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HEALTH ADVISORY: New Oregon State Public Health Lab (OSPHL) Measles Testing Procedure

July 25, 2024

Dear Colleagues,

We hope this message finds you well. Benton County is sharing the Oregon Health Authority (OHA) New Oregon State Public Health Lab (OSPHL) Measles Testing Procedure.

OHA reported a confirmed measles case on June 14, 2024. Since measles is currently circulating in Oregon, **OSPHL will conduct PCR testing of suspected measles cases without prior public health approval.** As of July 25, 2024, there are no confirmed measles cases in Benton County.

Please report suspected measles cases associated with Benton County residents **immediately** to Benton County Communicable Diseases Program at: **541-766-6654.**

OHA encourages clinicians to submit appropriate specimens directly to OSPHL if **both** of the following criteria are met: **1) Rash illness compatible with measles and with no other explanation for the clinical presentation; AND 2) The patient is unvaccinated or under-vaccinated for measles (i.e., fewer than 2 doses of measles-containing vaccine).**

All specimens sent to OSPHL must meet the specimen collection and submission criteria outlined in the OSPHL Measles Testing Guidance (pdf).

Collect ALL the following specimens, when possible, **listed in order of preference**: **1) Nasopharyngeal (NP) swab for measles PCR.** This is the preferred test for diagnosis given high sensitivity and reliability early in disease: NP swab should be collected 0–5 days after rash onset; after 5 days, NP swab should be accompanied by urine. Throat swab is also acceptable. **2) Urine for measles PCR:** Urine PCR test is most sensitive 3–10 days after rash onset. **3) Serum for measles IgM and IgG testing:** Measles-specific IgM antibody is the test for acute disease, but it may not be present until ≥3 days after rash onset but typically persists for about 30 days after rash onset. A positive IgG early in illness may suggest prior immunity.

The complete OHA Health Alert Network (HAN) message is referenced below. The Measles Investigative Guidelines and OSPHL Measles Testing Guidance are attached to this message. We appreciate your diligence in protecting the health of our collective communities.

Respectfully,

Carolina Amador, MD, MPH
Public Health Officer

April Holland
Public Health Administrator

State of Oregon
Health Alert Network

Colleagues,

Measles was confirmed in an Oregon patient on June 14th, and transmission is ongoing. While measles is circulating in Oregon, the Oregon State Public Health Lab (OSPHL) will conduct PCR testing of specimens from suspected measles cases without prior public health approval. Clinicians are encouraged to submit appropriate specimens directly to OSPHL if both of the following criteria are met:

1. Rash illness compatible with measles and with no other explanation for the clinical presentation;

AND

2. The patient is unvaccinated or under-vaccinated for measles (i.e., fewer than 2 doses of measles-containing vaccine).

All specimens sent to OSPHL must meet the specimen collection and submission criteria outlined in the OSPHL Measles Testing Guidance (pdf). Please adhere to the specified measles infection control practices throughout the patient evaluation to prevent exposures in other patients. Collect ALL of the following specimens when possible, listed in order of preference:

1. Nasopharyngeal (NP) swab for measles PCR. This is the preferred test for diagnosis given high sensitivity and reliability early in disease:
    NP swab should be collected 0–5 days after rash onset; after 5 days, NP swab should be accompanied by urine. Throat swab is also acceptable.

2. Urine for measles PCR:
    Urine PCR test is most sensitive 3–10 days after rash onset.

3. Serum for measles IgM and IgG testing:
    Measles-specific IgM antibody is the test for acute disease, but it may not be present until ≥3 days after rash onset but typically persists for about 30 days after rash onset.
    A positive IgG early in illness may suggest prior immunity.

Attached are new policy outlines, including instructions regarding type and timing of specimen collection, the updated testing algorithm, and the Oregon Health Authority (OHA) revised Measles Investigative Guidelines.

Timely laboratory confirmation of measles is critical to tracking the spread and prioritizing prevention efforts. Clinicians, please promptly report the following information for suspect cases to the local public health authority (LPHA; see www.healthoregon.org/lhddirectory): patient name, date of birth, address, contact information, language spoken, clinical presentation, date of rash onset, travel history, any known exposures to measles, and vaccination history. LPHAs should report all suspect cases to the ACDP on-call epidemiologist at 971-673-1111.

Measles

Investigative Guidelines

July 2024

1. DISEASE REPORTING

1.1 Purpose of Reporting and Surveillance

1. To identify measles cases.
2. To prevent the spread of measles.
3. To identify groups of unimmunized children and adults.

1.2 Laboratory and Physician Reporting Requirements

Physicians are required to report all cases (including suspected cases) immediately. Labs are required to report all measles-specific positive tests (e.g., IgM, virus isolation, PCR) immediately, day or night.

1.3 Local Health Department Reporting and Follow-Up Responsibilities

1. Report all confirmed and presumptive cases (see definitions below) to the Acute and Communicable Disease Prevention Program immediately, day or night. Call 971-673-1111 to reach the state epidemiologist on call. Then, the state epidemiologist should notify CDC Emergency Operations, immediately, day or night.
2. Begin follow-up investigation within 24 hours. Submit all case data electronically within 7 days of initial report. If measles is suspected, facilitate collection and transport of specimens immediately to Oregon State Public Health Laboratories (OSPHL). Collect data that must accompany all specimens sent to OSPHL (see §3.4).
3. Initiate special control measures within 24 hours of initial report (see §5)
   - Identify contacts of the case during the period of communicability.
   - Alert physicians, hospital emergency departments, and infection prevention programs for all healthcare facilities visited by the case during the period of communicability.
   - Alert physicians, hospital emergency departments, and infection prevention programs for all healthcare facilities visited by the case, and local officials of the potential for additional cases; encourage them to consider measles in patients presenting with a rash illness. Make special arrangements for patient flow to minimize transmission between potential cases and susceptibles. Advise healthcare workers to immediately report any suspected case. For more information on isolation precautions see §6.2.
   - Set up special clinics as needed to immunize susceptible persons.

