PICNet
PROVINCIAL INFECTION CONTROL NETWORK OF BRITISH COLUMBIA
A program of the Provincial Health Services Authority

BC Centre for Disease Control
AN AGENCY OF THE PROVINCIAL HEALTH SERVICES AUTHORITY

Surveillance Protocol for Carbapenemase-Producing Organisms (CPO) & *Candida auris (C. auris)* in British Columbia

January 2024

Contact:

Provincial Infection Control Network of BC (PICNet)
Suite #504, 1001 W Broadway, Vancouver, BC, V6H 4B1
Phone: (604) 875-4844
E-mail: picnet@phsa.ca

fraserhealth
Better health. Best in health care.

Interior Health
Every person matters

island health

northern health

Providence Health Care
How you want to be treated.

Provincial Health Services Authority
Province-wide solutions. Better health.

Vancouver CoastalHealth
Promoting wellness. Ensuring care.

Acknowledgements

We would like to acknowledge the contribution and expertise of the following groups:

- PICNet Management and Surveillance team
- BC Centre for Disease Control, Public Health Lab
- Health authority Infection Prevention and Control professionals
- BC Ministry of Health, Communicable Disease Prevention & Control, Population & Public Health
- PICNet's Surveillance Working Group
- Health authority Infection Prevention and Control leadership
- Regional Medical Health Officers

Table of Contents

Preamble

Carbapenemase-producing organisms (CPOs) refers to a large group of bacteria with genetic resistance to broad-spectrum antibiotics, in particular, to the carbapenem family of antibiotics, which are often considered a treatment drug of last resort. The emergence of these organisms in 2008, followed by international spread of CPOs was concerning, as little was known about its epidemiology, prevention, and control. Following the identification of travel related cases and transmission events in BC hospitals, CPO cases from acute care facilities were declared reportable in BC by the Provincial Health Officer in July 2014 and a mandatory CPO surveillance program for acute care facilities was initiated. A comprehensive surveillance program was developed and led by multiple partners in BC: the Provincial Infection Control Network (PICNet), health authorities' infection prevention and control (IPC) programs and laboratories and the BC Center for Disease Control's Public Health Laboratory (PHL). The surveillance program included patient screening, testing, and subtyping for CPO. The reportability of CPO was widened to include community identified cases and the provincial surveillance protocol for CPO was modified accordingly in December 2017 to incorporate CPO case identification and reporting in the community.

Candida auris (*C. auris*) is an emerging yeast (a type of fungus) first identified in Japan in 2009, which is causing particular concern within the healthcare context. Since its identification, *C. auris* has sparked outbreaks in healthcare settings around the world, often leading to severe infections with high mortality rates. Notably, there has been a rapid increase of cases in health-care facilities in Canada and the United States in recent years. Further, *C. auris* has a high rate of multi-drug resistance and, in some cases, is resistant to all three classes of antifungals. The first known case of multidrug-resistant *C. auris* was reported in Canada in 2017. Since then, there have been 16 confirmed *C. auris* cases, including a healthcare associated cluster, in the province of BC.

A provincial CPO working group meeting was convened by PICNet in June 2018, to address evolving CPO surveillance practices that should be reflected in the provincial surveillance protocol, and to initiate a conversation about *Candida auris* (*C. auris*). Provincial and health authority representatives came together, including medical health officers, medical microbiologists, epidemiologists, and infection prevention and control leaders and professionals. PICNet's Surveillance Working Group revised the protocol to reflect the decisions at the meeting and knowledge gained from CPO prevention and control practice.

C. auris cases identified in acute care facilities were declared reportable in BC by the Provincial Health Officer in September 2018, requiring the immediate provincial surveillance of laboratory-identified *C. auris* cases and the reporting of any investigation of ongoing *C. auris* transmission to PICNet. Since then, a case definition for *C. auris* was included in the surveillance protocol and *C. auris* was incorporated in the Notification of Ongoing Transmission form.

More recently in July 2023, PICNet hosted a provincial CPO and *C. auris* symposium to (1) update the existing protocol, (2) refine and reflect on CPO and *C. auris* information obtained through the BC PICNet Surveillance program, and (3) review guidance, protocols and evidence related to CPO and *C. auris* in both the Canadian and international contexts.

This updated protocol provides guidance on the:

(1) *minimum requirements* for identification of CPO, collection and reporting of CPO surveillance data, in both acute and community care settings in the province.
(2) minimum identification of *C. auris* in acute care facilities, collection and reporting of *C. auris* surveillance data and the reporting of ongoing *C. auris* transmission.

These data are also linked to the BCCDC Public Health Laboratory's CPO *and C. auris* genomics data to inform cluster investigation and understanding of strain prevalence in BC facilities.

1. Objectives of Surveillance: CPO/*C. auris*

a. To identify and monitor CPOs/*C. auris* among populations in the province

b. To examine the epidemiology of people who are infected or colonized with CPOs/*C. auris*

c. To examine the molecular profile of these emerging CPOs/*C. auris* organisms

c. To synthesize all epidemiologic and laboratory information to inform prevention control best practices and patient care for CPO/*C. auris*

2. Surveillance population, screening and sample collection: CPO

a. Population under surveillance

All cases of CPO identified in BC are included in the provincial surveillance activities. The following population will be screened by the CPO screening questionnaire at the time of admission or visit for health-care services:

- Patients admitted to acute care facilities
- People at high risk of acquiring CPO as defined by the health authority (e.g., patients who receive intensive medical care at outpatient settings, such as hemodialysis clinics, oncology clinics, bone marrow or solid organ transplant clinics, etc.)

b. Minimum screening swabs

- Admission screening swabs
  - Anyone who has had an overnight stay in a hospital or has undergone a medical/ surgical procedure outside Canada within the past 12 months
  - *A health authority **may choose** to expand admission screening swabs to patients who had any health-care encounter outside Canada or travelled to CPO endemic regions within the past 12 months*
- Other screening swabs
  - Anyone who was transferred from a care unit or care facility within your HA, which is under investigation for ongoing CPO transmission
  - Anyone admitted to a unit or care facility in your HA, which is under investigation for ongoing CPO transmission
  - Anyone who was deemed high risk for CPO acquisition by the health authority, such as the roommates or close contact of a known CPO-positive individual

