		Unrefrigerated fresh blood with anticoagulant (EDTA)	BCCDC PHL EDTA (purple top) blood tube		
Mansonelliasis[1] See also:	*Mansonella streptocerca*	Skin biopsy		Contact Medical Microbiologist	

Parasitology Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
Filariasis (*Mansonella perstans* and *Mansonella ozzardi*)			Sterile container	604-707-2619/2646 or Parasitology Laboratory 604-707-2629 Identification	1-2
Microsporidiosis	*Microsporidia* species	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5
Myiasis	Maggots	Maggots	Sterile container **Dead:** Submit Dry or in 70% Alcohol **Alive:** Submit with slightly moistened cotton	Identification	1-3
Onchocerciasis[1]	*Onchocerca volvulus*	Skin biopsy Aspirated material from skin nodules Excision of nodule	Sterile container	Contact Medical Microbiologist 604-707-2619/2646 or Parasitology Laboratory 604-707-2629 Identification	1-2
PAM[1] (Primary Amoebic Meningoencephalitis)	*Naegleria* species *Hartmanella* species *Acanthamoeba* species Others	Nasal swab CSF Autopsy material, fresh, preserved	Sterile container or tube	Contact Medical Microbiologist 604-707-2619/2646 or Parasitology Laboratory 604-707-2629 **24 hour notification required** Culture	Up to 31 for culture 7 for prelim-inary report
Paragonimiasis For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Paragonimus* species (lung fluke)	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5
		Sputum	Sterile container	Identification	1-2
Pediculosis	*Pediculus humanus capitis* (head louse) *Pediculus humanus corporis* (body louse) *Phthirus pubis* (crab louse)	Adults, nymphs, or eggs ("nits") Hair	Sterile container Submit Dry or in 70% Alcohol	Identification	1-3

Parasitology Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
Pinworm disease See: Enterobiasis					
Pneumocystis jiroveci pneumonia	*Pneumocystis jiroveci* *Note: P.jiroveci* is now classified as a fungus	Bronchialveolar lavage fluid Sputums and induced sputums are unacceptable	Sterile container	Identification	1-2
Pork Tapeworm Infection See: Taeniasis					
Primary Amoebic Meningoencephalitis See: PAME					
Scabies	*Sarcoptes scabiei*	Skin scrapings at end of tracks	Submit dry in a sterile container or mount scrapings between two slides with mineral oil	Identification	1-3
Schistosomal dermatits[1] (Swimmer's Itch)	Larvae of blood flukes of water birds	Larvae of blood flukes of water birds		Contact Medical Parasitologist 604-707-2619/2646	
Schistosomiasis For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Schistosoma haematobium* (urinary tract blood fluke) *Schistosoma mattheei*	Urine Submit midstream to terminal urine (12:00 pm to 3:00 pm void)	Sterile containter	O&P	2-3.5
		Urine **Do not refrigerate if a hatch test is requested.**		Hatch Test	
		Biopsy material (bladder mucosa)		Identification Contact Parasitology Laboratory 604-707-2629	1-2

Parasitology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
	Schistosoma japonicum (oriental blood fluke)	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5
		Unpreserved Feces **Do not refrigerate if a hatch test is requested.**	Sterile container	Hatch Test	
	Schistosoma mansoni *Schistosoma intercalatum*	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5
		Unpreserved Feces **Do not refrigerate if a hatching test is requested.**	Sterile container	Hatch Test	
		Scrapings from Rectum		Identification	1-2
Sleeping sickness[1] See: Trypanosomiasis, African					
Strongyloidiasis For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Strongyloides stercoralis*	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5
		Duodenal contents by intubation	Sterile container	Identification	2-3.5
		Sputum (migrating larva)		Identification	2-3.5
		Unpreserved Feces		Isolation and Culture	Up to 7
Taeniasis For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Taenia saginata* (beef tapeworm) *Taenia solium* (pork tapeworm)	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5
		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.	Sterile container	Identification	1-3
	Cysticercosis (pork tapeworm, larval stage)	Excised cysts Submitted fresh or in 70% alcohol	Sterile container	Identification	1-2
		Aspirate	Split sample –	Identification	1-2

Parasitology Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
			half into BCCDC PHL SAF feces vial and half into sterile container		
Ticks See: Lyme disease					
Toxocariasis[1] For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Toxocara canis* *Toxocara cati*	Biopsy material (liver)		Contact Parasitology Laboratory 604-707-2629	
Toxoplasmosis[1] For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Toxoplasma gondii*	CSF	Sterile container or tube	Contact Parasitology Laboratory 604-707-2629 Identification	1-2
		Biopsy material			
		Sputum			
		Whole blood in anticoagulant (EDTA)	BCCDC PHL EDTA (purple top) blood tube		
Trichinosis[1] For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Trichinella spiralis*	Biopsy material (gastrocnemius muscle)	Sterile container	Contact Parasitology Laboratory 604-707-2629 Identification	1-2
Trichostrongyliasis See: Hookworm disease	*Trichostrongylus* species	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5
Trichuriasis	*Trichuris trichiura* (human whipworm)	Feces	BCCDC PHL SAF feces vial	O&P	2-3.5

Parasitology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
Trypanosomiasis, African	*Trypanosoma rhodesiense* *Trypanosoma gambiense*	Blood films, thick and thin	Sterile container	Contact Medical Parasitologist 604-707-2619/2646 Identification	1-2
		Lymph node aspirate			
		Chancre aspirate			
		CSF (>5 ml) for the examination for the presence of Mott cells			
Trypanosomiasis, American For serologic testing see also: Zoonotic Diseases & Emerging Pathogens	*Trypanosoma cruzi*	Blood films, thick and thin		Contact Medical Parasitologist 604-707-2619/2646 Identification	1-2
		Lymph node aspirate	Sterile container	Culture	Up to 31 for culture 7 for prelim-inary report
		Tissue (lymph node)			
Visceral larva migrans See: Toxocariasis					
Whipworm disease See: Trichuriasis					
Wucheriasis See: Filariasis					

NOTES

1. Consultation with the Medical Parasitologist 604-707-2619/2646 is recommended. In case of emergency, contact the Medical Microbiologist On-Call at 604-661-7033.

2. Occurs in most tropical and subtropical areas. Blood to be collected between 10:00 pm and 4:00 am.

3. Occurs in Southeastern, East Asia including Japan and South Korea. Blood to be collected between 10:00 pm and 4:00 am.

4. Occurs in Africa and/or South America. Blood to be collected any time, but larger numbers of microfilaria can be found at night.

5. Occurs in Central and South Americas and West Indies. Blood to be collected any time during the day.

6. Blood to be collected during the day between 10:00 am and 3:00 pm. Multiple samples over a period of days.

7. Malaria is a medical emergency. Contact the Medical Microbiologist On-Call if after hours (604-661-7033). Clinical consultation required.

VIROLOGY PROGRAM

The Virology Program carries out diagnostic and reference testing for patient management, outbreak investigations and laboratory surveillance of diseases of viral origin.

Successful performance of virological investigations requires the cooperation of informed clinicians/nurses for the collection of the appropriate sample at the appropriate time during the patient's illness and for providing sufficient clinical information to allow the laboratory to select the most appropriate testing for each specific case

Virology testing is performed in two laboratories both overseen by the BCCDC PHL Medical Virologist. High volume viral serology is carried out in the Central Processing and Receiving, Public Health Microbiology Laboratory; all other virology tests are performed in the BCCDC PHL Virology Program of the BCCDC Public Health Laboratory. The Central Processing and Receiving, Public Health Microbiology Laboratory also works with the Zoonotic Diseases and Emerging Pathogens Program, performing serological testing for *H. pylori* and syphilis (see Zoonotic Diseases and Emerging Pathogens Program).

For consultation or discussion of specific Virology cases, please call the Dr. M. Krajden (Medical Virologist) at 604-707-2421.

Virology Sample Collection

When determining the most appropriate sample to submit to the laboratory the following concepts should be remembered,

- Infection with a single virus can have different clinical presentations
- One clinical presentation can be caused by different viruses
- Diagnosis may require both a sample sent for virus detection by PCR, isolation in cell culture, immuno-specific assays and a blood sample for monitoring for the presence of a specific IgM class antibody or the demonstration of seroconversion.

Essential clinical information must be submitted on the laboratory requisition, including patient's date of birth, date of onset of illness, clinical signs and diagnosis.

Special Requirements

- All samples must be packaged according to **Transport of Dangerous Goods** regulations.

Unacceptable Samples

- Unlabeled samples
- Samples that leaked during transport, unless collected via an invasive procedure
- Blood collected in tubes containing preservatives or anticoagulants may be unsuitable for some serologic procedures.
- Rectal swabs with no evident brown stain contain no fecal material
- Grossly hemolysed blood samples.
- Cord blood is not the sample of choice for neonatal testing because of the possibility of contamination with mother's blood.
- Blood should be drawn approximately one hour following a meal in order to avoid lipemic samples.

Sample Collection – Congenital and Neonatal Infections
Torch Serology (Toxoplasmosis, Rubella, Cytomegalovirus and Herpes)
Submit blood samples from both mother an infant (avoid using cord blood if possible)

		Nasopharynx	Rectal Swab	CSF	Urine	Vesicle fluid	Conjunctiva	Cervix	Serum	Autopsy/ Biopsy***
Rubella	Baby	X* (x 3)			X* (x 3)				X	
	Mother								X	
CMV	Baby				X* (x 3)				X	
	Mother								X	
Herpes	Baby	X	X	X**		X	X		X	
	Mother					X		X	X	
Enterovirus	Baby	X	X	X		X	X			
	Mother	X	X	X		X	X			
Parvo B19 (hydrops)	Baby								X	Liver, adrenal, bone marrow
	Mother								X	
Varicella	Baby			X		X	X		X	
	Mother			X		X	X		x	

***Collect on post-partum days 1, 3 and 5.**
** **If neurologic involvement is suspected.**
*** In case of abortion or still-birth, send unfixed tissue samples for virus detection.