- If indicated, prepare and distribute a press release in conjunction with the Immunization Program staff.
- Identify and exclude susceptibles (i.e., unimmunized children and staff) when measles has been identified in a school or daycare facility (see §§5 and 6). For more information on susceptibles in a medical setting see §6.2.

2. THE DISEASE AND ITS EPIDEMIOLOGY

2.1 Etiologic Agent

The measles virus — a single-stranded, RNA-encoded paramyxovirus.

2.2 Description of Illness

Measles is characterized by a generalized maculopapular rash, fever, and one or more of the following: cough, coryza, conjunctivitis, or Koplik spots. There are three stages of illness:

1. Prodrome

Measles has a distinct prodromal stage that begins with a mild to moderate fever and malaise. Usually within 24 hours there is an onset of conjunctivitis, photophobia, coryza (sneezing, nasal congestion, and nasal discharge), an increasingly severe cough, swollen lymph nodes (occipital, postauricular and cervical at the angle of the jaw), and Koplik spots (seen only for a day or two before and after onset of rash). These spots are seen as bluish-white specks on a rose-red background appearing on the buccal and labial mucosa usually opposite the molars.

2. Rash

The rash begins with flat, faint eruptions of upper lateral parts of the neck, behind the ears, along the hairline and on the posterior parts of the cheeks. The rash may appear from 1–7 days after the onset of the prodromal symptoms, but usually appears within 3–4 days. Individual lesions become more raised as the rash rapidly spreads over the entire face, neck, upper arms and chest. In severe cases, the lesions may become confluent. In mild cases, the rash may be macular and more nearly pinpoint, resembling that of scarlet fever.

3. Fever

Fever is mild to moderate early in the prodrome and goes up when the rash appears. Temperatures may exceed 40°C (104°F), and usually fall 2–3 days after rash onset. High fever persisting beyond the third day of the rash suggests that a complication (e.g., otitis media) may have occurred.

2.3 Reservoirs

Other acutely infected humans.

2.4 Modes of Transmission

Virus is spread directly from person to person by inhalation of suspended droplet nuclei or by contact with infective nasopharyngeal secretions. It can also be transmitted indirectly by objects (fomites) contaminated with nasopharyngeal secretions. Measles virus is labile. Half the infectivity is lost every 2 hr. at 37 C, so it depends on the initial number of viral particles in the droplet. It does not survive drying on a surface, so it has a short survival time on contaminated fomites. It is effectively spread as an aerosol. The virus survives drying in microdroplets in the air relatively well, as opposed to drying on a flat surface. Measles is one of the most contagious of all infectious diseases, with >90% attack rates among susceptible close contacts.

2.5 Incubation Period

The average incubation period for measles is 11–12 days, and the average interval between exposure and rash onset is 14 days, with a range of 7–21 days. The administration of IG early in the incubation period may extend this period to 28 days.

2.6 Period of Communicability

Persons infected with measles are infectious 4 days before rash onset through 4 days after rash onset. Immunosuppressed persons might have a longer period of communicability.

2.7 Treatment

No specific treatment.

3. CASE DEFINITIONS, DIAGNOSIS, AND LABORATORY SERVICES

3.1 Confirmed Case Definitions

Absent measles immunization or receipt of antibody-containing blood products within the previous 45 days[1]:

- Isolation of measles virus

or

- Detection of virus by PCR of >4-fold rise in IgG antibody titer with compatible illness, defined as:
  - acute onset generalized maculopapular rash and
  - fever and
  - cough, coryza, or conjunctivitis.

or

- Positive IgM serology with compatible illness, defined as:
  - acute onset generalized maculopapular rash lasting ≥3 days and

[1] Note that up to 10% of vaccinated individuals may remain IgM-positive even 3 months post vaccination. This caveat does not apply to case contacts who receive MMR prophylactically in the first 72 hours of exposure.

- temperature ≥38.3˚C (101°F) and
- cough, coryza, or conjunctivitis.

3.2 Presumptive Case Definition

A person who is epi-linked to a confirmed case and who has all the following:

- acute onset generalized maculopapular rash lasting ≥3 days and
- temperature ≥38.3˚C (101°F) and
- cough, coryza, or conjunctivitis.

3.3 Suspected (Clinical Diagnosis)

Any person with a generalized rash and fever of unknown etiology.

Note: When a patient with suspected measles has been vaccinated 6–45 days prior to blood collection, neither IgM nor IgG antibody responses can distinguish measles disease from the response to vaccination. Determination of the measles genotype is necessary when measles symptoms occur following an exposure to wild-type virus and MMR vaccine was subsequently provided as postexposure prophylaxis.

In the absence of strain typing to confirm wild-type infection, cases in persons with measles-like illness who received measles vaccine 6–45 days before onset of rash should be classified as confirmed cases if and only if a) they meet the clinical case definition and b) they are epidemiologically linked to a laboratory-confirmed case.

3.4 Services Available at the Oregon State Public Health Laboratory (OSPHL)

OSPHL performs RT-PCR for suspect cases of measles and refers specimens to the Washington State Public Health Laboratory (WSPHL) for any requested measles-specific IgM and IgG antibody testing (see testing algorithm on page 17).

All specimens submitted for measles testing must be coordinated with and approved by ACDP. For the ongoing 2024 measles outbreak, criteria have been temporarily modified. The updated guidance is available at: https://www.oregon.gov/oha/PH/LABORATORYSERVICES/COMMUNICABLEDISEASETESTING/Documents/measles.pdf

Whom to Test

Measles is rare in the United States, and even with the excellent laboratory tests available, false-positive results will occur. To minimize false-positive laboratory results, it is important to restrict testing to those patients most likely to have measles (i.e., those who have clinical symptoms compatible with disease, especially if they have risk factors for measles, such as being unvaccinated, recent history of travel abroad, no alternate explanation for symptoms) or to those with fever and generalized maculopapular rash with strong suspicion of measles. Individuals vaccinated in the previous 45 days that do not have documented or plausible contacts with measles cases and

without recent history of travel abroad, should not be tested at the public health lab and are presumed to be vaccine-associated cases.