- Serial screening swabs

  *Health Authorities **may** consider serial screening swabs over a period of up to 21 days after exposure, for patients with recent high risk exposure but negative for CPO upon admission swabs. This is determined after consultation with the medical microbiologists or infection control practitioners (ICPs) in the facility.*

c. Sample collection

- Screening sample
  - Rectal swab (preferred) with fecal staining (required)
  - Stool sample is acceptable if rectal swab is not available

- Clinical sample
  - Sample(s) from open wounds, blood, urine, tracheostomies, ostomies, intravenous catheter sites, and others as appropriate

- Contact tracing sample
  - Rectal swab (preferred) with fecal staining (required)
  - Stool sample is acceptable if rectal swab is not available

d. Scope

The following organisms that harbor a carbapenemase gene(s) are under surveillance:

- Screening sample: Enterobacteriaceae
- Clinical sample: Enterobacteriaceae (minimum), *Pseudomonas spp., and Acinetobacter spp. can be included as per the judgment of each HA*
- Contact tracing sample: organisms that may harbour a targeted CPO gene(s)

3. Surveillance population, screening and sample collection: *C. auris*

a. Population under surveillance

All cases of *C. auris* identified in BC are included in the provincial surveillance activities.

b. Minimum screening swabs

- Screening is at the discretion of the HAs based on local epidemiology and patient risk factors
- *HAs **may choose**, for example, to screen patients who received health care outside of Canada and are CPO positive or to screen patients who have had a high-risk exposure and are CPO negative*

c. Sample collection

- Screening sample
  - *C. auris* screening should include a swab of the patient's bilateral axilla/groin
- Clinical sample

- Sample(s) from open wounds, blood, urine, tracheostomies, ostomies, intravenous catheter sites, normally sterile sites and others as appropriate

- Contact tracing sample
  - *C. auris* screening should include a swab of the patient's bilateral axilla/groin

4. Case identification and confirmation: CPO/*C. auris*

All patient isolates that have been identified as potentially harboring *C. auris* or a carbapenemase gene(s) by the medical microbiology laboratories in HAs or communities should be sent to PHL for molecular testing and genotyping analysis (see Appendix A), accompanied by completed requisition form for CPO testing (Appendix B) or a *Bacteriology and Mycology Isolates Submitted for Identification Requisition* for *C. auris* testing.

PHL will report the molecular testing results directly to the submitting laboratory via the electronic laboratory information system as per current standard practice.

a. Eligible CPO case

The case of CPO is defined by carbapenemase gene for the provincial surveillance. A new case of CPO is a carbapenemase gene that was identified from a patient isolate for the first time in the province.

- The same gene identified from the same patient will be regarded as the same case of CPO, regardless of bacterial species or sample types.
- Different carbapenemase genes identified from the same patient are considered different cases of CPO, regardless of whether they are identified in the same isolate, or different isolates from the same sample, or subsequent samples.
- All newly identified carbapenemase genes from a patient previously colonized or infected with CPO are considered new cases of CPO.

b. Eligible *C. auris* case

A new *C. auris* case is defined as *C. auris* identified in a patient isolate for the first time in the province.

- Subsequent *C. auris* isolates identified from either a colonized or infected patient are considered known cases of *C. auris.*

Once an isolate is confirmed to harbor *C. auris* or a carbapenemase gene, PHL will determine from the laboratory *C. auris* or CPO testing database whether *C. auris* or the carbapenemase gene was already identified from the patient. If *C. auris* or the CPO gene is identified for the first time from a particular patient, it will be considered a new case, as defined above, and a unique identifier will be assigned and included in the laboratory report. The medical microbiologist at PHL will notify the medical microbiologist in the submitting laboratory of identification of the new case. If *C. auris* or the CPO gene has already been identified from the same patient, the previous case identification number will be retrieved and included in the laboratory report.

5. Case reporting: CPO/*C. auris*

After receiving the CPO/*C. auris* laboratory report from PHL, the submitting laboratory will determine the source of the isolate:

- If the CPO/*C. auris* positive isolate was obtained from patients admitted to an acute care facility, including long-term care units or facilities that are housed in or affiliated to an acute care facility, the submitting laboratory will inform the IPC team in the HA and the case will be reported by the HA's IPC to PICNet. PICNet will then inform Public Health through their quarterly and annual public report.
- If the CPO/*C. auris* positive isolate was obtained from a patient in a community health-care setting, including:
  - isolates forwarded by community laboratories to PHL
  - isolates obtained from all long-term care facilities identified by any laboratory
  - isolates obtained from outpatient clinics or emergency department visits, where the patient was not subsequently admitted to an acute care facility,

  PHL and the submitting laboratory will inform the local Medical Health Officer (MHO) as a "Reportable Condition", based on the location of patient's residence (including First Nations peoples on and off reserve and clients/residents in the long-term care facility). If the residence of the patient is not available, the submitting laboratory will contact the care provider directly. The MHO's office will receive (1) a copy of the PHL laboratory report with the unique identifier, which will be transcribed onto the "Letter to the Ordering Provider" (Appendix F), and (2) an "Enhanced Surveillance Form for Carbapenemase-Producing Organisms (CPO) OR *Candida auris (C. auris)* Identified in the Community" (Appendix G).
- PHL Medical microbiologist will inform HA's IPC program of CPO/*C. auris* cases identified in the communities within their HA.
- The MHO's Office and IPC within each HA will continue to communicate with each other regarding CPO/*C. auris* cases identified in their HA.

6. Surveillance data collection: CPO/*C. auris*

All new cases of CPO/*C. auris* require completion of the surveillance forms, which should be sent to PICNet for the purpose of provincial surveillance and reporting.

- New cases in acute care settings
  ICPs in HAs are responsible for collecting surveillance information and completing the surveillance forms (e.g., chart review, consultation with health-care provider or physician, etc.). The IPC Epidemiologist in HA will review the information collected and submit the data to PICNet as per established process.
  - For a new case of CPO/*C. auris* (either colonization or infection), the surveillance form for CPO/*C. auris* (Appendix C) must be completed and submitted.
  - If the patient is infected with CPO/*C. auris*, or if the patient was initially reported as CPO/*C. auris* colonization and subsequently developed into an infection within a year from initial identification, an addendum form for CPO/*C. auris* infection (Appendix D) must be completed and submitted.