SAMPLE COLLECTION
Virology

Sample Type	Container Type	Requisition	Instructions
Blood/serum	BCCDC PHL SST (gold top) blood tube	Serology	• Use Gold top blood tube (serum with gel separator). • Collect approximately 7mL of venous blood (at least one hour after a meal"). • Allow blood to clot in the tube, standing upright at room temperature for about one hour. • Submit the sample after ensuring that instructions on the requisition are followed. • When testing for sero-conversion, two successive blood samples are required to demonstrate a rise in antibody concentration. The first (acute) must be collected as early after onset as possible (not later than four days) and the second (convalescent) approximately 7-14 days later • Tests performed on the sample will be determined by the request entered on the requisition, the clinical information provided and any follow-up discussions with the clinician. • Blood samples that had been inadvertently frozen during transport are not acceptable for serology testing. If there is a risk that a blood sample will freeze during transport, please submit only the serum or plasma fractions for testing • For determination of immune status (IgG), only one blood sample is required.
Blood for HTLV I/II RT-PCR	BCCDC PHL EDTA (purple top) blood tube	Serology	• Indicate on the requisition that **HTLV PCR** is requested and document the **date** and **time** of collection. • Using a Vacutainer containing EDTA (purple top), withdraw venous blood (minimum volume 3 mL). Do **not** use Heparin. • Immediately invert the tube gently 2-3 times to completely mix the anticoagulant. • Collect sample on **Mondays and Tuesdays only and forward immediately to BCCDC PHL**. Samples are sent to the National Laboratory for HIV Reference Services, Ottawa and must be received there within 48 hours of collection. • Transport sample using room temperature conditions as soon as possible. • Contact the laboratory at 604-707-2839 before submitting sample.
Blood for HIV NAT	BCCDC PHL EDTA (purple top) blood tube	Serology	• Indicate on the requisition that **HIV PCR** is requested and document the **date** and **time** of collection. • Using a Vacutainer containing EDTA (purple top) collect designated amount of venous blood. Do **not** use Heparin. • For patients less than 2 years of age collect at least I mL of blood. For patients over 2 years of age collect at least 3 mL of blood • Immediately invert the tube gently 2-3 times to completely mix with the anticoagulant. • Transport under refrigerated conditions (cooler) as soon as possible. **Do not freeze**. The sample should be received by the laboratory within 4

SAMPLE COLLECTION
Virology

Sample Type	Container Type	Requisition	Instructions
			days.
Quantitative Hepatitis C virus (HCV) RT-PCR For treatment monitoring	EDTA (purple top) blood	Virology	• Using a Vacutainer containing EDTA (purple top), withdraw venous blood (minimum volume 3 mL). Do **not** use Heparin. **Do not open the purple top blood tube after collection.** The RT-PCR assay requires a dedicated tube. • Document the collection time (AM or PM) on the requisition form. • Samples must be stored and shipped at refrigerated temperatures. The sample must be received at the BCCDC PHL Laboratory and processed within 5 days of collection to ensure the integrity of the viral RNA".
Cerebrospinal fluid	Please refer to instructions	Virology	• Collect CSF aseptically and ensure that container is tightly closed before shipping. A minimum of 0.5 mL is required
Throat swab	BCCDC PHL Virus swab	Virology	• Swab back of throat near tonsils (if present) using a conventional swab • Insert the swab into the transport vial, snap off the stem and close tightly before sending to laboratory
Naso-pharyngeal swab	Please refer to instructions	Virology	• Collection kit includes flocked swab and tube of transport medium. • Gently press up on tip of nose and insert flocked swab with slow rotation along the base of the nasal passage to a depth of 3-6 cm. Rotate the swab and withdraw. • Insert the swab into the transport vial, snap off the stem and close tightly before shipping.
Auger suction	Please refer to instructions	Virology	• Collection kit consists of sterile, leak-proof, screw-cap jar, or a tube of transport medium and a No. 8 French catheter or equivalent with suction provided by 50 mL syringe or other means • After suctioning the nasopharynx, either elute catheter contents into transport medium or cut off portion of catheter containing suctioned mucus and place into screw-cap jar.
Tracheo-bronchial secretions	Please refer to instructions	Virology	• Suction catheter and a sterile, leak-proof, screw-cap test tube or jar are required • Collect secretions by suctioning and place 1-4 mL of secretions in a sterile test tube or jar. Close container tightly.
Sputum	Please refer to instructions	Virology	• Collection requires a wide mouth screw cap jar. • Instruct the patient **not to spit** into the sample container, but to take a deep breath and cough directly into the container.
			Specific Instructions for Patients **Note:** Sputum is the mucous (phlegm coughed up from the lungs). It is **not** saliva (the liquid from the mouth).

SAMPLE COLLECTION
Virology

Sample Type	Container Type	Requisition	Instructions
			1. Take a deep breath through the mouth and cough up some mucous into the sample jar. Be careful not to get any on the outside of the jar. 2. Put the lid back on the jar, and **close it tightly, so that it does not leak.**
Feces/Stool	Please refer to instructions	Virology	• Collection is performed into a sterile, leak-proof, wide mouth, screw-cap jar • Collect between 10-20 grams (walnut size) of sample in a tightly sealed, leak-proof container **without preservatives.** Close tightly. • Immediately refrigerate and transport as soon as feasible. Keep cool throughout shipment. • Rectal swabs are not a substitute for Feces sent for gastroenteritis virus diagnosis
Rectal swab	Virus swab	Virology	• Collection is performed using a conventional swab which is then placed into a container with viral transport medium • After collection the swab must appear brown as evidence of Feces • Insert the swab into the transport vial, snap off the stem and close tightly.
Urine	Please refer to instructions	Virology	• Collection is performed into a sterile, leak-proof, screw-cap tube or jar. • Collect approximately 10 mL of fresh urine into the tube and close tightly. • For CMV isolation, submit a midstream sample of first morning urine which must be received by the laboratory as soon as feasible after collection.
Lesion aspirate for EM *Requests for testing of patient samples by electron microscopy performed only after consultation with a Medical Microbiologist.	BCCDC PHL Slide		• Collection is performed using glass slides from the Microscopic Examination kit (See: General Bacteriology) • To prepare the sample on the slide for examination by electron microscopy* a) Open the vesicle by pricking with a sterile 25 ga. syringe needle, gently aspirate the fluid and apply it to a clean, dry slide as one or more spots. b) Air dry the preparation and mark the area on the slide with paraffin pencil. c) Do not fix. Place in a slide mailer and transport to the laboratory.
Lesion aspirate for culture or PCR	BCCDC PHL Virus swab	Virology	• Collection is performed using a conventional sterile swab or 25 ga. syringe, and virus transport medium. a) Unroof the blister with a tuberculin syringe needle or broken edge of a sterile swab shaft. b) Swab the broken blister. Place the swab in transport media and

SAMPLE COLLECTION Virology			
Sample Type	**Container Type**	**Requisition**	**Instructions**
			transport to the laboratory. c) Alternatively the contents of the vesicular lesion may be aspirated with the syringe and transferred to the vile of transport medium
Body fluids (pericardial, synovial pleural)	Please refer to instructions	Virology	• Collection is performed using a sterile, screw-cap test tube or Gold top blood tube. • Place fluid in the container and close tightly.
Biopsy / autopsy and other tissues	Please refer to instructions	Virology	• Collection is performed using a sterile, leak-proof, screw-cap jar **(do not use test tubes)** • Place approximately 0.3cm^3 of tissue in a separate, clean, sterile jar and identify with the patient's name, and type of tissue. **Do not fix or add any fluid.** Tiny samples which may be subject to drying should be kept moist by addition of a small amount of viral transport medium or saline.
West Nile virus testing	BCCDC PHL SST (gold top) blood tube and EDTA (purple top) blood tube	Virology	• Collection is performed using a gold top (serum) blood tube and a purple top blood tube containing EDTA (plasma) • Both a serum and a plasma samples must be submitted **together** to ZEP for WNV Serology • CSF samples should be submitted to Virology for RT-PCR. • It is essential that the clinical symptoms and or travel history are provided.

Interpretation of Viral Serology Reports

Rubella Serology:

1. Interpretation of Rubella Status Tests:

Reactive	> 10 IU/mL	rubella IgG antibodies present
Equivocal	6-10 IU/mL	rubella IgG antibody level is equivocal
Non-Reactive	0-5 IU/mL	no rubella IgG antibodies present at significant level

2. Interpretation of Results for Diagnosis of Rubella

Rubella antibodies will usually reach a maximum titre one week after the appearance of a rash. Acute and convalescent samples are tested together for both IgG and IgM antibodies. The presence of rubella-specific IgM or rubella-specific IgG seroconversion indicates recent infection or vaccination. IgG antibodies are reported as IU/mL.

3. Other Virus Serology Results

For some viruses, results for virus-specific IgM and IgG will be reported. These results are not expressed as titres, but are reported as **reactive, equivocal** or **non-reactive.** The presence of virus-specific IgM is compatible with a recent infection by that virus. It may take as many as seven days following onset before the majority of infected subjects produce detectable specific IgM antibody. In viral reactivation, there may or may not be an IgM response. Where the concentration of IgG class antibody is expressed in International Units per mL such as for example, antibody to rubella, HAV and HBsAg, defined thresholds for immunity have been established. In other cases such as for example, mumps, antibody levels do not correlate well with immune status.