Specimen Collection

If measles is considered a real possibility:

- Please contact ACDP epidemiologists for approval to test specimens. ACDP will notify OSPHL of approval.
- After the request has been approved, please refer to the OSPHL Lab Test Menu for all specific instructions to properly collect, store, and transport specimens, available at: www.healthoregon.org/labtests.
- Collect the following required information: submitter, method of transport, expected specimen arrival date, tracking number, patient initials, DOB, rash onset date, specimen collection date, specimen type(s), and test(s) requested.
- Collect specimens as soon as possible after rash onset. Collect serum for IgM and IgG testing, AND nasopharyngeal or throat swab specimens for RT-PCR. Respiratory specimens are strongly preferred. Urine is acceptable as a last resort but not preferred.

The laboratory diagnosis of measles is most often made by detection of measles RNA by RT-PCR. A negative PCR does not rule out measles because this method is affected by the timing of specimen collection and the quality and handling of the clinical specimens. RNA detection is more likely to be successful when samples are collected on the first day of rash through 3 days following onset of rash; however, it is possible to detect virus up to day 10 following rash onset.

The diagnosis can also be made by detection of measles IgM antibody in a single serum specimen. In most instances, a serum sample should be collected for measles IgM at the first clinical encounter. However, 30% of serum samples obtained in the first 72 hours after measles rash onset give false-negative results. Negative results from serum collected in the first 72 hours after rash onset should be confirmed with a second serum obtained 72 hours or longer after rash onset. IgM is detectable for at least 30 days after rash onset and frequently longer.

Often there is a blunted transient production of IgM and therefore a negative IgM test in vaccinated persons suspected of having measles should not be used to rule out the case; RT-PCR testing may be the best method to confirm such cases. If viral testing results are noncontributory, additional testing can be performed at CDC for highly suspicious cases (e.g., plaque reduction neutralization assay and avidity of IgG). Prior approval should be obtained from the CDC measles laboratory. Please consult with ACDP.

False-positive IgM results for measles may be due to the presence of rheumatoid factor in serum specimens. Serum specimens from patients with

other rash illness, such as parvovirus B19, rubella, roseola and dengue have been observed to result in false-positive reactions in some IgM tests for measles. In these situations, confirmatory tests may be done at the CDC. Because tests for IgG require two specimens, and because a confirmed diagnosis cannot be made until the second specimen is obtained, IgM tests are generally preferred. However, if the IgM tests remain inconclusive, a second (convalescent) serum specimen, collected 14–30 days after the first (acute) specimen, can be used to test for an increase in the IgG titer.

Among persons with a recent MMR vaccination, determination of the measles genotype is necessary to distinguish between wild-type virus infection and a rash caused from measles vaccination. In addition, this information is important for molecular epidemiologic surveillance to identify the genotypes associated with imported cases of measles.

4. ROUTINE CASE INVESTIGATION

4.1 Identify the Source of Infection

Efforts should be made to identify the source of infection for every confirmed case of measles. Cases or their caregivers should be asked about contact with other known cases. When no history of contact with a known case can be found, opportunities for exposure to unknown cases should be sought. Such exposures may occur in schools, during air travel, through other contact with recent travelers or foreign visitors, while visiting tourist locations (casinos, resorts, theme parks), in health care settings, or in churches. Unless a history of exposure to a known case within 7–21 days prior to onset of rash in the case is confirmed, cases or their caregivers should be closely queried about all these possibilities.

Ask about:

- Names, addresses and phone numbers of any householder, playmate or other contact who was sick or had a rash;
- Any indoor group activity attended (e.g., churches, theaters, tourist locations, air travel, parties, athletic events, family gatherings, and the like);
- Any visit to a doctor’s office, clinic, or hospital (find out exact time and date);
- Any healthcare employment;
- Attendance or work at a school, daycare, college, prison, etc.;
- Any travel outside of Oregon; and,
- Any visitors from outside the U.S.

4.2 Identify Potentially Exposed Persons (Contacts)

Identify persons who may have been exposed to the case during the period from 4 days before through 4 days after onset of rash.

Measles is spread by the airborne route and is potentially transmissible after only brief exposure and at distances as great as 30 meters. The virus can remain airborne for up to 2 hours. That said, the fact is that transmission of measles in

the United States is now the exception, rather than the rule, because of high levels of vaccine-induced immunity in the population. Therefore, an attempt to identify and interview every person who was within 30 meters of a case at any time during the case's 8-day period of potential contagion could represent an enormous amount of work for minimal public-health benefit.

There is no accepted, data-based definition of measles "exposure" that demands public-health follow-up. For practical reasons during a case investigation, some lines must nonetheless be drawn. In typical circumstances, "exposure" may be defined as

- any period of time spent indoors
- within 10 meters of a case's location
- within 20 minutes of the case's having been there.

These are operational guidelines only, and a more aggressive definition may be called for in some circumstances — e.g., a case who is coughing vigorously, a case in an under-immunized population or in a school with high exemption rates. Conversely, cases are less contagious after the rash appears — which is when most of them seek medical attention — lessening the risk of transmission in healthcare settings. In a hospital setting, the hospital's Infection Prevention Program might choose to use a broader time interval to define measles "exposure."

Of those exposed, determine which have no evidence of immunity (as in §4.3) and implement appropriate prevention measures (§5.4).