- New cases in community health-care settings
  MHO's office will send the following to the patient's ordering physician or care provider:

  (1) "Enhanced Surveillance Form for "Carbapenemase-Producing Organisms (CPO) OR *Candida auris (C. auris)* Identified in the Community" (Appendix G)
  (2) "Letter to the Ordering Provider" (Appendix F) including the unique identifier number, and a CPO/*C. auris* Health File,

  and ask them to complete the enhanced surveillance form (Appendix G). Once completed, the physician or care provider should send the enhanced surveillance form to PICNet in a timely manner via email (picnet@phsa.ca).

7. Data Management and Reporting: CPO/*C. auris*

a. Provincial molecular testing and genotyping data for CPO/*C. auris* are managed by PHL. Provincial surveillance data are managed by PICNet. PHL and PICNet will share the information with HAs when necessary for CPO/*C. auris* prevention and control, as per the data sharing agreement.

b. PICNet and PHL will cross-check the data weekly for data quality and assurance purposes. The information on the Requisition Form for CPO Testing (Appendix B) and the *Bacteriology and Mycology Isolates Submitted for Identification Requisition* for *C. auris* will be de-identified and shared with PICNet, along with the molecular testing results.

c. Each quarter, PICNet will report the number of new CPO cases identified by HA and genotype, and post them on the PICNet's website for access by the Ministry of Health, HAs, health-care professionals, and the public, as per established data validation and reporting protocols for dissemination of surveillance data.

d. PICNet will report the number of new *C. auris* cases identified by HA annually, and post them on the PICNet's website for the Ministry of Health, HAs, all health-care professionals, and the public. This will be based on established data validation and reporting protocols for dissemination of surveillance data.

e. PICNet and PHL will work together to summarize the CPO/*C. auris* laboratory testing and surveillance data and report back to the HAs, British Columbia Association of Medical Microbiologists (BCAMM), and the Ministry of Health, annually or as necessary.

f. IPC in HAs should inform PICNet and PHL of initiation of any investigation of suspect CPO/*C. auris* transmission, when the transmission is believed to be ongoing or IPC has reason to believe other patients may been exposed (Appendix E). PICNet and PHL should also be informed of investigation closures (Appendix E). PICNet will inform other HAs of investigation initiation and closures.

   In case of an outbreak of CPO/*C. auris* in an acute care facility, IPC will consult with the MHO or the Medical Microbiology (MMB) team regarding outbreak investigation and control, depending on their HA's medical leadership structure for IPC in acute care. If the outbreak occurs in a community setting, such as long-term care facilities and

outpatient clinics, IPC will assist the MHO in case management and infection control. The HA should communicate with or inform other HAs, PICNet, PHL, as well as the public as per established outbreak management processes.

8. Transmission investigation: CPO/*C. auris*

- Initiation of investigation

  If there is suspected transmission of CPO/*C. auris* in a care unit or care facility, an investigation should be initiated.

- Closure of investigation

  The investigation will be declared over if there is no further CPO/*C. auris* positive isolates identified after six weeks of the last CPO/*C. auris* in the unit.

9. Notification of transmission: CPO/*C. auris*

- When there is suspected ongoing CPO/*C. auris* transmission within a care unit or care facility, or the HA has reason to believe that other patients may have been exposed, HA's IPC will complete the form of notification of ongoing CPO/*C. auris* transmission investigation (Appendix E) and send it to PICNet in a timely manner. PICNet will disseminate the notification form to IPC program in other HAs.
- Once the investigation is resolved, an updated notification of CPO/*C. auris* transmission investigation form (Appendix E) should be sent to PICNet, who will disseminate the updated notification form HA IPC programs.
- HA should inform PH or MMB team as appropriate in their HA, regarding initiation and closure of ongoing CPO/C. auris transmission investigation.

Appendix A – Laboratory Interpretive Criteria for Identifying Suspected Carbapenemase-Producing Organisms (CPO)

Included in this surveillance protocol are isolates recovered from **screening, clinical** and **contact tracing** samples received by the microbiology laboratories in the health authorities and community.

Screening samples are samples collected at the time of patient admission/visit to or stay at a care facility or a care unit for the purpose of detection, prevention and control of CPO. Enterobacteriaceae will be tested for carbapenemase activities by the medical microbiology laboratories in HAs or community. If the isolates are suspected carbapenem resistant, they should be tested further with phenotypic/molecular methods. Non-Enterobacteriaceae may be pursued if there are epidemiological risk factors for CPO.

Clinical samples are samples collected for routine microbiology workup where carbapenem resistance is suspected by the medical microbiology laboratory based on 2019 CLSI interpretive criteria[1]. All isolates with suspected carbapenemase producing Enterobacteriaceae, *P. aeruginosa*, and *Acinetobacter spp,* should be investigated further with phenotypic/molecular methods.

Contact tracing samples are samples collected from people who have been identified as having an epidemiological link with a confirmed CPO case(s). Enterobacteriaceae and/or non-Enterobacteriaceae harbouring the CPO gene identified in the confirmed case will be targeted in testing of contact tracing samples.

At least ONE of the following	**Enterobacteriaceae**	
	MIC (*µg/ml*)	Zone diameters (*mm*)
Ertapenem	≥ 2	≤ 18
Imipenem	≥ 4	≤ 19
Meropenem	≥ 4	≤ 19

At least ONE of the following	***Acinetobacter spp.***	
	MIC (*µg/ml*)	Zone diameters (*mm*)
Imipenem	≥ 8	≤ 18
Meropenem	≥ 8	≤ 14

ALL of the following	***Pseudomonas aeruginosa***	
	MIC (*µg/ml*)	Zone diameters (*mm*)
Imipenem	≥ 8	≤ 15
Meropenem	≥ 8	≤ 15

1. Clinical and Laboratory Standards Institute. 2019. Performance standards for antimicrobial susceptibility testing; 29th informational supplement, M100-S29 (December 27, 2018). Clinical and Laboratory Standards, Wayne, PA.