4. Epstein-Barr Virus Serology Results

Enzyme immunoassays for two EBV markers are performed at the BCCDC Public Health Laboratory:

- IgM and IgG class antibody to VCA **(virus capsid antigen)**

In general, acute primary EBV infections are characterized by the following test results:

- VCA-IgG: +ve or –ve and VCA-IgM: +ve

Infections in the remote past or months after clinical recovery are characterized as follows:

- VCA-IgG: +ve and VCA-IgM: -ve

Absence of VCA-IgG and VCA-IgM antibodies indicates that the patient has not been infected by EBV. In most cases, a diagnosis of EBV infection can be made with a single serum sample. If a follow-up or convalescent sample is required, the laboratory will request it.
EBV infection in adolescents or adults can be diagnosed with a mono-spot test, however false negatives can occur approximately 15% of the time during acute infection. In pediatric patients the monospot test is insensitive and EBV serology is the appropriate approach

5. Hepatitis A Serology Results

- Anti-HAV IgM reactive: denotes recent hepatitis A virus infection or immunization
- Anti-HAV (total) reactive: denotes the presence of all antibodies to HAV and, if reactive in the absence of HAV-specific IgM, indicates prior vaccination or a previously resolved infection.

6. Hepatitis B Serology Results

+ = Reactive
- = Non-reactive

Markers						Interpretation
HBsAg	**Anti-HBc (total)**	**Anti-HBc IgM**	**Anti-HBS**	**HBeAg**	**Anti-HBe**	
+	+	+	-			Acute or chronic hepatitis B infection
-	+	+	-			Recent acute hepatitis B infection ("convalescent window" phase)
+	+	-	-	+	-	Chronic carrier state; highly infectious
+	+	-	-	-	-	Chronic carrier state; infectivity lower
+	+	-	-	-	+	Chronic carrier state; infectivity lower, possible resolution
-	+		+			Past hepatitis B infection = immune
-	+	-	-			Remote past hepatitis B: Resolved infection, probably immune*; Possibly "silent" carrier, Possibly co-infected with HIV or HCV
-	-	-	+			HBV vaccine recipient
-	-	-	-			No evidence of HBV infection; HBV vaccine candidate if infected with HCV

*If patient is a candidate for vaccine, it is recommended that vaccine should be offered to those patients who demonstrate this test profile.

7. Hepatitis C Serology Results

- A sensitive enzyme immunoassay (EIA) screen is used to detect antibodies to Hepatitis C virus (HCV). All samples reactive by this initial screen are retested using an EIA test from an alternative manufacturer. If both EIA tests are strongly reactive, typically 70%-80% of these individuals are HCV RNA reactive and considered chronically infected with HCV.

- Occasionally discordant EIA results occur (primary screen reactive, second screen non-reactive). These are reported as EIA equivocal. Reactive sera with test results falling close to the cut off value in either test are reported as weakly reactive. Equivocal results usually indicate a false positive. Weakly reactive and equivocal results require follow up testing after several weeks and usually require a PCR test to determine if active infection exists. Incidence of false positive EIA results is extremely low.

- It is not possible to differentiate recent from past infections on the basis of serologic markers nor is there any test available to determine the degree of infectivity. Studies have shown that 75 – 85% of true antibody-positive subjects are capable of transmitting HCV infection, i.e. will be HCV PCR positive.

8. HIV Serology Results

Reactive EIA screen tests for HIV undergo supplemental testing using an EIA which detects anti-HIV as well as p24 antigen. Diagnosis is confirmed by immunoblot and possibly by HIV NAT.

- Reactive antibody test for anti-HIV indicates infection with the virus.
- Repeatedly indeterminate HIV test results may require other procedures such as polymerase chain reaction (NAT) to resolve the patient's status. Consult with the Medical Virologist (604-707-2421) regarding the indications for these tests.

9. HTLV Serology Results

- EIA screen tests for anti-HTLV detect antibodies to both HTLV-I and II. Reactive screen tests must be confirmed by an alternative test (Line Immunoassay).
- The Line Immunoassay test is able to differentiate HTLV-I and II.
- Indeterminate HTLV test results may require follow-up testing such as RT-PCR to resolve the patient's status. Consult with the Medical Virologist (604-707-2421) regarding the indications for these tests.

NOTES

1. Persistence of HBsAg for more than 6 months after an acute episode is consistent with development of the chronic carrier state.
2. In the carrier state, conversion of HBeAg (+) to anti-HBe (+), indicates reduced infectivity and progress to possible resolution of infection.
3. Conversion from HBsAg (+) and the anit-HBs (+), indicates clinical recovery and immunity.

Disease or Infection	Causal Agent	Sample Required	Container Type	Tests Performed	TAT (days)
Adult Lymphoma/Leukemia (ATLL)	*HTLV I (Human T lymphotropic virus)*	Serum, 1 mL	BCCDC PHL SST (gold top) blood tube	HTLV I/II serology	7
		Blood, with anticoagulant (EDTA), 5-7 mL	BCCDC PHL EDTA (purple top) blood tub	Referred to NML for RT-PCR[1]	28–42 days
AIDS[2]	*Human immuno-deficiency virus* 1 and 2	Serum, 1 mL	BCCDC PHL SST (gold top) blood tube	HIV serology	3
		Blood with anticoagulant (EDTA), 3-7 mL	BCCDC PHL EDTA (purple top) blood tube	HIV RT-PCR[3]	3-5
Bronchiolitis **Bronchitis** **Bronchopneumonia** See: Respiratory infections					
Cervicitis	*Herpes simplex* and other viruses	Cervical swab	BCCDC PHL Virus swab	Virus identification by PCR or isolation[5]	3
Chickenpox, Varicella See also: Herpesvirus infections	*Varicella Zoster virus*	Vesicle fluid or smear	BCCDC PHL Virus swab	Virus identification by PCR or isolation	3
		Scrapings from open skin lesion		Immuno-fluorescence microscopy	
		Conjunctival swab or corneal swab			
		CSF, 500 µL			2
		Serum (acute and convalescent), 1 mL	BCCDC PHL SST (gold top) blood tube	Serology for VZV IgG class antibody	3-5
		CSF, 1 mL			
Chlamydia pneumoniae	*Chlamydiophila pneumoniae* (TWAR)			Serological test is no longer available	
Chlamydia psittaci See: Zoonotic Diseases & Emerging Pathogens					
Chlamydia trachomatis See: Zoonotic Diseases & Emerging Pathogens See					

Virology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Tests Performed**	**TAT (days)**
And also: Bacteriology					
CJD See: Creutzfeldt-Jacob Disease					
Cold Sore	*Herpes simplex viruses* 1 and 2	Vesicle fluid in transport medium or dried on a slide	BCCDC PHL Virus swab	Virus identification, by PCR	3
		Scrapings from open skin lesion on glass slide		Immuno-fluorescence microscopy	
Congenital Infections[6] See also: Rubella, congenital Rubella syndrome (CRS) Cytomegalovirus infection TORCH Syndrome	*Cytomegalovirus* *Rubella virus* *Herpes simplex virus* *Enterovirus* *Parvovirus B19* *Varicella-Zoster virus*	Urine, 5 mL	Sterile container	Virus isolation and PCR	See individual viruses
		Autopsy tissue, 5 mL			
		Throat swab,5 mL			
		Rectal swab, 5 mL			
		Aborted tissue			
		CSF, 250 µL			
		Clotted blood, 3 mL	BCCDC PHL SST (gold top) blood tube	Virus Serology (not available for *Enterovirus)*	3-5
		Serum, 1 mL			
Conjunctivitis Epidemic keratoconjunctivitis, pharyngo-conjunctival fever	*Adenovirus* (52 distinct antigenic types) *Herpes simplex virus* 1,2 *Enterovirus* 70	Conjunctival swab	BCCDC PHL Virus swab	Virus isolation and PCR	10 – 14
Contagious eczema **Contagious pustular dermatitis (Orf)** See also: Poxvirus infections	*Parapoxvirus*	scrapings from skin lesion	BCCDC PHL Virus swab	PCR with approval of Medical Virologist	3
		vesicle fluid			
		exudate from skin lesion			
		skin crusts			
Cowpox See: Poxvirus infections					
Coxsackievirus infections See: Enterovirus infections					

Virology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Tests Performed**	**TAT (days)**
Creutzfeldt-Jacob Disease	Prion	Cerebral spinal fluid 1mL	Sterile container	Referred to NML	14
Cytomegalovirus Infections[7]	*Cytomegalovirus*	Saliva, 1 mL	Sterile container	Virus isolation and identification PCR with approval of Medical Virologist	3
		Urine, 5 mL			
		Autopsy tissue			
		Blood, with anticoagulant, 5-7 mL			
		Serum (acute and convalescent), 1 mL	BCCDC PHL SST (gold top) blood tube	Serology	3-5
Diarrhea, viral Routine testing is not recommended for individual cases. Clusters/outbreaks of viral gastroenteritis are investigated through the GI Outbreak Coordinator 604-707-2611	*Adenovirus* *Astrovirus* *Calicivirus* *Coronavirus* *Norovirus* *Rotavirus*	Feces	Sterile container	EIA for Adenovirus and Rotavirus, RT-PCR/EIA through GI algorithm contact GI outbreak coordinator 604-707-2611	3
Ebola virus disease	*Ebola virus*	2 x 5mL Whole blood in anticoagulant (EDTA)	BCCDC PHL EDTA (purple top) blood tube	PCR - on approval by the Medical Microbiologist on-call (604-661-7033)	1
Echovirus infections See: Enterovirus infections					
Eczema herpeticum See: Herpesvirus and enterovirus infections					
Encephalitis, viral Including epidemic, sporadic and post-infectious types	*Arbovirus* *Enterovirus* *Herpesvirus* *Myxovirus* *Paramyxovirus* *Poxviruses* *Rubella*	NP/Throat swab	BCCDC PHL Virus swab	Virus identification by isolation or RT-PCR	See individual viruses
		CSF, 500 µL			
		Feces			
		Biopsy tissue (brain)			
		Autopsy tissues		PCR	1 – 7
Enterovirus infections	*Coxsackievirus A* (types 1-24) *Coxsackievirus B*	Vesicle swab, fluid, smear	BCCDC PHL Virus swab	Virus isolation and identification	10
		Throat swab			

