Measles

(Also known as Rubeola, Hard Measles, Red Measles, Morbilli)

IMMEDIATELY REPORTABLE DISEASE

Per NJAC 8:57, healthcare providers and administrators shall immediately report **by telephone** confirmed and suspected cases of measles to the health officer of the jurisdiction where the ill or infected person lives, or if unknown, wherein the diagnosis is made. The health officer (or designee) **must immediately institute the control measures listed below in section 6, "Controlling Further Spread,"** regardless of weekend, holiday, or evening schedules. A directory of local health departments in New Jersey is available at http://www.state.nj.us/health/lh/directory/lhdselectcounty.shtml.

If the health officer is unavailable, the healthcare provider or administrator shall make the report to the Department by telephone to 609.826.5964, between 8:00 A.M. and 5:00 P.M. on non-holiday weekdays or to 609.392.2020 during all other days and hours.

CDS Communicable Disease Service

NEW JERSEY DEPARTMENT of HEALTH and SENIOR SERVICES

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1 THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Measles (rubeola) is caused by measles virus (genus *Morbillivirus*, family *Paramyxoviridae*). The virus is an RNA virus with one serotype.

B. Clinical Description

Measles is an acute disease characterized by malaise; fever, which can peak as high as 103ºF to 105ºF; cough; coryza; conjunctivitis; and maculopapular rash. The rash usually begins at the hairline and proceeds downward and outward to the hands and feet. Koplik's spots are characteristic mouth lesions which appears as small, white papulae on a reddened background on the buccal mucosa. Koplik's spots usually occurs one to two days before the rash to one to two days after the rash. Complications associated with measles include diarrhea, otitis media, pneumonia, encephalitis (five to ten cases per 10,000 reported cases), and death (one to three per 1,000 cases), mostly from pneumonia (60%) and occasionally from encephalitis. Complications of measles are more common among children younger than five years of age and adults 20 years and older. Measles during pregnancy may result in a higher risk of premature labor, spontaneous abortion, and low–birth-weight infants. Immunocompromised persons and persons with acquired immunodeficiency syndrome (AIDS) may have a severe, prolonged course without the typical rash.

C. Reservoirs

Humans are the only host.

D. Modes of Transmission

Measles is transmitted by direct contact with infectious droplets or less commonly by airborne transmission. Airborne transmission via aerosolized droplets has been documented in closed areas for up to two hours after a person with measles occupied the area.

E. Incubation Period

The incubation period is usually eight to 12 days from exposure to onset of symptoms, with a range of seven to 18 days.

F. Period of Communicability or Infectious Period

Measles may be transmitted from four days before to four days after rash onset (counting the day of rash onset as day zero). The secondary attack rate among susceptible persons is > 90%. Immunocompromised patients may have prolonged excretion of virus in their secretions and can be infectious for the duration of their illness. Measles is highly infectious, with up to 5,000 infectious particles excreted per hour. Infectious particles may remain suspended in air for up to two hours, depending on ventilation, sunlight exposure, and relative humidity.

G. Epidemiology

Measles occurs worldwide. In the temperate zones, peak incidence is in late winter and early spring. One dose of mumps, measles, rubella (MMR) vaccine induces measles immunity in about 95% of vaccinees; however, due to measles' extreme infectiousness, two doses are necessary to prevent outbreaks. Vaccine failure after two doses, both administered at $\geq$ 12 months of age, is now uncommon.

In developing countries, case fatality rates average 3% to 5% but can range as high as 10% to 30% in some localities, and measles is the eighth leading cause of death worldwide. Since 1995, incidence of measles in the U.S. has been very low, with only a few hundred cases reported each year and indigenous transmission has been interrupted. An increasing proportion of U.S. cases are imported, often from Europe and Asia. In New Jersey there were only two confirmed reported cases 2004 and 2005 and one in 2006. During 2004, 37 cases (ten indigenous and 27 imported) were reported in the United States.

2 CASE DEFINITION

A. New Jersey Department of Health and Senior Services (NJDHSS) Case Definitions.

1. Clinical case definition/description

An illness characterized by all of the following:

- A generalized maculopapular rash lasting ≥3 days; and
- A temperature ≥101.0°F (38.3°C); and
- Cough, coryza, or conjunctivitis.

2. Laboratory criteria for diagnosis

Laboratory diagnosis of measles is established by:

- Positive serologic test for measles immunoglobulin M (IgM) antibody, or
- Significant rise in measles antibody level by any standard serologic assay, or
- Isolation of measles virus from a clinical specimen.

3. Case Classification

CONFIRMED
A case that is laboratory-confirmed or that meets the clinical case definition and is epidemiologically linked to a confirmed case. A laboratory-confirmed case does not need to meet the clinical case definition.

PROBABLE
A case that meets the clinical case definition, has noncontributory or no serologic or virologic testing, and is not epidemiologically linked to a confirmed case.