Ceftazidime	≥ 32	≤ 14

All carbapenem resistant strains of Enterobacteriaceae, *Pseudomonas spp.*, and *Acinetobacter spp*. should be sent to PHL, along with the "CPO Requisition Form" (for molecular testing and additional genotyping analyses (Appendix B).

Due to the importance of timely identification of these organisms for infection control and epidemiologic investigation, please send the isolates that are suspected of harbouring a carbapenemase gene(s) to the PHL as soon as possible.

When there is an internal alert or an outbreak of CPO is suspected, accelerated submission is strongly recommended.

PHL will report results back to the submitting laboratory directly via the electronic laboratory information system. For CPO positive isolates, PHL will check the laboratory database and determine whether it meets the definition of an eligible CPO case (see **Section 2e** in the Protocol). If it is a new case, a unique identifier will be assigned and included in the laboratory report. The submitting laboratory should work with ICPs in the HAs and care providers to ensure that the CPO surveillance information is collected and submitted to PICNet.

For urgent test requests, please contact Dr. Linda Hoang or the Public Health Advanced Bacteriology/Mycology Lab of PHL:

Dr. Linda Hoang, Interim Medical Co-Director/Medical Microbiologist, BCCDC Public Health Laboratory
Phone: (604) 707-2618; Email: Linda.Hoang@bccdc.ca

Janet Fung
Phone: (604) 707-2610; Email: janet.fung@bccdc.ca

Lab Supervisors
Phone: (604) 707-2617; Fax: (604) 707-2604

Mailing address
Public Health Advanced Bacteriology/Mycology Lab
BCCDC Public Health Laboratory
655 West 12th Avenue, Vancouver, BC, V5Z 4R4

Appendix B – Requisition Form for Carbapenemase-Producing Organisms (CPO) Testing

BAM

BC Centre for Disease Control

Public Health Laboratory

655 West 12th Avenue, Vancouver, BC V5Z 4R4
www.bccdc.ca/publichealthlab

Bacteriology and Mycology Requisition
Carbapenemase Producing Organism Testing

BAM LM LABS

Section 1 - Patient Information

PERSONAL HEALTH NUMBER (or out-of province Health Number and province)	DOB (DD/MMM/YYYY)	GENDER ☐ M ☐ F ☐ UNK
PATIENT SURNAME	PATIENT FIRST AND MIDDLE NAME	
ADDRESS	CITY	POSTAL CODE

DATE RECEIVED

LABORATORY USE ONLY

Section 2 - Submitting Laboratory Details

CONTACT PERSON	HOSPITAL (Name and address for report delivery)
TELEPHONE NUMBER	PHSA CLIENT NO.
ADDITIONAL COPIES TO:	

SAMPLE REF. NO.

DATE COLLECTED (DD/MMM/YYYY)

Section 3 - Specimen Details

ORGANISM IDENTIFICATION: Genus Species

☐ SCREENING ISOLATE ☐ CLINICAL ISOLATE ☐ CONTACT TRACING

PREVIOUS CPO SCREENING: ☐ NO ☐ YES DATE:

SPECIMEN SOURCE ☐ respiratory ☐ blood ☐ urine ☐ wound ☐ rectal ☐ other: _____

Automated Antibiogram:

Antibiotic	MIC	Interpretation (S, I, R)	Antibiotic	MIC	Interpretation (S, I, R)
Ampicillin		S☐ I☐ R☐	Gentamicin		S☐ I☐ R☐
Ampicillin/Clavulanate		S☐ I☐ R☐	Imipenem		S☐ I☐ R☐
Aztreonam		S☐ I☐ R☐	Levofloxacin		S☐ I☐ R☐
Amikacin		S☐ I☐ R☐	Meropenem		S☐ I☐ R☐
Cefazolin		S☐ I☐ R☐	Minocycline		S☐ I☐ R☐
Cefepime		S☐ I☐ R☐	Nitrofurantoin		S☐ I☐ R☐
Cefoxitin		S☐ I☐ R☐	Pefloxacin		S☐ I☐ R☐
Cefpodoxime		S☐ I☐ R☐	Piperacillin		S☐ I☐ R☐
Ceftazidime		S☐ I☐ R☐	Piperacillin/Tazobactam		S☐ I☐ R☐
Cefixime		S☐ I☐ R☐	Rifampin		S☐ I☐ R☐
Ceftriaxone		S☐ I☐ R☐	Ticarcillin		S☐ I☐ R☐
Cephalothin/Cephalexin		S☐ I☐ R☐	Ticarcillin/Clavulanic Acid		S☐ I☐ R☐
Ciprofloxacin		S☐ I☐ R☐	Tigecycline		S☐ I☐ R☐
Colistin		S☐ I☐ R☐	Tobramycin		S☐ I☐ R☐
Ertapenem		S☐ I☐ R☐	Trimethoprim/Sulfamethoxazole		S☐ I☐ R☐

☐ **OR, See attached for automated AST results**

Phenotypic Confirmation:

E-test/discs

Antibiotic	MIC	Zone diameter	Interpretation
Ertapenem			
Meropenem			
Imipenem			

Rosco Disc Interpretation: _____

Other Results:

ESBL E-test Interpretation: _____

Other Tests and Interpretation: _____

CPO PCR Interpretation: _____

Form PHBM_225_2001F Version 1.1 05/2017

BAM BAM

Appendix C - Surveillance Form for Carbapenemase-Producing Organisms (CPO) OR *Candida auris (C. auris)* Identified in Acute Care Facility