4.3 Determine Measles Immune Status of Exposed Contacts

Nothing is foolproof, but any of the following are considered acceptable evidence of immunity:

- Birth before 1957 (but see §6.2)
- Laboratory-confirmed disease
- Laboratory evidence of immunity (protective antibody titers); or
- Documentation of vaccination as follows:
    - Pre-school children: 1 dose
    - Children in grades K–12: 2 doses
    - Women of childbearing age: 1 dose
    - Healthcare personnel born during or after 1957: 2 doses
    - Students at post-high-school educational institutions: 2 doses
    - International travelers ≥12 months of age: 2 doses
    - Children 6–11 months who plan to travel internationally: 1 dose[2]
    - All other adults: 1 dose

Only doses with written documentation of the date of administration are considered valid; self-reported doses should not be counted. The vaccination

[2] A child receiving a measles-containing vaccine dose at this age should still receive the standard 2-dose MMR vaccine series starting at age 12 months. This child would receive a total of 3 MMR doses.

status of persons for whom vaccination is not documented should be classified as “unknown.” Persons are categorized as “unvaccinated” if they report that they had no history of being vaccinated; if available, immunization records should be checked to verify lack of vaccine receipt.

4.4 Environmental Evaluation

None.

5. CONTROLLING FURTHER SPREAD

5.1 General Comments

An outbreak is defined as three or more cases linked by time and place. However, outbreaks are now rare in Oregon where two doses of measles vaccination have been required since 1998. In 2018 about 96% of K–12 kids had received two doses. Such high vaccination rates have interrupted the endemic transmission of measles in the United States. As long as vaccination rates remain high, aggressive measures are not needed to control measles. In addition, consider asking the reporting provider questions like “might the rash be due to antibiotics? Have you tested for other viruses?”

5.2 Education

Case should be isolated for four days post rash onset. Instruct contacts or parents to look for signs and symptoms of measles 7–21 days after the first day of contact with the ill person during the communicable period. If suggestive symptoms develop, they must call the local health department ASAP. It is important to avoid exposing people who may coincidentally be present at a healthcare facility or doctor’s office. Persons with possible measles should call ahead first to alert staff at such facilities so that special arrangements can be made to prevent contact with other patients or employees, pending an evaluation. Ideally, for individuals for whom measles is a distinct possibility, the LHD will facilitate a plan for entry into the evaluating health care facility in a way that minimizes the likelihood of exposing others.

5.3 Isolation of Cases

Keep hospitalized patients under airborne precautions for 4 days after rash onset. Exclude cases with confirmed and presumptive measles from daycare, school or work as long as they could be contagious (ORS 433.255; OAR 333-019-00100. Advise cases to stay home and avoid contact with others.

5.4 Prioritization of Contacts

During investigation, postexposure prophylaxis of household contacts without presumptive evidence of immunity should not be delayed pending the return of laboratory results. Other high-priority groups for contact investigation are 1) close contacts other than household (e.g., persons who shared the same room or airspace in various settings), 2) persons exposed in health care settings because of the risk of transmission to persons at high risk of serious

complications, and 3) persons exposed in schools, child-care centers, colleges, churches, or other close settings where a defined number of persons have congregated because of high contact rates and transmission potential. In particular, one should identify individuals at high risk for severe disease, including infants who are not vaccinated, immunocompromised individuals, and pregnant women. Detailed instructions for contact management following suspected exposure to measles are available at: https://bit.ly/2019-measles-exposure-algorithm).

Exposed persons who cannot readily document presumptive evidence of measles immunity should be offered postexposure prophylaxis or excluded from the setting (school, hospital, day care). For assessment of presumptive evidence of immunity of contacts, only doses of vaccine with written documentation of the date of receipt should be accepted as valid; purported doses without written documentation should not be counted.

Persons who have been exempted from measles vaccination for medical, religious, or other reasons and who do not receive appropriate postexposure prophylaxis within the appropriate time should be excluded from affected institutions in the outbreak area until 21 days after the onset of rash in the last case of measles. Persons excluded from school or work should be advised to call ahead before visiting all healthcare facilities (including outpatient clinics, urgent care, and emergency departments), to ensure appropriate precautions are in place prior to patient arrival. These arrangements will minimize potential exposure of healthcare workers, patients, and visitors. Close collaboration with healthcare infection preventionists is recommended.

If resources are constrained, other exposure settings will more commonly be lower priority for investigation, though public health decisions should be guided by the epidemiologic findings. For exposures in venues like restaurants, stadiums, and malls, communicating with the general public through radio, TV, or other media (rather than through individual contact tracing) may be used to reach potentially exposed persons.

5.5 Protection of Contacts

Active Immunization with Measles Vaccine

There are few data regarding the effectiveness of MMR vaccine and immunoglobulin (IG) post-exposure prophylaxis against disease prevention. The MMR vaccine, if administered within 72 hours, may provide some protection or modify the clinical course of disease. Vaccine-induced immunity to measles varies from person to person, but usually develops by 14 days. A second dose of MMR, given at least 28 days after the first dose, is recommended for all eligible persons born during or after 1957 who have been close contacts of a confirmed measles case. Contraindications include: pregnancy; anaphylactic allergy to neomycin or gelatin; untreated active TB; or compromised immunity. HIV infection is no longer an “automatic” contraindication; thus, active immunization of HIV-infected persons should be

considered in consultation with the person's infectious disease physician and should be determined on a case by case basis**.** Susceptible contacts who received high-dose IG for measles prophylaxis should be immunized against measles. Vaccination should occur 6 months following the administration of IGIM (immune globulin intramuscular) for standard contacts. For immunocompromised persons, vaccination should occur 8 months after IVIG (intravenous immunoglobulin) if the vaccine is no longer contraindicated.

Passive Immunization with Immune Globulin

Individuals who are at risk for severe disease and complications from measles (e.g., infants <12 months of age, pregnant women without evidence of measles immunity, and severely immunocompromised persons regardless of vaccination status because they might not be protected by the vaccine) should receive IG.

IG can be given to other persons who do not have evidence of measles immunity, but priority should be given to persons exposed in settings with intense, prolonged, close contact (e.g., household, daycare, classroom).