Virology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Tests Performed**	**TAT (days)**
	(types 1-6) *Echoviruses* (types 1-34) *Polioviruses* (types 1, 2 and 3) *Enteroviruses* (types 68-72)	Rectal swab CSF, 250 µL Pleural fluid, 1 mL Pericardial fluid, 1 mL Biopsy tissue Autopsy tissue (brain, cord, intestinal contents)		RT-PCR is available with approval from Medical Virologist	5 - 7
Epidemic keratoconjunctivitis See also: Adenovirus infections	*Adenovirus* (52 distinct antigenic types) some *Enteroviruses* *Herpes simplex viruses* 1 and 2	Vesicle swab, fluid, smear Conjunctival swab, 1 mL Throat swab, 1 mL	BCCDC PHL Virus swab	Virus isolation and identification PCR with approval from Medical Virologist	7
Epidemic pleurodynia See: Enterovirus infections[1]					
Epstein-Barr Virus Infections **Oral hairy leukoplakia**	*Epstein-Barr virus*	Serum, 1 mL Mouth swabs	BCCDC PHL SST (gold top) blood tube	Antibodies to E*pstein-Barr virus* (VCA-IGG and –IGM) by enzyme immunoassay Herpes group PCR	3-5
Eye infections, Viral See: Adenovirus infections Conjunctivitis Enterovirus infections Keratoconjunctivitis	*Adenovirus* *Herpes simplex* *Enterovirus 70*	Conjunctival swabs or scrapings Feces Rectal swab	BCCDC PHL Virus swab	Virus isolation and identification PCR	10 – 14
Fifth Disease (erythema infectiosum)	*Parvovirus B19*	Clotted blood, 3 mL Serum (acute and convalescent), 1 mL	BCCDC PHL SST (gold top) blood tube	Virus serology[8]	5
Gastroenteritis, Viral See: Diarrhoea, viral					
Hand, Foot and Mouth Disease **See also:** **Enterovirus infections**	*Coxackievirus A*	Vesicle fluid Throat swab Rectal swab	BCCDC PHL Virus isolation swab	Virus isolation and identification	3 7
Hepatitis, Viral					

Virology Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Tests Performed	TAT (days)
Hepatitis A	*Hepatitis A virus* (HAV)	Serum or EDTA plasma (for PCR)	BCCDC PHL SST (gold top) blood tube or EDTA tube (for PCR)	Anti-HAV Total; Anti-HAVEIgM	3 1
Hepatitis B	*Hepatitis B virus* (HBV)	Serum, 500 µL*		HBsAg, anti-HBs, anti-HBc (total), anti-HBc IgM, HBeAg, anti-HBe[9]	3
Hepatitis C	*Hepatitis C virus* (HCV)	* for each test requested		Anti-HCV	3
Hepatitis D* * referred out by ZEP lab	*Hepatitis D virus* (HDV)				
Hepatitis E* *referred out by ZEP lab	*Hepatitis E virus* (HEV)				
Hepatitis G	*Hepatitis G virus (*HGV)			No serologic tests are available for HGV. Contact the Medical Virologist regarding indications for PCR tests.	
Herpes Virus Infections Including vesicular lesions of the skin, lips, mouth and genitals, vulvovaginitis, cold sores, stomatitis, keratitis, aseptic meningitis, ascending myelitis, encephalitis, disseminated herpes, infection of newborns[11], and specific entities of: **Eczema herpeticum** **Herpes Zoster (shingles)** **Varicella (chickenpox)** **Virus B infection[12]** See also: Cytomegalovirus infections	Members of the *Herpesvirus* family pathogenic for humans are: *Herpes simplex virus* 1 and 2 *herpesvirus simiae (Virus B)* *(Varicella-Zoster Virus)* *Cytomegalovirus* *Epstein-Barr virus* *Human herpesvirus 6 and 8*	Vesicle fluid	BCCDC PHL Virus isolation swab	Virus identification by PCR and isolation	3 – 5
		Vesicle smear			2
		Scrapings from base of skin lesion			
		Conjunctival swabs or scrapings			
		Corneal scrapings		PCR	3
		Cervical swab			
		Vaginal swab			
		Urethral swab			
		CSF, 500 µL			
		Biopsy tissue (brain)			1-2
		Autopsy material (brain, viscera)			
		Serum (acute and convalescent), 1 mL	BCCDC PHL SST (gold top) blood tube	Virus serology[14]	3-5
				HSV 1&2 type specific serology	14
		Blood from autopsy			
		CSF			

Virology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Tests Performed**	**TAT (days)**
Human immunodeficiency virus[15]	*Human immunodeficiency virus* 1 and 2	Serum, 1 mL	BCCDC PHL SST (gold top) blood tube	HIV serology	3
		Blood with Anticoagulant (ETDA), 3 – 7mL	BCCDC PHL EDTA (purple top) blood tube	HIV PCR[16]	1 – 5
Human T Lymphotropic Virus (HTLV) Adult lymphoma/leukemia (ATLL) **HTLV-I associated Myelopathy (HAM)** Also known as tropical spastic paraparesis (TSP)	HTLV I	Serum, 1 mL	BCCDC PHL SST (gold top) blood tube	HTLV serology	7
		CSF[17]			
		BCCDC PHL EDTA (purple top) blood tube	BCCDC PHL EDTA (purple top) blood tube	Referred to NML for PCR[18]	28 - 42
	HTLV II – no strong association with any disease state				
Influenza	*Influenza viruses* types A and B and rarely C (members of the *Orthomyxoviridae* family)	Nasal swab	BCCDC PHL Flocked swab	Virus identification, and subtype determination by RT-PCR	2
		Aspirated respiratory secretions			
		Nasopharyngeal washing or swab autopsy material (lung)		Direct immuno-fluorescence microscopy	1
		Autopsy material (lung)		Influenza A, B, RSV by RT-PCR during the winter season	1
Lymphogranuloma venerum (LGV) See: *Chlamydia trachomatis*					
Measles, **"Red Measles"** **Rubeola** **Including the following diseases associated with measles virus:** **Hecht's giant cell pneumonia, Subacute sclerosing panencephalitis**	*Measles virus (member of the paramyxoviridae family)*	Nasal swab Throat swab	BCCDC PHL Flocked swab for nasal sample and Virus swab for throat	RT-PCR	1 - 2
		Urine, 50 mL CSF, 500 µL		All primary positive samples are sent for Genotyping at the National Microbiology Laboratory, Winnipeg	20 – 22
		Autopsy material (lung, brain)			2-3

Virology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Tests Performed**	**TAT (days)**
(SSPE)		Serum (acute and convalescent), 1 mL	BCCDC PHL SST (Gold top) blood tube	Virus serology	5
		CSF			
Meningitis, Viral or Aseptic **Meningoencephalitis, viral**	Most common: *Echovirus* *Enterovirus* *Mumps virus* *Measles virus* *Epidemic Arboviruses* (Eastern, Western or St. Louis) Less common: *Adenoviruses* *Arboviruses* *Epstein-Barr virus* *Influenza* *Poliovirus* *Varicella-Zoster virus* *Herpes simplex virus* *West Nile virus*	Throat swab	BCCDC PHL Virus swab	RT-PCR for HSV, Mumps, Enterovirus, influenza, PCR for adenovirus	1 – 2
		Rectal swab			
		Vesicle fluid (skin)			
		CSF, 500 µL			
		Autopsy material (brain, cord, intestinal contents)		RT-PCR for West Nile virus	1 – 2
		Plasma, 7 mL			
		Clotted blood, 7 mL	BCCDC PHL SST (gold top) blood tube	Virus serology **(adeno, entero, influenza, no longer performed)**	1 – 7
		Serum (acute and convalescent), 3 mL			
Mononucleosis, Infectious See also: Epstein-Barr virus infections	*Epstein-barr virus* Rarely: *Cytomegalovirus*	Clotted blood, 3 mL	BCCDC PHL SST (gold top) blood tube	EBV VCA-IgG EBV VCA-IgM CMV-IgM	5
		Serum, 1 mL			
Mumps Including mumps meningoencephalitis, pancreatitis, orchitis	*Mumps virus* (member of the paramyxoviridae family)	Buccal or oral swab specimens are obtained by massaging around the parotid gland area for 30 seconds prior to swabbing the area around Stensen's duct.	BCCDC PHL Virus swab	RT-PCR All primary positive samples are sent for Genotyping at the National Microbiology Laboratory, Winnipeg	1 – 2 20 – 22
		Urine, 50 mL	Sterile container		
		CSF, 500 µL			
		serum, (acute and convalescent),	BCCDC PHL SST (gold top) blood	Serology	5