1	**Organism** ☐ CPO OR ☐ *C. auris* If a patient is colonized and/or infected with both CPO and C. *auris*, please fill out two separate forms for each organism
2	**Unique Identifier**– assigned by BCCDC Public Health Laboratory (PHL) _____
3	**Patient's status** ☐ Inpatient ☐ Other*, please specify* _____
4	**Date of admission or visit** (dd/mmm/yyyy) _____
5	**Name of the facility** _____
6	**Status** ☐ Infection (please also complete appendix D) ☐ Colonization ☐ Unknown
7	**Did the patient travel outside of Canada within the past 12 months?** ☐ Yes. *Please specify the name of the country* _____ ☐ Country not provided ☐ No. *Please skip Question 8.* ☐ Unknown or patient is discharged. *Please skip Question 8.*
8	**If answered Yes to Question 7, did the patient have a health-care encounter outside of Canada within the past 12 months?** ☐ Yes*,* an overnight stay in a hospital or undergone medical/surgical procedure outside of Canada ☐ Yes, other health-care encounter, e.g., visited GP, walking clinic, dentist, ER, etc. ☐ No health-care encounter ☐ Unknown
9	**Did the patient have an overnight stay in a Canadian facility or undergo medical/surgical procedure in Canada (including BC) within the past 12 months?** ☐ Yes. *Please specify the name of the province (s)*_____ ☐ No. *Please skip to question 11.* ☐ Unknown. *Please skip to question 11.*
10	**If answered Yes to Question 9 and one of the provinces identified was BC, what types of health-care encounters has the patient had in BC in the past 12 months (excluding current admission)*? (Check all that apply)*** ☐ An acute care unit/facility admission ☐ A long-term care facility admission ☐ A medical/surgical procedure in an outpatient setting ☐ No health-care encounter ☐ Unknown
11	**Is the unit/facility in which the patient is currently admitted under investigation for transmission of organism identified in question 1?** ☐ Yes ☐ No ☐ Unknown or patient is discharged
12	**Did the patient have contact *[minimum 12 hours]* with a known case or environmental sources for the organism (CPO or *C. auris*) identified in question 1 within the past 12 months?** *(Check all that apply)* ☐ Yes, within an acute care facility ☐ Yes, within a long-term care facility ☐ Yes, private household

	☐ Yes, other *please specify* _____ ☐ No. *Please skip Question 13.* ☐ Unknown. *Please skip Question 13*
13	**If answer Yes to Question 12, what was the *nature* of the contact?** *(Check all that apply)* ☐ Roommate ☐ Person in the same unit/facility or house ☐ Health-care provider ☐ Friend/Relative ☐ Environmental sources (e.g., contaminated sink or other surface, medical equipment, etc.) ☐ Other*, please specify* _____ ☐ Unknown

Once completed, please send it to PICNet at picnet@phsa.ca

Description and notes for Appendix C

1	Organism	Specify whether this is a CPO or *C. auris* case
2	Unique Identifier	CPO: Record the ID number assigned by PHL on their laboratory report. The format of ID includes yyyy####-###-## yyyy is the year of the first CPO test for the patient; #### is the serial number of the patient being tested for CPO in the year beginning from 0001 each year; ### is a serial number for the isolate being tested from the patient, and ## is a serial number of carbapenamase genes identified from the patient. *C. auris*: Record the ID number assigned by PHL on their laboratory report. The format of ID includes yyyy####-Caur-## #### is the serial number of the patient being tested for *C. auris* in the year beginning from 0001 each year; ## is a serial number for the isolate being tested from the patient If the ID number has not been received for this case or there are any questions about ID, please contact PHL
3	Patient's status	Check 'Inpatient' (hospitalized) if the patient was admitted to an acute care unit. Otherwise, check 'Other' and specify in written text the location where the sample was collected (e.g., Emergency Department, Hemodialysis or Oncology Clinic, etc)
4	Date of admission or visit (dd/mmm/yyyy)	Record the Day (e.g., 17), Month (e.g., Jul) and Year (e.g. 2014) in this order (e.g., 17-Jul-2014). Write out the month (e.g. Jan, Mar, Aug, etc.).
5	Name of the Facility	Specify the name of the facility where the patient was admitted or visited at the time when the sample was collected.
6	Status	Specify the patient's CPO or C. *auris* status in terms of infection, colonization or unknown according to the following definitions: **Infection** is defined as a patient with evidence of clinical signs and symptoms resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s) in addition to a positive culture of CPO or C. *auris*. Clinical evidence may be derived from direct observation of the infection site (e.g., a wound), or review of information in the patient chart or other clinical records, or a physician or surgeon diagnosis of infection. Please refer to the 2015 "CDC/NHSN Surveillance Definitions for Specific Type of Infections" for definitions and criteria of all specific types of infections (http://www.cdc.gov/nhsn/PDFs/pscManual/17pscNosInfDef_current.pdf). (Note that by checking infection, Appendix D needs to be completed.) **Colonization** is the presence of CPO on skin, on mucous membranes, in open wounds, or in excretions or secretions but are not causing adverse clinical signs or symptoms. **Unknown** if there is no or insufficient information to define whether the patient's CPO or C. *auris* status represents an infection or colonization.
7	Did the patient travel outside of Canada within the past 12 months?	Select **Yes** if the patient had travelled to other countries or had health-care encounter outside Canada in the past 12 months. Specify which country the patient travelled. Select **No** if the patient did not travel in the past 12 months and skip the Question 8.
8	If answered Yes to Question 7, did the patient have a	Select **one** that applies based on the information available

	health-care encounter outside of Canada within the past 12 months?	
9	Did the patient have an overnight stay in a Canadian facility or undergo medical/surgical procedure in Canada (including BC) within the past 12 months?	Select **Yes** if the patient an overnight stay in a Canadian facility or underwent a medical/surgical procedure in Canada (including BC) within the past 12 months. Specify which province the patient had the health encounter. If the patient had a health encounter in multiple provinces, write the provinces name in the blank.
10	If answered Yes to Question 9, what types of health-care encounters has the patient had in BC in the past 12 months (excluding current admission)*??*	Check **all** that apply based on the patient's health-care encounter history
11	Is the unit/facility in which the patient is currently admitted under investigation for transmission of organism identified?	Select **Yes** if the patient was admitted to a unit which was under investigation for on-going CPO or C. *auris* transmission during his/her stay in the unit. Select **No** if the was **NOT** under investigation for CPO or C. auris transmission during his/her stay in the unit.
12	Did the patient have contact *[minimum 12 hours]* with a known case or environmental sources for the organism **(CPO or *C. auris*)** identified in Question 1 within the past 12 months? *(Check all that apply)*	Check **all** that apply based on the patient's contact with a known CPO or C. *auris* case
13	If answered Yes to Question 10, what was the nature of the contact?	Check **all** that apply based on the nature of the contact

Appendix D – Addendum Form for Carbapenemase-Producing Organisms (CPO) OR *Candida auris (C. auris)* Infections Identified in Acute Care Facility

NB: This form should be complete if a) the case was identified as a CPO or *C. auris* infection; b) the case was initially reported as colonization, and subsequently developed into a CPO or C. *auris* infection within a year from initial identification. Please ensure that the surveillance form for CPO or C. *auris* (***Appendix C***) has been completed for this case.