Patients should be warned that IG may only modify measles infection and may increase the incubation period to 28 days. IG should never be used as an outbreak control measure. To be effective, IG must be administered ASAP but not more than 6 days after exposure.

Recommended dosages and routes of administration of IG for measles post-exposure prophylaxis are as follows:

- Infants <12 months of age: 0.5 mL/kg of body weight, given *intramuscularly* (maximum dose = 15 mL). For infants aged 6–11 months, MMR vaccine is an acceptable alternative to IG, if given within 72 hours of exposure.
- Pregnant women without evidence of measles immunity: 400 mg/kg of body weight, given *intravenously*.
- Severely immunocompromised persons, irrespective of evidence of measles immunity: 400 mg/kg of body weight, given *intravenously*.
- IG (0.5 mL/kg of body weight; maximum dose = 15 mL) can be given *intramuscularly* to other persons who lack evidence of measles immunity, but priority should be given to persons exposed in settings with intense, prolonged, close contact (e.g., household, child care, classroom, etc.). However, postexposure use of intramuscular IG might be limited because of the required volume; persons who weigh >30 kg will receive less than the recommended dose.

Severely immunocompromised patients include patients with severe primary immunodeficiency; patients who have received a bone marrow or stem cell transplant until at least 12 months after finishing all immunosuppressive treatment, or longer where the patient has developed graft-versus-host disease; patients on treatment for ALL within and until at least six months after completion of immunosuppressive chemotherapy; and patients with a diagnosis of AIDS or

HIV-infected persons with CD4 percent <15% (all ages) or CD4 <200 lymphocytes /mm3 (age >5 years) and those who have not received MMR vaccine since receiving effective ART; some experts would include HIV-infected persons who lack recent confirmation of immunologic status or measles immunity.

The recommended interval before measles- or varicella-containing vaccine administration is available at: https://public.health.oregon.gov/PreventionWellness/VaccinesImmunization/ImmunizationProviderResources/Documents/SOMMR-MMRV.pdf

5.6 Contact Follow up

Quarantine

Broad, mandatory quarantine is not generally indicated to control measles outbreaks. However, targeted (most commonly voluntary) quarantine may be implemented, especially where unvaccinated or populations at risk are affected. In such situations, susceptible persons who have been exposed to measles should be advised to stay home during days 5–21 after exposure. Under special circumstances, such as during outbreaks in schools attended by large numbers of persons who refuse vaccination, restriction of an event or other quarantine measures might be warranted (see §6).

5.7 Activation of Person Under Monitoring (PUM) Approach

If the event that a local measles case is identified and exposures (defined loosely above) occurred, a Person Under Monitoring (PUM) approach may be used, where asymptomatic persons with exposure to a measles case and without evidence of immunity to measles, are actively monitored by LHD staff for 21 days following exposure (28 days if IG was administered). Active monitoring involves frequent (at least 3 times/week) reporting of temperature and symptoms to public health staff without visual contact. Direct active monitoring with visual contact is not typically necessary in measles investigations. The use of the PUM approach ensures ongoing follow-up with public health staff, allows for immediate scale-up of response steps should symptoms begin, and facilitates safe entry to health care settings when medical care is needed.

6. MANAGING SPECIAL SITUATIONS

6.1 Case among Employees or Attendees at School/Daycare Facility

1. Establish symptom watch for all identified school or daycare contacts, requesting a call to the local health department for any prodromal signs, symptoms, or rash illnesses compatible with measles occurring within 21 days from the last date of attendance by any measles case. Offer vaccine for those who are not up to date with age-appropriate vaccination (first dose to unvaccinated, second dose to those with one documented dose can be given at least 28 days after the first dose). Active surveillance, with periodic check-ins, is recommended for susceptible contacts and those who received post-exposure prophylaxis because of the measles exposure.

2. Encourage those with suspected infections to stay home while symptomatic so as not to expose susceptibles. To prevent healthcare-associated transmission, parents should call their children's healthcare provider about the possibility of measles prior to arriving to the clinic, urgent care, or emergency department. Parents should also be instructed to immediately notify the local health department if symptoms develop. The LHD should facilitate special arrangements with the healthcare facility, to minimize potential exposure of healthcare workers, patients, and visitors. Upon arrival to the facility, suspected patients should be met outside the building and masked before entering (surgical or procedure mask). Ideally, the medical evaluation should be scheduled for the end of the day to further minimize exposures. Close collaboration with healthcare infection preventionists is recommended. Airborne precautions include isolation in a negative air pressure isolation room, also known as airborne infection isolation (AII) or airborne infection isolation room (AIIR). *In clinic settings where a negative air pressure isolation room may not be available, a single room with the door closed and away from susceptible contacts may be used when evaluating persons in whom measles is suspected.* The door should be kept closed as much as possible. After the patient leaves, that exam room should not be used, with the door kept closed for 2 hours after the patient leaves. Suggest that the clinic places a "do not enter" sign on the door with the time that the patient exited.
3. Exclude all unimmunized children and staff without evidence of natural immunity (including susceptible siblings of a case attending other schools). Susceptible children and staff attending school (including susceptible siblings of a case attending other schools) at the time the case was communicable should be excluded for 21 days after the last date of attendance of the last measles case. However, these individuals should be monitored for signs and symptoms of measles, and age-appropriate vaccination should be encouraged. At the health officer's discretion, these persons can be readmitted once vaccinated.

   Except in health care settings, unvaccinated persons who receive their first dose of MMR vaccine within 72 hours postexposure may return to childcare, school, or work. Persons who have been exempted from measles vaccination for medical, religious, or other reasons and who do not receive MMR within 72 hours should be excluded from affected institutions in the outbreak area until 21 days after the onset of rash in the last case of measles.

6.2 Case in a Medical Setting

Control efforts in medical settings should focus on reviewing existing immunization policies, employee immunization records, and patient isolation practices.