Virology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Tests Performed**	**TAT (days)**
			tube		
Mycoplasmal Infections of Respiratory Tract	*Mycoplasma pneumoniae*	serum (acute and convalescent)	BCCDC PHL SST (gold top) blood tube	Serology for *M. pneumonia*e IgM	5
		Respiratory secretions		PCR - on approval by the microbiologist or Medical Microbiologist on-call (604-661-7033).	
Parainfluenza virus See: Respiratory infections, viral					
Paralytic illnesses, viral See also: Encephalitis, viral Polio serology will **not** be done to determine immune status.	Several viruses especially *Polio-, Echo-, Coxsackie-,* and *Herpesviruses* and as part of encephalomyelitis or ascending myelitis syndromes	Throat swab	BCCDC PHL Virus swab	Virus isolation and identification PCR	7
		CSF (250 µL)			
		Feces			
		Biopsy tissue (brain, cord)			
		Autopsy material (brain, cord)			
		serum Serum (acute and convalescent), 500 µL	BCCDC PHL SST (gold top) blood tube	Virus serology **(entero no longer performed)**	7
Paravovirus B19 See: Fifth disease					
Pneumonia, viral See: Respiratory infections, viral					
Poliomyeltitis (Polio) See: Paralytic illnesses, viral					
Poxvirus infections	Poxvirus group includes *cowpox, vaccinia, contagious pustular dermatitis (Orf), Milkers nodes (para-vaccinia)* and	Exudate from skin lesions	Spot on glass slide and ship dry Virus swab in transport	PCR with approval of Medical Virologist or Medical Microbiologist on-call	2
		Scrapings from rash			
		Vesicle fluid			

Virology Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Tests Performed	TAT (days)
	molluscum contagiosum	Skin crusts	medium	(604-661-7033).	
Psittacosis/Ornithosis	*Chlamydia psittaci*			Serological test is no longer available at the National Microbiology Lab	
Rabies For serology see: Zoonotic Diseases & Emerging Pathogens	*Rabiesvirus* (member of the *Rhabdovirus* family)	Biopsy, hairline of neck, Saliva		Contact Medical Microbiologist on-call: (604-661-7033)	14
Reovirus infections	*Reoviruses* (types 1, 2, 3)	Throat swab Feces Rectal swab	BCCDC PHL Virus swab	Virus isolation and identification	10
Respiratory infections, viral 1. Lower respiratory tract infections: Bronchiolitis Bronchopneumonia Bronchitis Laryngotracheobronchitis (croup) Pneumonia 2. Upper respiratory tract infections: Rhinitis Pharyngitis Laryngitis Common cold	Lower respiratory only: *Varicella-Zoster virus* Lower and upper respiratory (in order of importance): *Adenovirus* *Bocavirus* *Influenza virus* *Parainfluenza* *Respiratory syncytial virus* *Coxsackie B virus* *Coronavirus* *Echovirus* *Enterovirus* *Herpes simplex virus* *Human metapneumovirus* Upper respiratory only: *Rhinovirus* *Coxsackie A virus*	Aspirated respiratory secretion Sputum Throat swab Throat washings Nasal swab Pleural fluid Bronchial wash Feces Nasopharyngeal wash, aspirate and swab	BCCDC PHL Flocked swab for nasal sample, Virus swab for throat	Virus identification by PCR and isolation Luminex multiplex PCR Direct immuno-fluorescence microscopy Influenza A, B, RSV by PCR during the winter season Influenza A typing by PCR	7 1 – 2
Respiratory Syncytial Virus infections See:					

Virology Diseases & Infections

Disease or Infection	Causal Agent	Sample Required	Container Type	Tests Performed	TAT (days)
Respiratory infections, Viral					
Roseola Infantum (Exanthema subitum)	*Human herpesvirus 6*	Clotted blood, 3 mL Serum (acute and convalescent, 1 mL	BCCDC PHL SST (gold top) blood tube	Referred to BC Children's Hospital[23]	7 – 14
Rubella, congenital rubella syndrome (CRS)[24] **Abortion associated with rubella**	*Rubella virus*	Throat swab Urine Rectal swab CSF, 250 µL Lens fluid	BCCDC PHL Virus swab	Virus isolation and identification	14 - 16
		Autopsy material (all organs)			
		Clotted blood, 3 mL Serum,[25] 1 mL	BCCDC PHL SST (gold top) blood tube	Virus serology including tests for rubella specific IgM	1
Rubella, postnatal (i.e. in children and adults)	*Rubella virus*	Clotted blood, 3 mL Serum (acute and convalescent), 1 mL	BCCDC PHL SST (gold top) blood tube	Virus serology	3
Rubeola See: Measles					
Shingles See also: Herpesvirus infections	*Varicella-Zoster virus*	Vesicle fluid Vesicle smear Scrapings from base of skin lesions	BCCDC PHL Virus swab	Virus identification by PCR	14
		Blood, 3 mL Serum (acute and convalescent), 1 mL	BCCDC PHL SST (gold top) blood tube	Serology	5
Syphilis Screen (EIA) See also: Zoonotic Diseases &	*Treponema pallidum* subspecies	Serum, 2 mL	SST (gold top) blood tube	Enzyme immunoassay	2

Virology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Tests Performed**	**TAT (days)**
Emerging Pathogens	*pallidum*				
Tropical Spastic Paraparesis See: HLTV I					
TWAR See: *Chlamydophila pneumoniae*					
Urethritis, Vaginitis, Viral	*Herpes simplex virus*	Urethral swab	BCCDC PHL Virus swab	Virus identification by PCR[14]	3
		Lesion swab			
Varicella See also: Herpesvirus infections	*Herpesvirus varicella* *Varicella-Zoster virus*	Vesicle fluid or smear	BCCDC PHL Virus swab	Virus identification by PCR	14 – 16
		Scrapings from base of skin lesion			
		Conjunctival swab or scrapings			
		Corneal scrapings			2
		CSF, >250 µL			
		Clotted blood, 1 mL		Virus serology	1
		Serum (acute and convalescent), 500µL			
		CSF, 500 µL			
Virus B of monkeys, Sabin's virus or Herpesvirus simiae[27] See: Herpesvirus infections	*Herpes simiae*			Consult Medical Virologist	
Vulvovaginitis, Viral	*Herpes simplex viruses* 1 and 2 And other viruses	Vaginal swab	BCCDC PHL Virus swab	Virus identification by PCR[14]	3
		Vaginal smear from base of lesions			
		Vesicle fluid			
		Vesicle smear			
		Scrapings from base of skin lesion			
West Nile virus infection **Also:**	*West Nile virus*	CSF, 250µL		West Nile PCR is offered from June to end of November.	

Virology Diseases & Infections					
Disease or Infection	**Causal Agent**	**Sample Required**	**Container Type**	**Tests Performed**	**TAT (days)**
West Nile Fever or West Nile Encephalitis For serologic testing see also: Zoonotic Diseases & Emerging Pathogens		EDTA Plasma, 7 mL		Please refer to ZEP for initial serological screening of sample.	
Zoster See: Varicella					

NOTES

1. Contact the laboratory (604-707-2839) before submitting samples for PCR.

2. Indicate on the requisition if the test is for a visa application.

3. Contact the laboratory (604-707-2839) before submitting samples for PCR.
4. Spread by mosquitoes, ticks, and sandflies. Almost all are zoonotic infections. Those most likely to be seen in Canada are Western Equine, Venezuelan Equine, St. Louis or California Encephalitis, Powassan infection, and Dengue in travelers returning from the tropics.

5. Serology is of limited value in the diagnosis of genital herpes infections.

6. Refer to page 97 for appropriate sample collection.

7. In congenital infections, refer to page 97 for appropriate sample collection.

8. PCR is also available for acutely infected patients. Contact the Medical Virologist for advice.

9. According to the clinical information provided with the sample.

11. In newborn infections, submit samples from the mother also.

12. *Herpes simiae* is very dangerous for humans. Contact the Medical Health Officer and the Medical Virologist (604-707-2421) before collecting samples.

13. Testing of lesion sample is the optimal approach for detection of genital herpes while serology is of limited value but is indicated in specific cases.

15. Indicate on the requisition if the test is for a visa application.

16. Contact the laboratory (604-707-2839) before submitting samples.

17. CSF samples are not optimally suited for serological testing. Approval from Medical Virologist is required.

18. Contact the Medical Virologist (604-707-2421) before submitting samples.

19. Submit CSF for suspected SSPE only.

20. Notify the Medical Health Officer of animal bites or other possible exposures **IMMEDIATELY**. For virus isolation and identification from suspected human cases, consult with the Medical Virologist before submitting samples.

21. A complete history is required before tests will be performed. Forms are available at all health units 22.The diagnosis of rickettsial infections by isolation of the causal agent is a dangerous procedure. Contact the Medical Virologist before proceeding.

23. The reference laboratory will not proceed without a clinical history, including date of onset.

24. Refer to page VS-8 for appropriate sample collection.

25. Submit blood from the mother also.

26. Serology is of limited value in the diagnosis of genital herpes.

27. *Herpes simiae* is very dangerous for humans. Contact the Medical Health Officer and the Medical Virologist before collecting samples.

ZOONOTIC DISEASES & EMERGING PATHOGENS (ZEP) PROGRAM

The Zoonotic Diseases & Emerging Pathogens Program (ZEP) is the province's reference laboratory for the detection of vector-borne, zoonotic and emerging/re-emerging diseases.

The Zoonotic Diseases and Emerging Pathogens Program carries out specialized serology and cell mediated immune response testing (Interferon-Gamma Release Assays, IGRA, for latent TB).