POSSIBLE
Any febrile illness accompanied by generalized maculopapular rash.

The NJDHSS case definition for a POSSIBLE case is the same as the Centers for Disease Control and Prevention (CDC) case definition for a SUSPECT case.

4. Measles cases classified by importation status:

Internationally imported case: A case in which measles results from exposure to measles virus outside the United States from another country as evidenced by at least some of the exposure period (seven to 21 days prior to rash onset) occurring outside the United States and rash onset occurring within 21 days of entering the United States and there is no known measles exposure in the United States during that time. All other cases are considered US-acquired cases.

US-acquired case: A case in which the patient had not been outside the United States during the 21 days before rash onset or was known to have been exposed to measles within the United States.

3 LABORATORY TESTING SERVICES AVAILABLE

NOTE: Prior to drawing or sending any specimens for diagnostic/confirmatory testing, call NJDHSS, Vaccine Preventable Disease Program (VPDP) at 609.826.4860 for consultation and guidance.

A. Serologic Testing

- **Measles IgM test—**NJDHSS strongly recommends submission of specimens to NJDHSS Public Health and Environmental Laboratories (PHEL). The measles IgM test is greatly preferred because it provides an earlier result. Ideally, the specimen should be drawn at least three days after onset of rash to minimize the possibility of false negative results. If serum is collected prior to the third day, a follow-up specimen may be requested.
- **Measles total antibody paired-titer test—**PHEL performs this paired-titer test. Acute serum should be collected as soon as possible after onset of rash; convalescent serum should be collected about 14 days later.

Shipment of sera—Please refer to Attachment A (at the end of this chapter) for instructions on collecting and submitting specimens to PHEL. At least 2 mL of serum should be sent on a cold pack, with a completed virus serology requisition form, SRD-1 (Exhibit I), to Virology, NJDHSS PHEL, John Fitch Plaza, PO Box 361, 369 South Warren St., Trenton, NJ 08625. Before sending, please call VPDP staff at 609.826.4860.

B. Virus Isolation and Molecular Characterization of Measles

Virus isolation is much less useful for disease control purposes than serologic testing because results are not available for several weeks. However, molecular characterization of isolated measles virus is an extremely important tool in epidemiologic investigation; for example, to determine source of infection and which cases and outbreaks are linked to each other. Also, in cases where serology is not useful or possible (for example, when a suspect case-patient has been recently vaccinated with MMR), virus isolation can be used for confirmation, and molecular characterization can distinguish wild-type virus from vaccine virus. Specimens submitted to PHEL for measles virus isolation will be forwarded to CDC.

The following table below and Attachment A (at the end of this chapter) show how to collect specimens.

Measles Viral Isolation

Specimen	Collection Interval
Urine[1]	≤5 days after rash onset
Nasopharyngeal[2]	≤5 days after rash onset
Blood[3]	≤7 days after rash onset

[1] Clean voided first morning urine
[2] Separate swabs for nares and pharynx
[3] Blood in green-top tube (heparinized)

Please consult VPDP staff at 609.826.4860 prior to the submission of virus specimens.

4 PURPOSE OF SURVEILLANCE AND REPORTING REQUIREMENTS

A. Purpose of Surveillance and Reporting

- To rapidly identify all cases and exposed susceptibles to prevent further spread of this highly contagious disease.
- To identify the source of infection so as to better understand how and why the case(s) occurred.
- To help in the international effort to eradicate measles.

B. Laboratory Reporting Requirements

New Jersey Administrative Code (NJAC 8:57-1) stipulates that confirmed and suspect cases of measles must be **immediately reported** by telephone to the local health department where the patient resides. If the laboratory director or his/her designee is unable to reach the local health department where the patient resides, call NJDHSS VPDP at 609.826.4860 (weekdays) or 609.392.2020 (nights/weekends). Telephone reports shall be followed by a report via confidential fax, over the Internet using the Communicable Disease Reporting and Surveillance System (CDRSS), or in writing to the health officer of the jurisdiction in which the patient lives or, if unknown, to the health officer in whose jurisdiction the healthcare provider requesting the laboratory examination is located. Please refer to the list of reportable diseases at http://www.state.nj.us/health/cd/documents/reportable_diseases.pdf for information.

C. Healthcare Provider Reporting Requirements

NJAC 8:57-1 stipulates that a suspect or confirmed case of measles must be **immediately reported** by telephone to the health officer of the jurisdiction in which the patient lives, or if unknown, wherein the diagnosis was made. If the health officer is unavailable, the report shall be made to NJDHSS VPDP at 609.826.4860 (weekdays) or 609.392.2020 (nights/weekends).