1	**Organism** ☐ CPO OR ☐ *C. auris* If a patient is colonized and/or infected with both CPO and C. *auris*, please fill out two separate forms for each organism
2	**Unique Identifier** – assigned by BCCDC Public Health Laboratory (PHL) _____
3	**Patients' status** ☐ Inpatient ☐ Other*, please specify* _____
4	**Date of admission or visit** (dd/mmm/yyyy) _____
5	**Name of the facility** _____
6	**Date of CPO infection identification** (dd/mmm/yyyy) _____
7	**Site(s) of infection** ☐ Bloodstream ☐ Urinary tract ☐ Respiratory tract ☐ Wound ☐ Surgical site ☐ Other*, please specify* _____
8	**Was ICU admission required due to the infection or the complications associated with the infection within <u>30 days</u> after identification of the infection?** ☐ Yes – the patient was admitted to ICU as a result of the infection or complications associated with the infection. ☐ No – the patient was not admitted to ICU ☐ N/A – patient was already in ICU due to other medical conditions ☐ Unknown
9	**Patient outcome within <u>30 days</u> after identification of the infection** ☐ Patient alive and still in hospital 30 days after identification of the infection ☐ Patient survived and discharged ☐ Patient survived and transferred ☐ Patient died

Once completed, please send it to PICNet at picnet@phsa.ca

Description and notes for Appendix D

1	Organism	Specify whether this is a CPO or C. auris case
2	Unique Identifier	Record the ID number assigned by PHL for the positive isolate that was associated with the infection. If the ID number has not been received for the isolates or there are any questions about ID, please contact PHL.
3	Patient's status	Check 'Inpatient' (hospitalized) if the patient was admitted to an acute care unit. Otherwise, check 'Other' and specify in written text the location where the sample was collected (e.g., Emergency Department, Hemodialysis or Oncology Clinic, etc)
4	Date of admission or visit (dd/mmm/yyyy).	Record the Day (e.g., 17), Month (e.g., Jul) and Year (e.g. 2014) in this order (e.g., 17-Jul-2014). Write out the month (e.g. Jan, Mar, Aug, etc.).
5	Name of the Facility	Specify the name of the facility where the patient was identified with infection
6	Date of CPO infection identification (dd/mmm/yyyy)	Record the date when the CPO infection was identified, based on collection date, and enter Day (e.g. 17), Month (e.g. Jul) and Year (e.g. 2014) in this order (e.g., 17-Jul-2014).
7	Site(s) of infection	Check the site(s) of infection – check **all** that apply or specify the site(s) of infection(s).
8	Was ICU admission required due to the infection or the complications associated with the infection within 30 days after identification of the infection?	Select **one** of the options that applies to the patient
9	Patient outcome within 30 days after identification of the infection	Select **one** of the options that apply to the patient at 30 days or at the time of discharge after the infection was identified.

Appendix E – Notification of Ongoing Carbapenemase-Producing Organisms (CPO) or *Candida auris* (*C. auris*) Transmission

Please complete this form for notification of ongoing CPO transmission/ C. auris case investigation in your facility or health authority and email to picnet@phsa.ca

A. Notification Information

Health Authority: _____ Facility Name: _____ Unit: _____

Contact Person: _____ Title: _____

Contact Phone: _____ Email: _____

Facility type: ☐ Acute Care Hospital ☐ Long-term Care Facility ☐ Other _____

Is this report: ☐ Notification of CPO or *C. auris* transmission investigation *(complete section B)*

☐ Notification of CPO or *C. auris* transmission investigation resolved *(complete section C)*

B. Investigation Notification

Organism: ☐ CPO ☐ *C. auris*

Date of the index case* identified (dd/mmm/yyyy): _____

Date investigation initiated (dd/mmm/yyyy): _____

If CPO, please specify:

Organism (Genus species): _____

CPO gene identified (e.g. NDM, KPC): _____

* The first case in the transmission. This date is based on collection date.

C. Transmission Investigation Resolved

Date investigation closed (dd/mmm/yyyy): _____

Notes:_____

_____

_____

_____

Reported by: _____ Date: _____

Once completed, please send to PICNet at picnet@phsa.ca

Appendix F – Letter to Ordering Provider in Response to CPO or *C. auris* Cases Identified in the Community

Date:

Dear *Health Care Provider (ordering provider),*

Re: *Patient Last name, First name; PHN; DOB*

Public Health has received laboratory notification that your patient tested positive for a carbapenemase-producing organism (CPO) ☐ or *Candida auris (C. auris)* ☐ - both emerging public health concerns. As per the Public Health Act and the Communicable Disease Regulation, physicians/administrators for laboratories that identify CPO or *C. auris* are required to report cases to their local medical health officer.

A provincial non-nominal surveillance program is in place to monitor the epidemiology (e.g. risk factors, laboratory data) of CPO and *C. auris* in BC. Each patient isolate is assigned a unique identifier for this purpose. The unique identifier for your patient is _____. Attached is a surveillance form. We ask that you complete this form to the best of your ability and return it by email to the Provincial Infection Control Network of BC at picnet@phsa.ca.

CPOs and *C. auris* both pose significant risk to vulnerable patients in health-care facilities. In the case of CPOs, these are multi-drug resistant gram negative bacteria for which antibiotics available to treat infections are very limited. *C. auris* is an emerging yeast, which is often resistant to at least one class of antifungals. Due to this risk, please request that your patient inform any health-care facility on admission and/or routine health-care encounters (such as hemodialysis, oncology clinics, BMT day care) that they have tested positive for CPO or *C. auris*. Infection Control measures will be put in place to decrease the likelihood of spreading these bacteria or yeast to other patients.

At this time, little is known about the carriage and clearance of CPO infections in the community after treatment. Follow-up testing of clearance is not recommended, as carriage may return after treatment with a carbapenem antibiotic. After treatment for *C. auris* infections, patients can remain colonized, perhaps indefinitely.