This laboratory also carries out the detection of antigens or antibodies to bacterial, fungal, viral, rickettsial and parasitic agents of public health importance such as *Treponema pallidum*, *Helicobacter pylori*, *Borrelia burgdorferi*, *Toxoplasma gondii* and West Nile virus. Staff also performs culture and molecular assays, participates in outbreak investigation and works closely with national and international reference laboratories.

The Program is recognized nationally for its work on Lyme disease and other spirochetal agents. Its experts provide province-wide consultations to physicians and other health workers. Tests not available at BCCDC PHL are forwarded to appropriate national and international reference centers.

ZEP also works with the Central Processing & Receiving Laboratory for *H. pylori* and syphilis screening.

For discussion of individual cases or specific investigations, contact Dr. Muhammad Morshed, ZEP Program Head, (604-707-2622). For after hour emergencies, page the Medical Microbiologist On-Call (604-661-7033).

General Information:

1. Samples must be properly identified and accompanied by a completed requisition.
2. **Samples must be submitted with relevant clinical and epidemiological information.**
3. Plastic, siliconized vacutainers can be used for samples collection for all tests.
4. Hemolysed blood samples may compromise test results.
5. All human or animal samples (prior to prescribing antibiotics) must be collected in sterile tubes.

For serological investigations, IgM antibodies usually appear in the bloodstream 7-10 days after infection **(acute)**, while IgG antibodies appear 2-3 weeks later **(convalescent)**, rising for several weeks to a peak level.

An acute infection may be indicated by one or more of the following:

1. A single sample positive for IgM antibodies
2. A single sample with a high IgG antibody titre, or
3. A fourfold rise in antibody titre from paired sera (acute and convalescent samples) collected 2-3 weeks apart.

For Zoonotic Diseases and Emerging Pathogens serological test requests, generally only a single sample is required. However, if necessary, a second convalescent or follow up sample will be requested by the laboratory.

Unacceptable Samples

- Unlabeled samples will not be processed.
- Leaking or broken samples may not be processed. Approval for some samples may be required.
- Cord blood is unsuitable for syphilis serology.
- Plasma is unsuitable for serology.
  Whole blood with anticoagulant (e.g. EDTA) is unsuitable for serology.
- Blood should not be drawn within an hour after a meal to avoid lipemic samples.

SAMPLE COLLECTION Zoonotic Diseases & Emerging Pathogens			
Sample Type	**Container Type**	**Requisition**	**Instructions**
Clotted blood or serum	BCCDC PHL Gold top blood tube	Zoonotic Diseases & Emerging Pathogens	1. Collect approximately 7 mL of venous blood into a plastic, siliconized Gold top blood tube. 2. Serum may be separated from clotted blood. Refrigerate serum before and during transport.
Cerebrospinal fluid	Sterile tube	Zoonotic Diseases & Emerging Pathogens	1. Submit minimum 1 mL CSF in a sterile, leak-proof tube. 2. CSF for *Borrelia* or *Toxoplasma* serology must be accompanied by a blood sample. **3. CSF should not be sent in vacutainer tubes.**
Chancre fluid for syphilis testing	BCCDC PHL DF slide (capillary tubes, wax sealer, FA slide)	Zoonotic Diseases & Emerging Pathogens	1. Before collecting samples of exudates, ask whether the lesion has received local treatment. If so, cleanse twice with a moist saline compress and advise patient to return for testing the next day. 2. If exudate from lesion is plentiful, collect samples for both Darkfield (DF) and Direct Fluorescent Antibody-*Treponema pallidum* (DFA-TP) tests. If scant, take sample for DFA-TP only. a) Cleanse lesion with moist saline compress. b) Dry with sterile gauze. c) To produce clear exudates squeeze base of sore. 3. DF procedure: a) To obtain exudate hold each capillary tube horizontally and stroke across lesion. b) Seal by pressing each end of tube into small vial of wax. c) Place capillary tubes in test tube. d) Write patient's and physician's name on test tube label. 4. DFA-TP procedure: a) Mark patient's name on frosted end of sterile slide lead pencil (other markers interfere with staining). b) Hold slide by frosted end, apply etched circles on marked surface to three of four areas of lesion. c) Air-dry and place in envelope.
Other samples (sputa, aspirates, urine, other body fluids, etc.)	Please refer to instructions	Zoonotic Diseases & Emerging Pathogens	1. Refer to the pertinent diseases in the **Diseases Table** 2. Consult the Medical Microbiologist (604-707-2622) or the Zoonotic Disease & Emerging Pathogens Laboratory (604-707-2628) regarding the collection and submission of satisfactory samples.

Zoonotic Diseases & Emerging Pathogens Diseases & Infections (Bacterial)

Diseases and Syndromes	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
Bejel[1] (Non-venereal syphilis) See: Syphilis	*Treponema pallidum* subspecies *endemicum*				2
Brucellosis (Undulant fever) See also: Bacteriology/Mycology	*Brucella abortus* *Brucella canis* *Brucella melitensis* *Brucella ovis* *Brucella suis*	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology	5-7
		Serum, 2 mL	Sterile tube		
Cat-scratch disease See also: Bacteriology/Mycology	*Bartonella henselae* *Bartonella quintana*	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology	7
		Serum, 2 mL	Sterile tube		
		Fluid aspirate, 1 mL from: wound, pus sample, fluid and /or tissue from lymph nodes, heart valve biopsy, synovial joint fluid (Refrigerate)	Sterile tube	PCR[7, 8]	Referred Test
		CSF, 1 mL (accepted, but not ideal) (Refrigerate)	Sterile tube		
		EDTA blood, 1 mL (accepted, but not ideal) (Refrigerate)	BCCDC PHL EDTA (purple top) blood tube		
		Swabs, 1 mL, Dry swabs not acceptable. (Refrigerate)	Swab must be in transport medium		
Chlamydia pneumoniae	*Chlamydiophila pneumoniae* (TWAR)			Serological test is no longer available	
Chlamydia psittaci[7]	*Chlamydia psittaci*	Serum, 2 mL (paired sera preferred – acute and convalescent).	BCCDC PHL SST (gold top) blood tube	Referred to NML (appropriate history required)	Referred Test
Chlamydia trachomatis[7] See also: Bacteriology	*Chlamydia trachomatis (LGV)*	Serum, 2 mL (paired sera preferred – acute and convalescent).	BCCDC PHL SST (gold top) blood tube	Referred to NML (appropriate history required)	Referred Test

Zoonotic Diseases & Emerging Pathogens Diseases & Infections (Bacterial)					
Diseases and Syndromes	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
Diphtheria (Immune Status)[6, 8] See also: Bacteriology/Mycology	*Corynebacterium diphtheriae*	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Testing for immune status has been discontinued. Only patients with the following history will be tested: -16 years of age or less, or -Organ transplant patient **For other special circumstances consult Program Head**	7
		Serum, 2 mL	Sterile tube		
Genital chancre See: *Syphilis*					2
***Helicobacter pylori* Infection (Serology)**	*Helicobacter pylori*	Serum, 2 mL	BCCDC PHL SST (gold top) blood tube	Serology	2
		Biopsy[8]	Sterile container	Culture Physicians should consult Dr. Morshed prior to sample collection	up to 7
		Feces,[8] 5 g		Stool Antigen	7
Hepatitis, Viral Hepatitis D[6] Hepatitis E[6]	*Hepatitis D virus* (HDV) *Hepatitis E virus* (HEV)	Serum or EDTA plasma (for PCR)	BCCDC PHL SST (gold top) blood tube or EDTA tube (for PCR)	Anti delta[9] PCR Anti-HEV PCR	6 6 6 6
Legionnaire's disease[6] See also: Bacteriology/Mycology	*Legionella* species	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology (antibody detection)	Referred Test
		Serum, 2 mL	Sterile tube		
		Urine (acute stage of the disease), 5-10 mL	Sterile container	Serology (antigen detection)	1-3
Leptospirosis	*Leptospira* species	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology	Referred Test
		Serum. 2 mL	Sterile tube		

Zoonotic Diseases & Emerging Pathogens Diseases & Infections (Bacterial)					
Diseases and Syndromes	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
		EDTA blood, 2 – 5 mL (Refrigerate)	BCCDC PHL EDTA (purple top) blood tube	PCR[7,8] **PCR testing only available after consultation with Program Head 604-707-2622**	Referred Test
		Urine -fresh as possible, 5 – 10 mL (Refrigerate)	Sterile container		
		CSF, minimum 400 µL (Refrigerate)	Sterile tube		
Lyme Disease	*B. burgdorferi*	Serum. 2 mL	Sterile tube	Serology	3-7
		CSF,[8] 1 mL	Sterile tube	PCR[7,8]	7
		Synovial/Joint Fluid	Sterile tube	PCR[7,8]	7
		EM Biopsy[8]	Sterile container	PCR[7,8]	7
Melioidosis[6]	*Burkholderia pseudomallei*	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology	Referred Test
		Serum, 2 mL	Sterile tube		
Meningococcal Polysaccharide antibody titre[6]		Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology	Referred Test
		Serum 2 mL			
Pinta[1] (Non-venereal syphilis) See: Syphilis	*Treponema pallidum* subspecies *carateum*				2
Plague See: Yersiniosis					
Relapsing fever[2]	*Borrelia hermsii*	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology	2
		Serum, 2 mL	Sterile tube		
		CSF,[2,8] 1 mL	Sterile tube	PCR	7
		EDTA Blood[8],5 mL	BCCDC PHL EDTA (purple top) blood tube	Microscopy	2
				Culture	30-31
				PCR	7
Steptococcal infections (group A Streptococcus)	*Streptococcus pyogenes*	Clotted blood, 1 tube	BCCDC PHL SST (gold top)	Serology	2