D. Health Officer Reporting and Follow-up Responsibilities

As specified in NJAC 8:57-1, each local health officer notified of measles must **immediately report** the occurrence of any case or outbreak of measles to NJDHSS VPDP by telephone. The health officer shall within 24 hours of receipt of a report initiate or update the information on CDRSS. If the initial report is incomplete, a health officer shall seek complete information and provide all available information to NJDHSS VPDP within 5 days of receiving the initial report. If the health officer is unavailable, the report shall be made to NJDHSS VPDP at 609.826.4860 (weekdays) or 609.392.2020 (nights/weekends).

NJAC 8:57-1 stipulates that each local health officer shall investigate the facts contained within the report and follow such direction regarding the investigation as may be given by NJDHSS VPDP. Completion and submission of a Measles Investigation Record (IMM-11) is required, see Exhibit II. Current requirements are that cases be reported immediately to NJDHSS VPDP at 609.826.4860 (weekdays) or 609.392.2020 (nights/weekends). Refer to the Health Officers Reporting Timeline (http://www.state.nj.us/health/cd/reporting.shtml) for information on prioritization and timeliness requirements of reporting and case investigation.

E. Entry into CDRSS

The mandatory fields in CDRSS include: disease, last name, county, municipality, gender, race, ethnicity, case status, report status.

The following table can be used as a quick reference guide to determine which CDRSS fields need to be completed for accurate and complete reporting of Measles (Rubeola) cases. The "Tab" column includes the tabs which appear along the top of the CDRSS screen. The "Required Information" column provides detailed explanations of what data should be entered.

CDRSS Screen	Required Information
Patient Info	Enter the disease name ("MEASLES") patient demographic information, illness onset date, and the date the case was reported to the local health department (LHD). There are no subgroups for Measles. In Demographics section, indicate residency status. For non-U.S. residents indicate country of origin and date of arrival.
Addresses	Enter any alternate address (e.g., a daycare or school address). Use the Comments section in this screen to record any pertinent information about the alternate address (e.g., the times per week the case-patient attends daycare or school). Entering an alternate address will allow other disease investigators access to the case if the alternate address falls within their jurisdiction.
Clinical Status	Enter any treatment that the patient received and record the names of the medical facilities and physician(s) involved in the patient's care. If the patient received care from two or more hospitals, be sure that all are entered so the case can be accessed by all infection control professionals (ICPs) covering these facilities. Indicate pregnancy status under Clinical Status section. If immunization status is known, it should also be entered under Immunizations section. If the patient died, date of death should be recorded under the Mortality section.

CDRSS Screen	Required Information
Signs/Symptoms	Check appropriate boxes for signs and symptoms and indicate their onset date. Make every effort to get complete information by interviewing the physician, family members, ICP, or others who might have knowledge of the patient's illness. Also, information regarding the resolution of signs and symptoms should be entered.
Risk Factors	Enter complete information about risk factors to facilitate study of measles disease in New Jersey. If patient has not received immunizations due to a medical or religious exemption, please check risk factor in Risk factor(s) section. Please document travel history of patient or any visitors to patient (e.g. domestic/international within past 21 days) in the Comments section.
Laboratory Eval	Indicate appropriate test, specimen collection date, and serology (IgM & IgG) test result with values. Isolation of Measles virus from a clinical specimen should also be recorded. Following initial diagnosis of Measles, any additional laboratory results should also be entered in the section. For additional laboratory testing or information see Section 3 and Attachment A.
Contact Tracing	Information regarding contacts is required for this disease including information on any household and other close contacts. Identify susceptible high-risk contacts (e.g., pregnant women, immunocompromised or unvaccinated persons, infants <12 months of age). Document any vaccine or travel history of contacts in Comments section.
Case Comments	Enter general comments (i.e., information that is not discretely captured by a specific topic screen or drop-down menu) in the Comments section. **NOTE:** Select pieces of information entered in the Comments section CANNOT be automatically exported when generating reports. Therefore, whenever possible, record information about the case in the fields that have been designated to capture this information; information included in these fields CAN be automatically exported when generating reports.