Healthcare workers (volunteers, trainees, nurses, physicians, technicians, receptionists and other clinical support staff) should be immunized before exposure. Documentation of immunity should be easily and readily available.

When a person suspected of measles visits a healthcare facility, airborne isolation precautions should be followed stringently. The patient should wear a mask (procedure or surgical mask) until isolated in a negative air pressure isolation room, also known as airborne infection isolation (AII) or airborne infection isolation room (AIIR). If an AIIR is not available, the patient should be placed in a private room with the door closed and be asked to wear a surgical or procedure mask. Only staff with presumptive evidence of immunity should enter the room of a person with suspect or confirmed measles. Ideally, for individuals for whom measles is a distinct possibility, the LHD will facilitate a plan for entry into the evaluating health care facility in a way that minimizes the likelihood of exposing others.

If a case with measles in any stage of communicability was treated at a healthcare facility, identify potentially exposed healthcare workers (see §4.2 above) and assess their documented immune status to confirm that they are immune. In an abundance of caution, all susceptible healthcare personnel who have been exposed to measles should be relieved from all patient care, and excluded from the facility from the 5th to the 21st day after exposure, regardless of whether they have received vaccine or immune globulin after the exposure. Personnel who become ill should be relieved from all patient care and excluded from the facility until 4 days after the rash appears. This includes any ill physicians. The desirability of a priori immunity is obvious. If immune globulin is administered to an exposed person, observations should continue for signs and symptoms of measles for 28 days after exposure since immune globulin may prolong the incubation period.

Case-patient contacts should likewise have their immune status assessed and be given vaccine if they are not immune; school and work restrictions for exposed, susceptible contacts apply. Obtain a line list of patients exposed from the infection control nurses at the hospital. This line list should include all necessary information to be able to contact such patients, including – name, DOB, address, phone #s, etc.

When calling exposed patients, inquire about any visitors who may have visited these patients during their stay in the hospital and who, consequently, were also exposed.

During an outbreak of measles, healthcare facilities serving the outbreak area should recommend 2 doses of MMR vaccine for unvaccinated personnel, including those born before 1957 who lack laboratory evidence of measles immunity or laboratory confirmation of disease.

We occasionally get questions about potential risk to persons in distant locations, but which share an air supply – e.g., via ventilation ducts. Priority in contact tracing and management should first be given to immediate close contacts of ill patients or healthcare workers. Subsequently, contact identification may proceed at the discretion of the facility's infection preventionists for those who may have been exposed via the air flow in other areas of the hospital, if the nature of the HVAC system suggests true potential for exposure.

6.3 Case on an Aircraft

Although measles transmission has been documented during air travel, it is uncommon; a CDC study found 9 secondary cases of measles among 3,399 passengers potentially exposed on one of 108 flights by one of 74 measles cases who flew while contagious. All secondary cases were exposed on international flights lasting 6.9–15 hours and sat within 11 rows of the case.[3] Notify the ACDP epidemiologist on-call if the case has traveled while infectious.

Please collect the following information: name and DOB of patient, names and DOB of travel companions, travel dates (include airline name, flight number), seat number and any information about whether the index case plans to continue travel while infectious.

An admittedly arbitrary definition has been devised to cover who may have been sufficiently exposed to warrant notification.

Persons aboard the plane who are considered exposed:

- In planes with >50 passengers:
  - passengers sitting in the same row, and in the 2 rows in front of and behind the ill passenger (except that the Bulkhead is considered a barrier);
  - all children younger than 2 years seated on adult passengers' laps anywhere on the plane; and
  - any flight crew serving case.
- In planes with ≤50 passengers: all passengers and crew, including the pilots.

Passengers who are contacted should be informed of their exposure, queried about their age and immune status, and offered post-exposure immunoprophylaxis with vaccine or IG as appropriate.

Exposed persons without evidence of immunity should be offered MMR vaccine, be excluded from high-risk settings (school, hospital, day care), and advised to avoid travel during the incubation period, and if symptoms develop, to avoid contact with others. If health care is required, they should call the office or emergency department beforehand to make arrangements to be seen where others will not be exposed.

A second dose of measles vaccine is recommended for people who travel internationally and were born in 1957 or later (absent a history of measles infection).

6.4 Going Public

Consult with ACDP/Immunization staff before going public. They will help you draft your press release and can assist with contacting media representatives who are outside your local area (e.g., Portland TV stations, the Oregonian), as well as public health officials in other counties and neighboring states.

[3] Nelson K, Marienau K, Schembri C, Redd S. Measles transmission during air travel, United States, December 1, 2008–December 31, 2011. Travel Med Infect Dis 2013; 11:81–9.

UPDATE LOG

July 2024. OSPHL testing criteria temporarily modified because of the ongoing outbreak. (Juventila Liko).

February 2021. Reporting period updated for LHDs. It's now immediately reportable. (Juventila Liko)

October 2020, Editing of some language and fixed formatting issues. (Juventila Liko)

November 2019. Updated flight investigation to reflect CDC/DGMQ guidance. (Juventila Liko)

June 2019. Second MMR recommended for eligible persons exposed to measles. Reference to Algorithm for assessment of persons exposed to measles added. (Paul Cieslak, Juventila Liko; algorithm created by Alex Wu)

November 2018. Sections on laboratory testing and contact investigation revised including introduction of PUM approach. (Juventila Liko, Becca Pierce)

August 2018. Added clarification for laboratory testing approvals. (Sarah Humphrey, Juventila Liko)

June 2018. Added PCR testing at the OSPHL. (Juventila Liko)

April 2017. Confirmed case definition revised. (Juventila Liko)

March 2017. Lab section revised for clarity and to transport specimens to the OSPHL. (Juventila Liko)

October 2016. Table on the recommended interval before measles- or varicella-vaccine containing administration is deleted. Reference to the standing order added. (Juventila Liko)

May 2015. Added CDC's language about laboratory testing. (Juventila Liko)

March 2015. Added flowchart for testing criteria. (Juventila Liko)