Zoonotic Diseases & Emerging Pathogens Diseases & Infections (Bacterial)

Diseases and Syndromes	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
See also: Bacteriology/Mycology			blood tube	ASO Test[3]	
		Serum, 2 mL	Sterile tube	Serology Anti-DNase B is not routinely performed Relevant clinical information required	
Syphilis Confirmatory[4, 5]	*Treponema pallidum* subspecies *pallidum*	Chancre Fluid from Genital, Anal and Oral ulcers	BCCDC PHL DF slide (capillary tubes, wax sealer, FA slide	Darkfield Microscopy	2
			FA slide	DFA	
			PCR	PCR[8]	7
		Serum, 2 mL		Confirmatory testing (non treponemal and treponemal): RPR TPPA LIA FTA-ABS (for CSF cases only) Please provide clinical history.	3-5
		CSF, 1 mL	Sterile tube	VDRL	2
				CSF (FTA on special cases after consultation with Program Head).	3-5
				PCR[8]	7
Tetanus (Immune Status)[6, 8] (Lockjaw) See also: Bacteriology/Mycology	*Clostridium tetani*	Clotted blood 1 tube	BCCDC PHL SST (gold top) blood tube	Testing for immune status has been discontinued. Only patients with the following history will be tested: -16 years of age or less, or -Organ transplant patient **For other special circumstances consult Program Head**	7
		Serum, 2 mL	Sterile tube		

Zoonotic Diseases & Emerging Pathogens Diseases & Infections (Bacterial)					
Diseases and Syndromes	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
				604-707-2622	
Tuberculosis[8]	*Mycobacterium tuberculosis*		**Special collection tubes** will be available at the collection site.	Interferon-Gamma Release Assays: (T-SPOT®) (Quantiferon®- TB Gold) Approval for testing is required from the TB Clinics at BCCDC, Royal Jubilee Regional Hospital (Victoria), Kelowna General Hospital or Prince George Regional Hospital. Requests for testing outside of BCCDC, Royal Jubilee Regional Hospital (Victoria), Kelowna General Hospital or Prince George Regional Hospital must have prior approval from the Program Head (604-707-2622). Instructions for collection and transportation will be provided in the consult.	1-2 7
Tularemia See also: Bacteriology/Mycology	*Francisella (Pasteurella) tularensis*	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology	5-7
		Serum, 2 mL	Sterile tube		
		Biopsy[8]	Sterile container	PCR	7
Ulcers, GI See also: *Helicobacter pylori*					
Yaws[1] (Non-venereal syphilis) See:	*Treponema pallidum* subspecies				2

Zoonotic Diseases & Emerging Pathogens Diseases & Infections (Bacterial)					
Diseases and Syndromes	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
Syphilis	*pertenue*				
Yersiniosis[6] See also: Bacteriology/Mycology	*Yersinia enterocolitica* *Yersinia pseudotubercu-losis*	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology by special request only Contact ZEP 604-707-2628	Referred Test
		Serum, 2 mL	Sterile tube		
Yersiniosis[6] See also: Bacteriology/Mycology	*Yersinia pestis*	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology on approval of Program Head. Contact 604-707-2622. For emergencies, contact the laboratory at 604-707-2628 or the on-call Medical Microbiologist (604-661-7033)	Referred Test
		Serum, 2 mL	Sterile tube		

Zoonotic Diseases & Emerging Pathogens Diseases & Infections (Fungal)					
Diseases and Syndromes	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
Aspergillosis[6] See also: Bacteriology/Mycology	*Aspergillus fumigatus*			Submit Samples directly to H. Chan @ Jack Bell Research Center Rm 312-2660 Oak St Van, BC V6H 3Z6 604-875-4812	
Aspergillosis, invasive[7]	Test for serum galactomannan	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology	Referred Test
		Serum, 2 mL	Sterile tube		
Blastomycosis, North American [7, 8] See also: Bacteriology/Mycology	*Blastomyces dermatitidis*	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	**Testing** [8] **only available after consultation with Program Head 604-707-2622**	Referred Test
		Serum, 2 mL	Sterile tube		
		Urine, 5 mL	Sterile tube		
Blastomycosis, South American See: Paracoccidioidomycosis					

Zoonotic Diseases & Emerging Pathogens Diseases & Infections (Fungal)

Diseases and Syndromes	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
Coccidioidomycosis[7] See also: Bacteriology/Mycology	*Coccidioides immitis*	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	**Testing**[8] **only available after consultation with Program Head 604-707-2622**	7
		Serum, 2 mL	Sterile tube		
Cryptococcosis See also: Bacteriology/Mycology	*Cryptococcus neoformans*	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Antigen Detection STAT testing performed if clinical history warrants	3-5
		Serum, 2 mL	Sterile tube		
		CSF, 1 mL – 2 mL	Sterile tube	Antigen Detection CSF sample should also be submitted to Public Health Advanced Bacteriology/Mycology Section for culture.	3-5
		Culture		RFLP[7]	7-15
Fusariosis[7] See also: Bacteriology/Mycology	*Fusarium* species	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology	
		Serum, 2 mL	Sterile tube		
Histoplasmosis[7, 8] See also: Bacteriology/Mycology	*Histoplasma capsulatum*	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	**Testing**[8] **only available after consultation with Program Head 604-707-2622**	Referred Test
		Serum, 2 mL	Sterile tube		
		Urine, 5 mL	Sterile tube		
Paracoccidioidomycosis[7] See: Blastomycosis, South American See also: Bacteriology/Mycology	*Paracoccidioi-des brasiliensis*	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology	Referred Test
		Serum, 2 mL	Sterile tube		
Zygomycosis See : Bacteriology/Mycology					

Zoonotic Diseases & Emerging Pathogens Diseases & Infections (Parasitic)					
Diseases and Syndromes	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
African Sleeping Sickness See: Trypanosomiasis, African					
Amoebiasis (extraintestinal disease) **Amoebic liver abscess**[5] See also: Parasitology	*Entamoeba histolytica*	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology STAT testing performed if clinical history warrants. Please contact the Program Head (604-707-2622) or the laboratory (604-707-2628)	7
		Serum, 2 mL	Sterile tube		
Babesiosis[6] See also: Parasitology	*Babesia* species	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology will be performed only after smears are negative from 3 different collection dates	Referred Test
		Serum, 2 mL	Sterile tube		
Bilharziasis See: Schistosomiasis					
Chagas' disease See: Trypanosomiasis, American See also: Parasitology					
Cysticercosis[6] See also: Parasitology	*Taenia solium* (pork tapeworm)	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology	
		Serum, 2 mL	Sterile tube		
		CSF,[2] 1 mL	Sterile tube		
Echinococcosis (Hydatidosis) See also:	*Echinococcus granulosus* (dog tapeworm)	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology STAT testing performed	7

Zoonotic Diseases & Emerging Pathogens Diseases & Infections (Parasitic)					
Diseases and Syndromes	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
Parasitology	*Echinococcus multilocularis*	Serum, 2 mL	Sterile tube	if clinical history warrants. Please contact the Program Head (604-707-2622) or the laboratory (604-707-2628) [6]Confirmatory testing is referred out if in-house serology for *Echinococcus* is positive.	
Elephantiasis See : Filariasis					
Filariasis[6] See: Elephantiasis Loiasis Onchocerciasis Wucheriasis See also: Parasitology	*Wuchereria bancrofti* *Brugia malayi* *Loa loa* *Mansonella ozzardi* *Mansonella perstans*	Clotted blood, 1 tube Serum, 2 mL	BCCDC PHL SST (gold top) blood tube Sterile tube	Serology	Referred Test
Hydatid Disease See: Echinococcosis					
Kala Azar See: Leishmaniasis					
Leishmaniasis[7] See also: Parasitology	*Leishmania donovani* *Leishmania tropica* *Leishmania braziliensis*	Clotted blood, 1 tube Serum, 2 mL	BCCDC PHL SST (gold top) blood tube Sterile tube	Serology	Referred Test
Loa loa See: Filariasis					
Loiasis *(Loa loa)* See: Filariasis					

Zoonotic Diseases & Emerging Pathogens Diseases & Infections (Parasitic)					
Diseases and Syndromes	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
Malaria[6] See also: Parasitology	*Plasmodium falciparum* *P. vivax* *P. malariae* *(P. ovale* not available) Cross reactions with *Babesia* species may occur	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology will be performed only after smears are negative from 3 different collection dates	Referred Test
		Serum, 2 mL	Sterile tube		
Onchocerciasis See: Filariasis					
Paragonimiasis[6] See also: Parasitology	*Paragonimus* species (lung fluke)	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology	Referred Test
		Serum, 2 mL	Sterile tube		
Pork tapeworm infection See: Cysticercosis					
Schistosomiasis See also: Parasitology	*Schistosoma mansoni* *Schistosoma haematobium* *Schistosoma japonicum*	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology	Referred Test
		Serum, 2 mL	Sterile tube		
Strongyloidiasis See also: Parasitology	*Strongyloides stercoralis*	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology	7
		Serum, 2 mL	Sterile tube		
Taeniasis See: Cysticercosis					
Toxocariasis[6] See also: Parasitology	*Toxocara canis*	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology	Referred Test
		Serum, 2 mL	Sterile tube		
Toxoplasmosis See also: Parasitology	*Toxoplasma gondii*	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology	3-7
		Serum, 2 mL	Sterile tube		