CDRSS Screen	Required Information
Epidemiology	Indicate method of import in the Epidemiology section. Under the Other Control Measures section, indicate if the patient falls into any of the categories listed under Patient Role(s)/Function(s) (e.g., "DAYCARE ATTENDEE," "DAYCARE PROVIDER", "HEALTHCARE WORKER"). Record name and contact information of case investigators from other agencies (e.g., CDC, out-of-state health departments). Document communication between investigators in the Comments section.
Case Classification Report Status	Case status options are: "REPORT UNDER INVESTIGATION (RUI)," "CONFIRMED," "PROBABLE," "POSSIBLE," and "NOT A CASE." • All cases entered by laboratories (including LabCorp electronic submissions) should be assigned a case status of "REPORT UNDER INVESTIGATION (RUI)." • Cases still under investigation by the LHD should be assigned a case status of "REPORT UNDER INVESTIGATION (RUI)." • Upon completion of the investigation, the LHD should assign a case status on the basis of the case definition. "CONFIRMED", "PROBABLE", "POSSIBLE", and "NOT A CASE" are the only appropriate options for classifying a case of *Measles*. Report status options are: "PENDING," "LHD OPEN," "LHD REVIEW," "LHD CLOSED," "DELETE," "REOPENED," "DHSS OPEN," "DHSS REVIEW," and "DHSS APPROVED." • Cases reported by laboratories (including LabCorp electronic submissions) should be assigned a report status of "PENDING." • Once the LHD begins investigating a case, the report status should be changed to "LHD OPEN." • The "LHD REVIEW" option can be used if the LHD has a person who reviews the case before it is closed (e.g., health officer or director of nursing). • Once the LHD investigation is complete and all the data are entered into CDRSS, the LHD should change the report status to "LHD CLOSED." • "LHD CLOSED" cases will be reviewed by DHSS and be assigned one of the DHSS-specific report status categories. If additional information is needed on a particular case, the

CDRSS Screen	Required Information
	If a case is inappropriately entered (e.g., a case of Mumps was erroneously entered as a case of *Measles*) the case should be assigned a report status of "DELETE." A report status of "DELETE" should NOT be used if a reported case of *Measles* simply does not meet case definition. Rather, it should be assigned the appropriate case status, as described above.

5 CASE INVESTIGATION

NJDHSS requests that any initial information about any suspect or known case of measles, as defined by the criteria in Section 2A, be immediately reported to NJDHSS VPDP at 609.826.4860 (weekdays) or 609.392.2020 (nights/weekends).

- It is the health officer's, or his/her designee's, responsibility to investigate the case by interviewing the patient and others who may be able to provide pertinent information.
- The health officer shall document any suspected or confirmed case investigation on NJDHSS VPDP's Measles Investigation Record (IMM-11). See Exhibit II.
- The measles case investigation documentation should include the following information: (1) clinical symptoms, (2) date of onset of illness, (3) measles immunization history, (4) country of origin and length of residence in the United States, (5) recent history of travel (to where and dates), (6) laboratory findings, (7) whether there were any recent out-of-town visitors (from where and dates), (8) whether there was any recent contact with anyone with similar symptoms, and (9) risk factors for the disease (e.g. pregnancy, immunosuppression, < 12 months of age).
- Upon completion of a suspected or confirmed measles case investigation, the IMM-11 is to be faxed or mailed to NJDHSS VPDP, PO Box 369, Trenton, NJ 08625-0369.
- The institution of disease control measures is an integral part of case investigation. It is the local health officer's responsibility to understand, and, if necessary and directed by NJDHSS VPDP, institute the control guidelines in Section 6, Controlling Further Spread.

6 CONTROLLING FURTHER SPREAD

This section provides detailed control guidelines that are an integral part of case investigation. Local health departments should familiarize themselves with the information. However, NJDHSS VPDP will coordinate the implementation of any control measures in collaboration with the local health department or other state institution.

A. Isolation and Quarantine Requirements (*NJAC 8:57-1*)

The current recommendations of CDC and NJDHSS are as follows:

1. Minimum Period of Isolation of Patient

Through 4 days after onset of rash (counting the day of rash onset as day zero).

2. Minimum Period of Quarantine of Contacts

Students and staff born in or after 1957 who are not appropriately immunized and do not have serologic evidence of immunity should be excluded from school from the 5th through the 21st day after their exposure. If exposure was continuous and/or if multiple cases occur, susceptibles will be excluded through the 21st day after rash onset in the last case. **Healthcare workers** who are not appropriately immunized and do not have serologic evidence of immunity should be excluded from work from the 5th day after their first exposure through the 21st day after their last exposure. These restrictions, if implemented after consultation with NJDHSS VPDP, may be considered for students, school staff, and healthcare workers even if the contact received immune globulin (IG).

B. Protection of Contacts

1. Implementation of control measures *before* serologic confirmation after consultation with NJDHSS VPDP may be considered.

2. Inquire about contact with a known or suspected case or travel during the measles exposure period (eight to 18 days prior to onset).

3. Isolate the case-patient during his/her infectious period, as defined above.

4. Identify all those exposed. Think in terms of the "zones of exposure" and consider members of the following groups if they were in contact with the case-patient during his/her infectious period:

- Household members,
- School/daycare contacts (students and staff),

- Staff and patients at medical facility where patient was seen (including staff with and without direct patient contact),
- Individuals at workplace of case-patient (especially daycare centers, schools, and medical settings),
- Members of same religious or social groups,
- Members of sports teams or other extracurricular groups,
- Bus or carpool mates,
- Close friends, and
- Persons potentially exposed at social events, travel sites, etc.

NOTE: Measles is so contagious that we may consider everyone in the *entire* institution exposed.