Interpretation of this laboratory result should be in context of the overall health of your patient. In the community, patients who test positive for a CPO or *C. auris* do not generally pose a risk to others. Patients should be advised to maintain good personal hygiene and avoid sharing personal items to prevent spread to others. Added precautions are NOT required in the community office setting.

Attached is a patient information sheet for your patient (CPO or *C. auris* Health file). Further information on CPO is available at BCCDC website. Further information on *C. auris* is available at PICNet website.

Appendix G - Enhanced Surveillance Form for Carbapenemase-Producing Organisms (CPO) OR *Candida auris (C. auris)* Identified in the Community

1	**Organism** ☐ CPO OR ☐ *C. auris* If a patient is colonized and/or infected with both CPO and C. *auris*, please fill out two separate forms for each organism
2	**Unique Identifier** – assigned by BCCDC Public Health Laboratory (PHL) _____
3	**Status** ☐ Infection ☐ Colonization ☐ Unknown
4	**Date of visit** (dd/mmm/yyyy) _____
5	**At what care setting was the patient identified with the organism identified in Question 1?** ☐ Outpatient clinic ☐ Emergency room ☐ Community health center/clinic ☐ Long-term care facility ☐ GP's office ☐ Other, *please specify* _____
6	**Did the patient travel outside of Canada within the past 12 months?** ☐ Yes*, please specify the name of the country* _____ ☐ Country not provided ☐ No. *Please skip Question 7.* ☐ Unknown. *Please skip to question 7.*
7	**If answered Yes to Question 6, did the patient have a health-care encounter outside of Canada within the past 12 months?** ☐ Yes*,* an overnight stay in a hospital or undergone medical/surgical procedure outside of Canada ☐ Yes, other health-care encounter, e.g., visited GP, walking clinic, dentist, ER, etc. ☐ No health-care encounter ☐ Unknown
8	**Did the patient have an overnight stay in a Canadian facility or undergo medical/surgical procedure in Canada (including BC) within the past 12 months?** ☐ Yes. *Please specify the name of the province (s)*_____ ☐ No. *Please skip to question 10.* ☐ Unknown. *Please skip to question 10.*
9	**If answered Yes to Question 8 and one of the provinces identified was BC, what types of health-care encounters has the patient had in BC in the past 12 months (excluding current admission)*? (Check all that apply)*** ☐ An acute care unit/facility admission ☐ No health-care encounter ☐ A long-term care facility admission ☐ Unknown ☐ A medical/surgical procedure in an outpatient setting
10	**Did the patient have contact *[minimum 12 hours]* with a known case or environmental sources for the organism identified in question 1 within the past 12 months?** *(Check all that apply)* ☐ Yes, within an acute care facility ☐ Yes, within a long-term care facility ☐ Yes, private household ☐ Yes, other *please specify* _____ ☐ No. *Please skip Question 10.* ☐ Unknown. *Please skip Question 10*
11	**If answered Yes to Question 9, what was the *nature* of the contact?** *(Check all that apply)* ☐ Roommate ☐ Person in the same unit/facility or house ☐ Health-care provider ☐ Friend/Relative

	☐ Environmental sources (e.g., contaminated sink or other surface, medical equipment, etc.) ☐ Other*, please specify* _____ ☐ Unknown
If the patient was infected, please answer the following questions	
12	**Site(s) of infection** (*Check all that apply*) ☐ Bloodstream ☐ Urinary tract ☐ Respiratory tract ☐ Wound ☐ Surgical site ☐ Other*, please specify* _____
13	**Was the patient admitted to a BC hospital due to the current infection identified in question 1?** ☐ Yes, the patient was admitted due to infection. *Specify the name of the facility* _____ ☐ No, the patient was admitted due to other medical conditions. ☐ No, the patient was not admitted ☐ Unknown

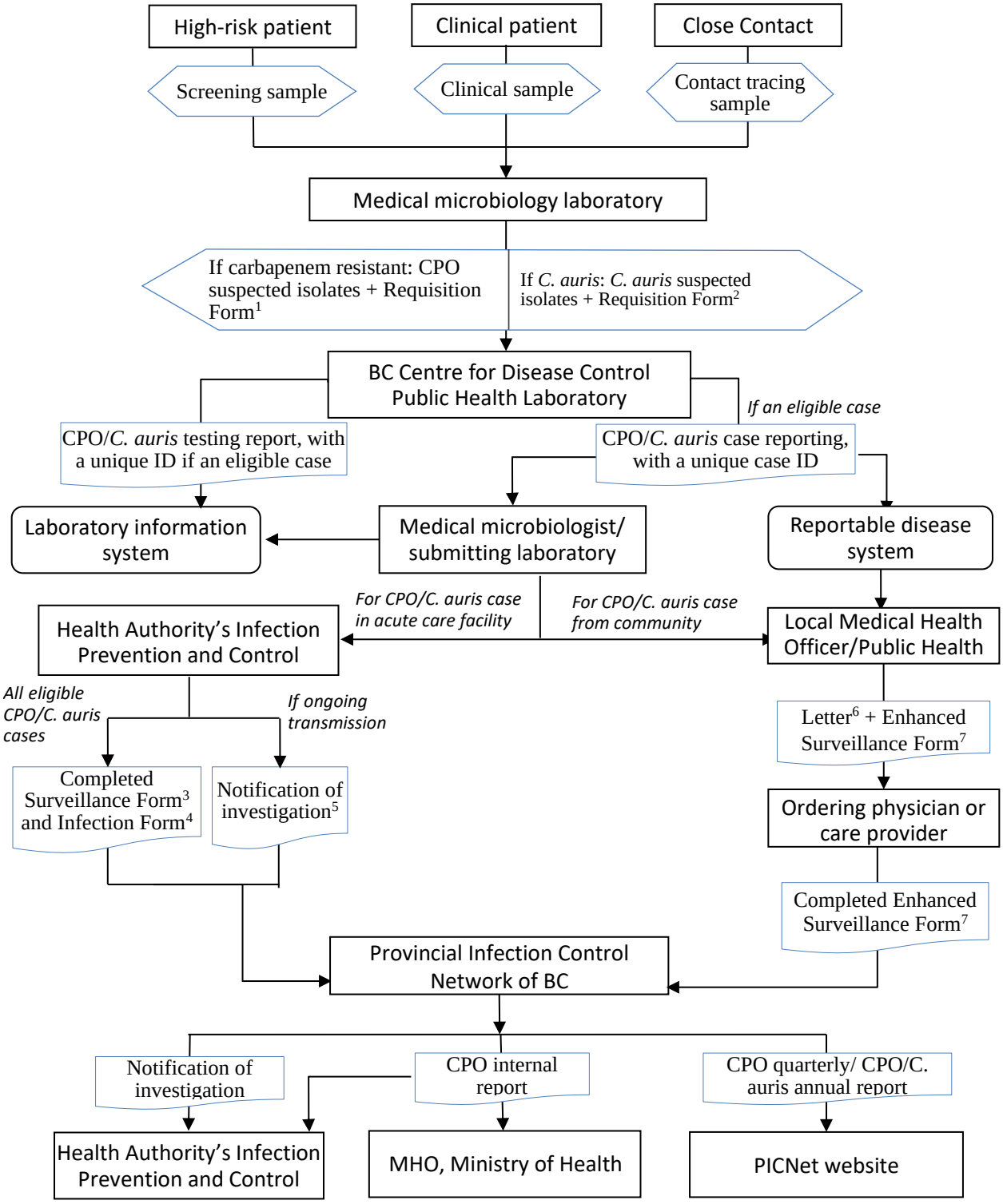
Once completed, please send by email to picnet@phsa.ca