Zoonotic Diseases & Emerging Pathogens Diseases & Infections (Parasitic)					
Diseases and Syndromes	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
		CSF,[2] 1 mL			
Trichinosis/ Trichinellosis See also: Parasitology	*Trichinella spiralis*	Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology	7
		Serum, 2 mL	Sterile tube		
Trypanosomiasis, African[6] See also: Parasitology	*Trypanosoma brucei* *Trypanosoma gambiense/ brucei* *Trypanosoma rhodesiense*			Serology is not useful. Contact the Program Head 604-707-2622	Referred Test
Trypanosomiasis, American (Chagas' Disease) [7] See also: Parasitology	*Trypanosoma cruzi*	Clotted blood, 1 tube	BCCDC PHL SST (gold top)	Serology	Referred Test
		Serum, 2 mL	blood tube		
Wucheriasis See: Filariasis					

Zoonotic Diseases & Emerging Pathogens Diseases & Infections (Rickettsial/Viral)					
Diseases and Syndromes	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
African Tick Bite Fever See: Rickettsial infections					
Alpha Virus Infection See: Arbovirus infections					
Anaplasmosis See: Rickettsial infections					
Arbovirus infections[7]					

Zoonotic Diseases & Emerging Pathogens Diseases & Infections (Rickettsial/Viral)

Diseases and Syndromes	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
Flavivirus infections[7]	West Nile virus Dengue virus St. Louis Encephalitis virus Powassan virus Japanese B Encephalitis virus Murray Valley Encephalitis virus Yellow Fever virus Zika virus **<u>History is required for Zika testing:</u>** Location and date of travel, symptoms, onset dates and prenatal status	Clotted blood, 1 tube Serum, 2 mL	BCCDC PHL SST (gold top) blood tube Sterile tube	Serology In-house flavivirus testing for Dengue virus and West Nile virus. Further confirmatory testing may be referred out if in-house serology for flavivirus is positive as required Testing for SLE, PV, JBEV, CEV, MVEV, YFV and Zika virus serology are referred out	3-5 for EIA screen 5-7 for supplemental testing (if needed)
		PCR for Zika virus: 1 tube Nasopharyngeal swab (only if respiratory symptoms) Urine, 5-10 mL	 EDTA (purple top) blood tube Sterile tube	Zika PCR is performed in house	3-4 days
Alphavirus infections[7]	Eastern Equine Encephalitis virus Western Equine Encephalitis virus Chikungunya virus Ross River virus Venezuelan Equine Encephalitis virus Barmah Forest virus	Clotted blood, 1 tube Serum, 2 mL	BCCDC PHL SST (gold top) blood tube Sterile tube	Serology	Referred Test
Coltivirus infections[7]	Colorado Tick Fever virus			Serology	Referred Test
Hantavirus infections[7]	Sin Nombre virus Hantaan virus			Serology	Referred Test
Phlebovirus infections[7]	Rift Valley Fever virus			Serology	Referred Test

Zoonotic Diseases & Emerging Pathogens Diseases & Infections (Rickettsial/Viral)

Diseases and Syndromes	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
Orthobunya virus infections[8]	California Encephalitis virus			Serology	Referred Test
Other Arbovirus infections[7]				Serology	Referred Test
Barmah Forest Virus Infection See: Arbovirus infections					
Boutonneuse Fever See: Rickettsial infections					
Brill-Zinsser Disease See: Rickettsial infections					
California Encephalitis Virus See: Arbovirus infections					
Chikungunya Virus Infection See: Arbovirus infections					
Colorado Tick Fever Infection See: Arbovirus infections					
Coxiella burnetii Infection See: Rickettsial infections					
Dengue Fever See: Arbovirus infections					
Eastern Equine Encephalitis See: Arbovirus infections					
Ehrlichiosis (Anaplasmosis) See: Also see Rickettsial infections Serology		EDTA Blood, 2-5mL, refrigerated	BCCDC PHL EDTA (purple top) blood tube	PCR[8]	7
Encephalitis See: Arbovirus infections					
Epidemic typhus (European, Classic, louse-					

Zoonotic Diseases & Emerging Pathogens Diseases & Infections (Rickettsial/Viral)					
Diseases and Syndromes	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
borne) See: Rickettsial infections					
Flea-borne Typhus See: Rickettsial infections					
Hantaan Virus Infection See: Arbovirus infections					
Epidemic Typhus (European, Classic, louse-borne) See: Rickettsial infections					
Human Granulocytic Ehrlichiosis See: Rickettsial infections					
India Tick Typhus See: Rickettsial infections					
Israeli Tick Typhus See: Rickettsial infections					
Japanese B Encephalitis See: Arbovirus infections					
Japanese (Oriental) Spotted Fever See: Rickettsial infections					
Kenya Tick Typhus See: Rickettsial infections					
Louse-borne Typhus See: Rickettsial infections					
Lymphocytic Choreomeningitis[7]	Lymphocytic Choreomeningitis virus (LCMV)	Clotted blood, 1 tube Serum, 2 mL	BCCDC PHL SST (gold top) blood tube Sterile tube	Serology	Referred Test
Marseilles Fever See: Rickettsial infections					

Zoonotic Diseases & Emerging Pathogens Diseases & Infections (Rickettsial/Viral)					
Diseases and Syndromes	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
Mediterranean Tick Fever See: Rickettsial infections					
Mite-borne Typhus See: Rickettsial infections					
Muerto Canyon Virus Infection See: Arbovirus infections (Hanta virus infections)					
Murine Typhus (rat/flea-borne) See: Rickettsial infections					
Murray Valley Encephalitis See: Arbovirus infections		Clotted blood, 1 tube Serum, 2 mL	BCCDC PHL SST (gold top) blood tube Sterile tube	Serology	Referred Test
North Asian Tick Typhus See: Rickettsial infections					
Powassan Virus Infection See: Arbovirus infections					
Q-Fever See: Rickettsial infections					
Queensland Tick Typhus See: Rickettsial infections					
Rabies[7]	*Rabiesvirus* (member of the *Rhabdovirus* family)	Serum, 3.5 mL	BCCDC PHL SST (gold top) blood tube	Referred to NML Vaccination history required with submission. Test is not to be used for diagnosis of Rabies infection.	Referred Test

Zoonotic Diseases & Emerging Pathogens Diseases & Infections (Rickettsial/Viral)

Diseases and Syndromes	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
Rickettsial infections[7] Louse-borne typus: Epidemic typhus Brill-Zinsser disease Flea-borne typhus Mite-borne typhus: Tsutsugamushi fever or Scrub typhus Tick-borne typhus Rocky Mountain Spotted fever North Asian (Siberian) tick typhus Boutonneuse fever, Mediterranean tick fever, Marseilles fever, Indian, Israeli and Kenya tick typhus Queensland tick typhus African tick bite fever Japanese (Oriental) spotted fever	 *Rickettsia prowazekii* *Rickettsia prowazekii* *Rickettsia typhi (mooseri)* *Rickettsia/Orientia tsutsugamushi (orientalis)* *Rickettsia rickettsii* *Rickettsia siberica* *Rickettsia conorii* *Rickettsia australis* *Rickettsia africae* *Rickettsia japonica*	Clotted blood, 1 tube Serum, 2 mL	BCCDC PHL SST (gold top) blood tube Sterile tube	Serology	Referred Test
Rickettsialpox Q fever Anaplasmosis (Ehrlichiosis)	*Rickettsia akari* *Coxiella burnetii* *Ehrlichia chaffeensis* *Anaplasma phagocytophilia*				
Rickettsialpox See: Rickettsial infections					
Rift Valley Fever See:					

Zoonotic Diseases & Emerging Pathogens Diseases & Infections (Rickettsial/Viral)

Diseases and Syndromes	Causal Agent	Sample Required	Container Type	Test Performed	TAT (days)
Arbovirus infections					
Rocky Mountain Spotted fever See: Rickettsial infections					
Ross River Virus Infection See: Arbovirus infections		Clotted blood, 1 tube	BCCDC PHL SST (gold top) blood tube	Serology	Referred Test
		Serum, 2 mL	Sterile tube		
Scrub Typhus (mite-borne) See: Rickettsial infections					
Siberian Tick Typhus See: Rickettsial infections					
Sin Nombre Virus Infection See: Arbovirus infections					
South African Tick Typhus See: Rickettsial infections					
St. Louis Encephalitis See: Arbovirus infections					
Trench Fever See: *Bartonella quintana*					
Tsutsugamushi Fever See: Rickettsial infections					
Typhus Fever See: Rickettsial infections					
Venezuelan Equine Encephalitis See: Arbovirus infections					
Weil Felix See: Rickettsial infections					
West Nile Virus Infection See: Flavivirus infections See also: Virology					

Zoonotic Diseases & Emerging Pathogens Diseases & Infections (Rickettsial/Viral)					
Diseases and Syndromes	**Causal Agent**	**Sample Required**	**Container Type**	**Test Performed**	**TAT (days)**
Western Equine Encephalitis See: Arbovirus infections					
Yellow Fever See: Arbovirus infections					

NOTES

1. Adequate clinical and epidemiological information must accompany the sample.
2. CSF must be accompanied by a blood sample.
3. Anti-DNase B test is performed as per predetermined laboratory results.
4. For immigration only, an RPR screen test is required. All samples are screened by RPR. Confirmatory tests are performed on samples with a positive RPR.
5. Clinical information must be provided when requesting confirmatory tests (TPPA, FTA-ABS) for syphilis.
6. Samples are forwarded to a reference laboratory
7. Samples are forwarded to a reference laboratory. Please ensure adequate clinical and epidemiological information accompanies the sample.
8. Consultation with the Program Head (604-707-2622) is required. In case of emergency, contact the Medical Microbiologist On-Call at (604-661-7033).
9. Anti-delta hepatitis tests are performed only when the patient has markers for HBV present.