5. Identify high-risk susceptibles with whom the case-patient had contact during his/her infectious period. Pregnant women, immunocompromised individuals, and infants < 12 months of age should be referred to their healthcare provider.

6. Identify all other susceptible individuals *without* proof of immunity as defined below:

- Born in the United States before January 1, 1957 (year of birth is not acceptable proof of immunity in a healthcare setting);
- Born outside the United States, where measles immunization is not routine;
- Two doses of measles vaccine, given at least 4 weeks apart, with both doses administered at ≥12 months of age; and the second dose given prior to or within 72 hours of exposure (in most situations, individuals receiving their first dose within 72 hours of exposure will be considered immune);
- Serologic proof of immunity.

NOTE: Physician-diagnosed disease is NOT acceptable. Susceptibles include those with medical and religious exemptions to immunization. Susceptibles include those with only one dose of a measles-containing vaccine.

Year of birth as proof of immunity—Epidemiologic data indicate that most individuals born in the United States before January 1, 1957, are immune to measles. This has not been found to generally apply to those born in some other countries, where the epidemiology of measles is not well known and where measles immunization may not have been routine. Exceptions to the "1957 rule" are employees in healthcare settings. Because persons born before 1957 have acquired and transmitted measles in healthcare settings, vaccination of these older employees with one dose of MMR vaccine or single measles antigen is recommended.

7. Immunize all susceptibles. Please review Attachment B: Recommendations for Measles Immunization and Attachment C: MMR Vaccine Fact Sheet located at the end of this chapter. All susceptibles ≥ 12 months of age, for whom vaccine is not contraindicated, must be immunized, keeping in mind the following:

- MEASLES VACCINE GIVEN WITHIN 72 HOURS OF EXPOSURE CAN PREVENT DISEASE.
- The combined MMR vaccine is the preferred formulation for those ≥ 12 months of age. It will provide additional protection against mumps and rubella. Single measles antigen, if available, remains an acceptable alternative to MMR.
- Vaccinating an individual who may be incubating measles is NOT harmful.
- Vaccinate susceptibles even if it is > 72 hours postexposure. It will protect against exposure to the next potential generation of cases. In addition, the situation may be viewed as an opportunity to vaccinate.
- MMR vaccine may be given to infants six to 12 months of age only if a declared outbreak is occurring affecting that age group and if monovalent measles vaccine is not available. If given, for outbreak control purposes, these cases are not to be counted as part of the measles/MMR vaccine series because they are administered before the first birthday. These children will require an additional two doses of a measles-containing vaccine on or after their first birthday. In addition, monovalent measles vaccine is not routinely given to this age group unless indicated by local epidemiology or declared outbreak.

8. Consider recommending IG for susceptibles with contraindications to measles vaccine if it is within 6 days of exposure. See Attachment D (at the end of this chapter) for a list of such individuals, the recommended dosages, and subsequent deferral of live viral vaccines.

NOTE: NJDHSS does not provide IG. This biologic product must be privately purchased by the physician or local health agency.

9. Isolation/exclusion (non-healthcare settings):

- **Case-patient**

  Isolate and exclude the case-patient during his/her infectious period (from four days before through four days after rash onset, counting the day of rash onset as day zero). He/she may return to normal activities on the fifth day.

  Criteria for isolation/exclusion of a case-patient are more rigorous for immunocompromised individuals and for others in healthcare settings.

- **Contacts**

  Susceptibles include all unvaccinated individuals without proof of immunity as specified in section 6B including

  - individuals who receive IG,
  - medical /religious exemptions,
  - individuals who have other contraindications to MMR vaccine,
  - those vaccinated > 72 hours postexposure.

- Isolate susceptibles on days 5 to 21 postexposure.
- Several criteria are used to determine when to exclude susceptible contacts and when they can return to normal activities, as outlined below:
    - **If there was a discrete (one-time) exposure—**exclude on days 5 through 21 from that exposure. They may return to normal activities on the 22nd day.
    - **If there was continuous exposure**—exclude on days 5 through 21 from the day of rash onset in the case. (However, in healthcare settings, exclusion must begin five days after the *earliest* exposure and extend through 21 days from the *last* exposure.) They may return to normal activities on the 22nd day.
    - **If there is more than one case of measles**—exclude until 14 days after the onset of rash in the last reported case in the outbreak setting. They may return to normal activities on the 22nd day.

Summary of Measles Exclusion Requirements

Case and Symptomatic Contacts	Asymptomatic Contacts
Exclude through the fourth day after rash onset (count day of rash onset as day zero). They may return to normal activities on the fifth day.	**One case:** Exclude susceptibles for five to 21 days postexposure. **Multiple cases:** Exclude susceptibles for 21 days from date of rash onset in last case. **Healthcare settings:** Exclude or isolate susceptibles from five days after the earliest exposure through 21 days after the last exposure.