Description and notes for Appendix G

1	Organism	Specify whether this is a CPO or C. auris case
2	Unique Identifier	The unique ID for the CPO or *C. auris* case assigned by PHL is provided in the letter from medical health officer. If the ID number has not been included or there are any questions about ID, please contact the PHL.
3	Status	Specify the patient's status in terms of infection, colonization or unknown according to the following definitions: **Infection** is defined as a patient with evidence of clinical signs and symptoms resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s) in addition to a positive culture of CPO/C. auris. Clinical evidence may be derived from direct observation of the infection site (e.g., a wound), or review of information in the patient chart or other clinical records, or a physician or surgeon diagnosis of infection. Please refer to the 2023 "CDC/NHSN Surveillance Definitions for Specific Type of Infections" for definitions and criteria of all specific types of infections (http://www.cdc.gov/nhsn/PDFs/pscManual/17pscNosInfDef_current.pdf). **Colonization** is the presence of CPO on skin, on mucous membranes, in open wounds, or in excretions or secretions but are not causing adverse clinical signs or symptoms. **Unknown** if there is no or insufficient information to define whether the patient's CPO status represents an infection or colonization.
4	Date of visit (dd/mmm/yyyy).	Record the Day (e.g., 17), Month (e.g., Jul) and Year (e.g. 2014) in this order (e.g., 17-Jul-2014). Write out the month (e.g. Jan, Mar, Aug, etc.).
5	At what care setting was the patient identified with the organism identified in Question 1?	Check one that applies
6	Did the patient travel outside of Canada within the past 12 months?	If the patient has stayed outside Canada for overnight or longer within the past 12 months, select **Yes** and specify which country the patient travelled to.
7	If answered Yes to Question 6, did the patient have a health-care encounter outside of Canada within the past 12 months?	Select **one** that applies based on the information available
8	Did the patient have an overnight stay in a Canadian facility or undergo medical/surgical procedure in Canada (including BC) within the past 12 months?	Select **Yes** if the patient an overnight stay in a Canadian facility or underwent a medical/surgical procedure in Canada (including BC) within the past 12 months. Specify which province the patient had the health encounter. If the patient had a health encounter in multiple provinces, write the provinces name in the blank.
9	If answered Yes to Question 8, what types of health-care encounters has the patient had in BC in the past 12 months (excluding current admission)*? (Check all that apply)*	Check **all** that apply based on the patient's health-care encounter history

10	Did the patient have contact [minimum 12 hours] with a known case or environmental sources for the organism identified in question 1 within the past 12 months? (Check all that apply)	Check **all** that apply based on the patient's contact with a known CPO or *C. auris* case
11	If answered Yes to Question 10, what was the nature of the contact?	Check **all** that apply based on the nature of the contact
12	Site(s) of infection	Check the site(s) of infection – check all that apply or specify the site(s) of infection(s).
13	Was the patient admitted to a BC hospital due to current infection?	Select **Yes** the patient admitted to a hospital due to current infection. Select **No** if the patient admitted to a hospital due to other medical conditions, or the patient was not admitted.

Appendix H – Process Flowchart for Carbapenemase-Producing Organisms (CPO) and *Candida auris* (*C. auris*) Surveillance



* includes CPO cases identified in community clinics, outpatient clinics, emergency rooms, and long-term care facilities

1. Requisition Form for CPO Testing (Appendix B); 2. *Bacteriology and Mycology Isolates Submitted for Identification Requisition*; 3. Surveillance Form for CPO/*C. auris* (Appendix C); 4. Addendum Form for CPO/*C. auris* Infection (Appendix D); 5. Notification Form of CPO/*C. auris* Transmission (Appendix E); 6. Sample Letter to Ordering Provider (Appendix F); 7. Enhanced Surveillance Form for CPO/*C. auris* (Appendix G)

Contact information

For questions regarding CPO and *C. auris* prevention and control, please visit PICNet's website (www.picnet.ca) for general information, or contact with IPC in your HA.

Fillable forms for Appendix B, C, D, E, F, and G are available on the PICNet website (https://www.picnet.ca/surveillance/cpo/cpo-surveillance/)

For questions regarding CPO or *C. auris* confirmatory tests, please contact

Dr. Linda Hoang
Medical Director/Medical Microbiologist,
BCCDC Public Health Laboratory
655 West 12th Avenue, Vancouver, BC, V5Z 4R4
Phone: (604) 707-2618
Email: Linda.Hoang@bccdc.ca

For questions regarding the protocol, please contact

Provincial Infection Control Network of BC (PICNet)
Suite #504, 1001 W Broadway, Vancouver, BC, V6H 4B1
Phone: (604) 875-4844
E-mail: picnet@phsa.ca