February 2015. The lab section was updated to reflect the most recent OSPHL guidelines. (Juventila Liko)

September 2014. Added clarification about other potential diagnosis for measles-like illnesses. (Juventila Liko)

March 2014. Urine specimen recommended in addition to NP swab; passive surveillance for UTD contacts and language clarified in several places. (Juventila Liko)

August 2013. Outbreak definition revised to be more in line with the national definition. (Juventila Liko)

March 2013. The acceptable evidence of immunity is updated. Dosage of the immune globulin for measles post exposure prophylaxis is increased since IG levels have been going down in the donor population in the vaccine era and

available evidence suggests that the dose of 0.25ml/kg may not provide adequate protection. (Juventila Liko)

December 2012. Clarified LHD responsibilities regarding measles testing at WSPHL. (Juventila Liko)

January 2012. Typo corrected in section 6.2 Healthcare workers should be excluded for 4 days after rash onset, not 7. (Paul Cieslak)

September 2011. Minor wordsmithing of case definitions and the acceptable evidence of immunity. Reporting responsibilities revised. Also, revised the lab section adding testing availability at WSPHL for cases when disease is considered a possibility. Section 6.4 “Going Public” was added. (Juventila Liko)

March 2011. Minor wordsmithing of case definitions. (Juventila Liko)

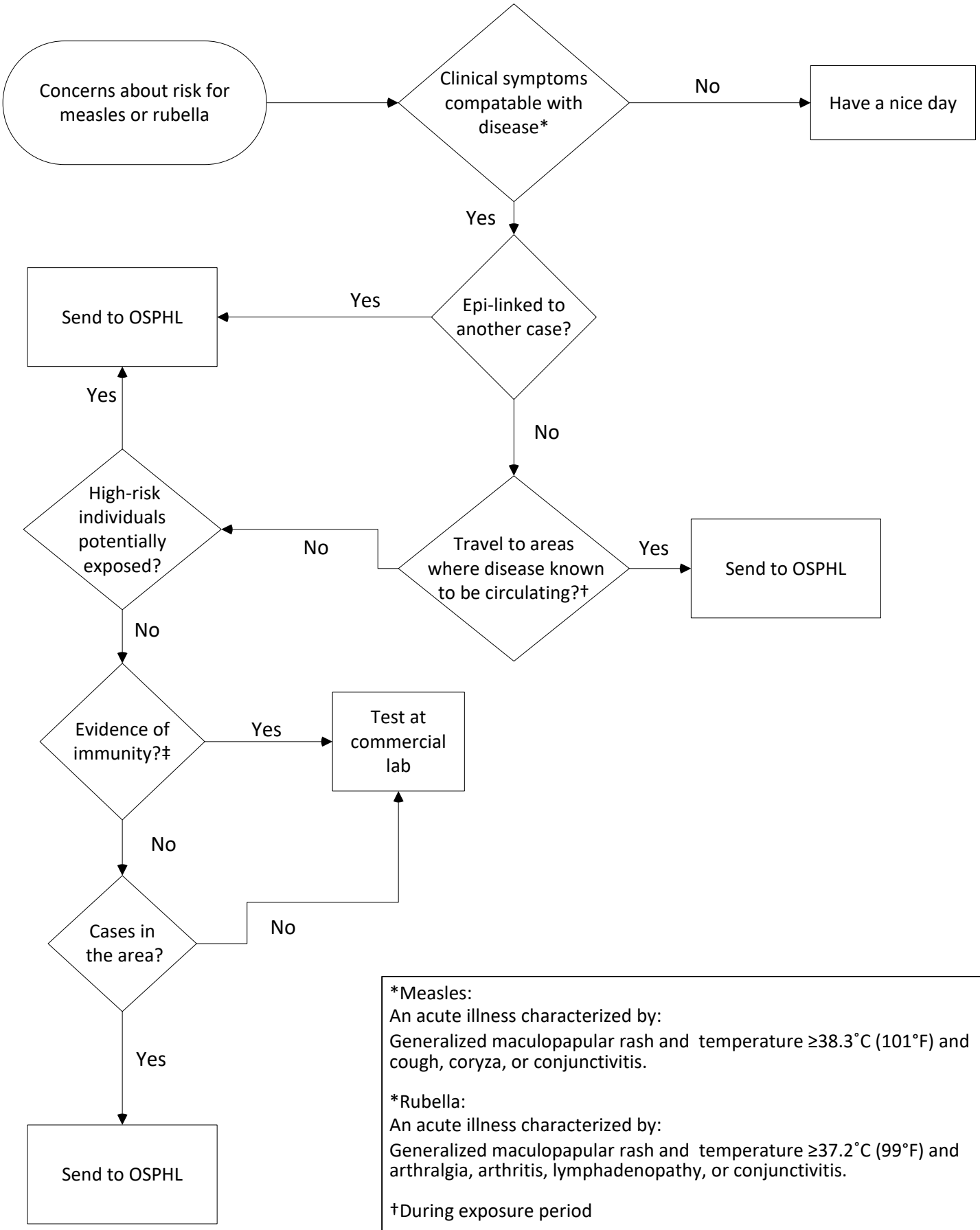
April 2010. Services available at OSPHL updated. (Juventila Liko)

April 2008. Revised 2.4, 3.4, 4.2, 4.3, 5.1, 5.4, 5.5, 6.2, 6.3 to reflect a concerted approach to the control of measles in Oregon based on high levels of measles vaccination in the community, national recommendations, and a focused attack on measles outbreak. Recommendations concerning identification of contacts were revised to recommend “20 minutes-10 meters rule” (down from 2 hours cutoff). (Paul Cieslak, Juventila Liko)

October 2007. Case definitions revised to require symptoms. This is more in line with the national definition and acknowledges the fact that with our incidence of disease being so low, IgM has a poor positive predictive value. (Juventila Liko)

July 2006. The confirmed case definition was modified from "IgM antibody to measles virus" to "positive IgM serology to measles." Several people had misinterpreted the older language to mean that the presence of any IgM antibody was indicative of a confirmed case. Recommendations concerning follow- up to potential airborne exposures were revised to recommend a 2-hour cutoff (down from 4 hours). Longer periods are certainly possible, but the risk beyond 2 hours is apparently low enough that the juice isn't worth the squeeze. Not coincidentally this makes our recommendations more consistent with CDC's. (Juventila Liko)

Testing criteria for measles and rubella



*Measles:
An acute illness characterized by:
Generalized maculopapular rash and temperature ≥38.3˚C (101°F) and cough, coryza, or conjunctivitis.