10. Conduct surveillance for 2 incubation periods (28 days) after rash onset in the last case or the last exposure in the setting, whichever is later.

C. Managing Special Situations

Do not plan or commence any exclusion procedures without consultation and approval from NJDHSS.

1. **School Settings**

Remember to determine whether there are any

- Pregnant teachers, staff (including those without direct contact with students), and students (do not forget about student teachers) anywhere in the school;
- Immunocompromised individuals among the students, teachers, and staff anywhere in the school;
- Medical/religious exemptions anywhere in the school, among both students and staff. It is particularly important to identify these individuals in the same classroom and/or grade of case-patients. Remember, these susceptible individuals should be excluded.

Exceptions to Exclusion

- Susceptible contacts, including those in classrooms, extracurricular activities, and other settings, who have already received one dose of MMR and receive a second dose of measles vaccine within 72 hours of exposure can be readily readmitted; otherwise, they should be excluded as discussed above.
- In some settings, individuals who have received their first or second dose > 72 hours postexposure, **but within a specified time period (as determined by NJDHSS VPDP with the local health department)**, may be allowed to continue to attend classes.

If multiple cases occur, guidelines may be revised to include other classrooms, their teachers, and other feeder schools ("Sending School").

Interactions in sports and other extracurricular activities facilitate the spread of measles. Additional recommendations to prevent the spread of measles between schools can be found in the table "Control Guidelines for Sports Teams and Extracurricular Groups."

Control Guidelines for Sports Teams and Extracurricular Groups

Control guidelines differ and are dependent on whether measles is currently occurring at your institution. Schools without cases that will be involved with an institution that is experiencing cases also need to follow control guidelines. Please refer to the appropriate category below for the recommendations for your facility.

A. **At the school where measles cases are reported**

1. All students, staff, supporters, and media personnel attending activities at other schools or participating in sports or other group activities at your school should have proof of immunity as defined below:

- Born in the United States before January 1, 1957, or
- Two doses of measles vaccine, with both doses administered at ≥ 12 months of age, given at least four weeks apart (the second dose must have been given before the rash onset of the first case, or within 72 hours of exposure to the known case), or
- Serologic proof of immunity

NOTE: Physician-diagnosed disease is **NOT** acceptable.

On receipt of a second or first dose of a measles-containing vaccine, the child can return to school immediately.

2. Notify the schools to which students are traveling and inform them of

- the cases or suspected cases at your school, and
- the immune status of your students and staff who will be traveling to the other school.

B. **Schools without measles cases receiving students from or traveling to a school with measles cases**

All students, staff, supporters, and media personnel participating in activities with students from a school with cases should have proof of immunity as defined below:

- Born in the United States before January 1, 1957, or
- Two doses of measles vaccine with both doses administered at ≥ 12 months of age, given at least 4 weeks apart (as outlined above), or
- Serologic proof of immunity.

NOTE: Physician-diagnosed disease is **NOT** acceptable

2. **Healthcare Settings**

Recommendations for healthcare facilities are *more rigorous*. In New Jersey, hospitals are required to assess all new hospital employees and staff for measles and rubella immunity as per NJAC 8:43G-20.1.

- **Proof of immunity—**The risk of acquiring measles in medical settings is up to 13-fold higher than in other settings. Therefore, documentation of immunity is extremely important.
    - All staff born on or after January 1, 1957, should have proof of two doses of measles vaccine or serologic proof of immunity, with a second dose having been given ≤ 72 hours after exposure.
    - Medical personnel born before January 1, 1957, have acquired measles in medical facilities. Therefore, consideration may be given by NJDHSS to require documentation of at least one dose of measles vaccine for staff born before 1957.
    - In special high-risk healthcare settings, such as transplant, oncology, neonatal units, etc., exclusion criteria should be even more rigorous. Infection control personnel may elect to exclude all susceptible personnel even if they have been immunized within 72 hours.
- Initial management of patients with febrile rash illness
    - Assess and screen all patients with febrile rash illness, either prior to or immediately on arrival at the intake area.
    - Escort patients to a separate waiting area or place immediately in a private room.
    - Both patients and staff should wear appropriate masks or respirators (masks for patients to prevent generation of particles, and particulate respirators for staff, if possible, to filter airborne particles).

  - If not admitted, maintain airborne precautions (including while patient is exiting the facility, e.g., separate exit). Patients should receive instructions to remain in isolation at home, through four days after rash onset.
  - Measles virus can remain suspended in the air for up to two hours. Therefore, we recommend that susceptible patients **NOT** be placed in a room that has been occupied by a suspect case for at least two hours following the case-patient's exit from that room.

- Infectious period
  - Cases are considered to be infectious from four days before rash onset through four days after rash onset, counting the day of rash onset as day zero. Therefore, cases are considered infectious for a total of nine days.
  - Immunocompromised patients may have prolonged excretion of viral particles in their secretions and should be considered infectious for the duration of their illness.
- Exclusion/isolation of cases
  - Personnel who become sick should be excluded from work for four days after they develop a rash consistent with measles. They may return on the fifth day.
  - If admitted, patients should be on airborne precautions (in addition to standard precautions) while infectious (four days before rash onset through four days after rash onset) in a negative pressure room. They may be taken off isolation on the fifth day.
  - If not admitted, patients should maintain respiratory isolation while exiting the facility (e.g., mask, separate exit) and remain at home through four days after rash onset. They may return to normal activities on the fifth day.
- **Exclusion/isolation of contacts—**The recommended exclusion/isolation periods are extended in the healthcare setting.
  - Susceptible staff contacts should be excluded from the fifth day after the earliest exposure through the 21st day after the last exposure to the case-patient during his/her potential infectious period (as defined above). They may return on the 22nd day.
  - Susceptible patient contacts should be placed in airborne isolation from day 5 after the earliest exposure through day 21 after the last exposure to the case during his/her potential infectious period (as defined above). They may be taken off isolation on the 22nd day.

The above recommendations are summarized in the following table, "Measles Control in Medical Settings."

Measles Control in Medical Settings

This table summarizes additional control measures to decrease nosocomial measles transmission.

1. Assess and screen all patients with rash illness or with other potential airborne diseases, either prior to or immediately on arrival at intake area.

2. Escort patients to a separate waiting area or private room.

3. Both patients and staff should wear appropriate masks or respirators (masks for patients to prevent generation of particles, and particulate respirators for staff, if possible, to filter airborne particles).

4. If a case patient is placed in a negative pressure room and admitted, maintain airborne precautions (in addition to standard precautions). Patients are considered infectious for four days before through four days after rash onset, counting the day of rash onset as day zero.

5. If not admitted, maintain respiratory isolation, including while patient is exiting the facility (e.g., mask, separate exit). Patient should remain in isolation at home through four days after rash onset, counting the day of rash onset as day zero. The patient may resume normal activities on the fifth day.

6. Avoid placing susceptibles in a room that has been occupied by a suspect case for at least two hours following the case-patient's exit.

7. Identify all contacts among patients and staff. These include

- patients and families in the waiting and examination rooms up to two hours after case-patient was present;
- all proximate staff both with and without direct patient contact;
- due to airborne route of transmission, those exposed may often include everyone at the entire facility.

8. Identify susceptibles (particularly high-risk susceptibles) and offer

- MMR, or monovalent measles antigen, within 72 hours of exposure (will most likely prevent illness if given in this window), or
- for high-risk susceptibles and those ineligible for vaccination, IG ≤ 6 days after exposure (may modify or prevent illness, but a recipient is still considered to be infectious).

9. Notify infection control, employee health, department heads, and the healthcare providers of exposed patients.

- Post a "Measles Alert" notice in prominent areas.

10. Exclusion of susceptibles

- All staff born in or after 1957, who have not received a second dose of measles vaccine ≤

72 hours postexposure, lacking serologic evidence of immunity should be **excluded from five days after their earliest exposure through 21 days after their last exposure to the case-patient during his/her potential infectious period.**

- All staff born before 1957 lacking serologic evidence of immunity or who have not received one dose of MMR ≤ 72 hours postexposure should be excluded five to 21 days postexposure.
- Staff who contract measles should be excluded for four days after their first day of rash onset.

In special high-risk healthcare settings, such as transplant, oncology, neonatal units, etc., exclusion criteria should be even more rigorous. Infection control personnel may elect to exclude all susceptible personnel even if they have been immunized within 72 hours.

3. Management and MMR Vaccination of HIV-Infected Individuals and Their Contacts

The American Academy of Pediatrics (AAP) and the Advisory Committee on Immunization Practices (ACIP) have recently revised their recommendations regarding the management of HIV-infected individuals exposed to measles, as well as the routine MMR immunization of those with HIV infection, particularly those with severe immunosuppression. These guidelines, applicable to children and adults, are summarized below.

- Management of HIV-Infected Individuals Exposed to Measles

  MMR or IG should be given, in consultation with the patient's personal physician, depending on the situation:

  - **Asymptomatic HIV-infected individuals who are not severely immunosuppressed** (i.e., with higher age-specific CD4+ T-lymphocyte counts or percentages than those in the table listing contraindications for measles-containing vaccines), *if susceptible and exposed ≤ 3 days prior* should receive MMR vaccine.
  - **Asymptomatic HIV-infected individuals who are not severely immunosuppressed** (i.e., with higher age-specific CD4+ T-lymphocyte counts or percentages than those in the table listing contraindications for measles-containing vaccines), *if susceptible and exposed >3 to 6 days prior* should receive 0.25 mL/kg IM immune globulin (maximum 15 mL). They should subsequently be immunized with MMR after the appropriate interval. Please refer to the table in Attachment D: "Suggested Intervals Between Administration of Immunoglobulin Preparations and Measles-Containing and Varicella Vaccines."
  - **Symptomatic HIV-infected individuals who are severely immunosuppressed** (as defined in the table listing contraindications for measles-containing vaccines), *regardless of past history of immunizations or disease, unless they have serologic proof of immunity,* should receive IG 0.5 mL/kg IM (15 mL max).