*Rubella:
An acute illness characterized by:
Generalized maculopapular rash and temperature ≥37.2˚C (99°F) and arthralgia, arthritis, lymphadenopathy, or conjunctivitis.

†During exposure period

‡See Section 4.3 in Investigative Guideline for applicable disease

Testing for Measles PCR at the Oregon State Public Health Laboratory

While measles is confirmed to be circulating in Oregon, clinicians may send specimens to the Oregon State Public Health Laboratory (OSPHL) for measles PCR testing for patients that meet the criteria for testing. All specimens tested at OSPHL must meet the criteria described.

Different criteria and approval processes may apply when circulation is not confirmed.

Criteria for testing

Rash illness compatible with measles and with no other explanation for the clinical presentation,

and

Unvaccinated or under-vaccinated for measles (i.e., fewer than 2 doses of measles-containing vaccine).

Infection Control

- Bring patients with suspected measles into the facility in a way that does not expose other patients (e.g., not sitting in a waiting area).
- Institute the highest level of respiratory precautions available (preferably negative-pressure room and staff with N-95 respirators or PAPR).
- Isolate patient so as not to expose others until measles is ruled out.
- Allow no other patients into the exam room for at least 2 hours after the patient with suspected measles has left.

Report the Suspect Case

Contact your local public health authority (LPHA) to report the suspected case. LPHA contact information: www.healthoregon.org/lhddirectory

Have the case information ready when you call. (name, date of birth, contact information, language spoken, clinical presentation, date of rash onset, travel history, exposure and vaccination history).

General Specimen Information

Specimens for real-time RT-PCR:

Collect specimens for PCR as soon as possible after rash onset. Ideally, collect within 3 days but no later than 10 days after illness onset.

Swabs: See Page 2 for additional information.

- **Nasopharyngeal swab is the preferred specimen type.**
- Oropharyngeal (throat) swabs are also acceptable.

Urine is accepted but not preferred: 10–50 mL in a sterile container.

Specimen submission process

- **Complete** an OSPHL Virology/Immunology Test Request Form. (www.bitly.com/phl-forms)
  - Each specimen requires its own form.
  - Complete all required fields and indicate the requested test.
- **Label** all specimens with at least two unique patient identifiers that match the Test Request Form. Acceptable identifiers include: Full patient name; Date of birth; and Medical record number
- **Keep specimens cold**: Store and ship specimens at refrigerated temperatures. Ship on ice packs.
- **Send specimens** using your facility's courier or via overnight shipping or using your facility's courier to arrive at OSPHL Monday to Friday between 8 a.m. and 4:30 p.m.

- Specimens must be received within 72 hours of collection and on ice packs to be tested.

  Oregon State Public Health Laboratory

  7202 NE Evergreen Pkwy, Suite 100

  Hillsboro, OR 97124
- If you need to use the OSPHL contracted courier service, visit www.bitly.com/phl-courier to request a pick up. For support or questions, email osphl.courier@odhsoha.oregon.gov.
- All specimens are subject to the requirements of the OSPHL Specimen Submission Policy (pdf).

Swab specimen collection

Use a synthetic swab, such as Dacron or rayon, on a plastic shaft.

After the specimen is collected, insert swab into a tube containing 2–3 mL of Viral Transport Media (VTM) or Universal Transport Medium (UTM) and snap off end at the scored breakpoint.

Nasopharyngeal swab (preferred): Rotate swab two to three times over surface of the posterior nasopharynx.

Oropharyngeal (throat) swabs: Use a single swab to collect secretions from the posterior pharynx and tonsillar areas, avoiding the tongue and teeth.

Combined swabs: NP and OP swab, both collected and inserted into a single tube containing 2–3 mL VTM or UTM, are also accepted.

Not acceptable for testing: Swabs not in acceptable media, wooden-shafted or calcium alginate swabs, and specimens stored at incorrect temperatures, received more than 72 hours after collection, incorrectly labeled, or that do not otherwise follow OSPHL Specimen Submission Policy (pdf).

Specimen collection guidance adapted from OSPHL Test Menu at www.healthoregon.org/labtests.

Results and turnaround

Results for testing performed by OSPHL will be sent via fax to the submitting facility.

Turnaround time for PCR results is within 3 working days after receipt of the specimens at OSPHL.

Ordering supplies for testing

Most facilities have supplies meeting the criteria for testing. If your facility does not have the supplies needed to collect specimens, you may order specimen collection kits using the OSPHL Stockroom Order Request Form, posted at www.bitly.com/phl-forms.

Other Laboratory Testing

Measles serology testing is not available at OSPHL. However, for highly suspect cases the **LPHA may request or approve** a serum sample to be forwarded to the Washington State Public Health Laboratory for serology testing. IgM testing is required to test for acute disease.

Measles testing can also be performed by commercial laboratories. If another laboratory will be used, please contact the laboratory for their requirements prior to specimen collection.

Public Health Contact Information

Epidemiology and disease prevention:

- Local Public Health Authorities: www.healthoregon.org/lhddirectory.
- State Acute and Communicable Disease Prevention section: 971-673-1111

Specimen collection and submission questions:

- OSPHL Lab Test Menu: www.healthoregon.org/labtests
- OSPHL Virology/Immunology testing section: 503-693-4100