If an individual has received immune globulin intravenous preparation (IGIV) (400 mg/kg) ≤ 3 weeks *before* exposure, no additional IG is required. However, some experts recommend an additional dose of IGIV if ≥ 2 weeks have elapsed since last treatment. (Remember, when deciding to vaccinate these individuals, MMR vaccine should be given ≥ 2 weeks *before* any IG or other blood products.)

- Management of contacts of HIV-infected individuals who are themselves exposed to measles
    - If they are susceptible and exposed 3 days prior, they should receive MMR vaccine.
    - If they are susceptible and exposed > 3 to 6 days prior, they should receive IG. Those receiving IG should subsequently be immunized with MMR after the appropriate interval. Please refer to the table in Attachment D: "Suggested Intervals Between Administration of Immunoglobulin Preparations and Measles-Containing and Varicella Vaccines."

- General guidelines for the use of MMR vaccine in HIV-infected and potentially HIV-infected individuals

1. Prevaccination HIV testing is **NOT** recommended.

2. MMR vaccine is recommended for routine immunization of individuals with asymptomatic HIV infection who do not have evidence of severe immunosuppression.

3. MMR vaccine should be **considered** for all symptomatic HIV-infected persons who do not have evidence of severe immunosuppression, as defined in the table listing contraindications for measles-containing vaccines.

4. It is now recommended that **severely immunocompromised HIV-infected individuals** (as defined by low CD4+ counts or low percentage of CD4+ circulating lymphocytes—see table listing contraindications for measles-containing vaccines) should **NOT** receive MMR or other measles-containing vaccines.

Measles-containing vaccines are *contraindicated* in those with the following:

Age Group	Total CD4+ Count	*or*	CD4+ as a % of Total Lymphocytes
< 12 months	< 750/mcL	*or*	< 15%
1–5 years	< 500/mcL	*or*	< 15%
6–12 years	< 200/mcL	*or*	< 15%
≥ 13 years	< 200/mcL	*or*	< 14%

5. Because the immunologic response to vaccines is often poor in HIV-infected patients, the first dose of MMR should be given as early as possible after 12 months of age. This will increase the chance of an adequate immune response before further deterioration of the immune system.

6. Give the second dose of MMR 4 weeks after the first. This will increase the likelihood of seroconversion.

7. During outbreak situations only, and after consultation with NJDHSS, consider giving the first dose of **monovalent** measles vaccine or MMR if monovalent is not available at six to 11 months of age to those infants who are not severely immunocompromised. Remember, these children **must be revaccinated** with two doses of MMR beginning at 12 months of age. Mumps- or rubella-containing vaccines cannot be given at < 12 months of age and are not counted as valid doses and must be repeated on or after the first birthday.

7 OUTBREAK SITUATIONS

In an outbreak situation, guidance will be given by NJDHSS staff. In general, information will need to be tracked by constructing a line listing of cases that provides a status of ongoing case investigations and a summary of the current outbreak. During the outbreak, every suspected case would need to be thoroughly investigated. Data would need to be used to determine the scope of the outbreak and potential for spread. Achieving a high level of immunity in the population in which the outbreak is occurring is the primary method of controlling a measles outbreak.

8 PREVENTIVE MEASURES

A. Personal Preventive Measures and Education

Vaccination, including routine childhood vaccination, catch-up vaccination of adolescents, and targeted vaccination of high-risk adult groups (including international travelers), is the best preventive measure against measles. It is particularly important to vaccinate susceptible household contacts of high-risk susceptibles who cannot themselves be vaccinated, such as immunocompromised individuals, pregnant women, and infants. Good personal hygiene (which consists of proper handwashing, disposal of used tissues, not sharing eating utensils, etc.) is also important in preventing measles.

Please refer to the most current versions of the ACIP statement on measles, rubella, and mumps (listed under References). These, as well as other relevant resources, are available through NJDHSS VPDP at 609.826.4860. For more information regarding international travel and measles, contact CDC's Traveler's Health Office at 877.394.8747 or through the Internet at http://www.cdc.gov/travel.

Additional Information

Additional information on measles can be obtained at the NJDHSS Web site at http://www.state.nj.us/health/. Click on the "Topics A to Z" link and scroll down to subject "Measles."

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Attachment A

NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
NEW JERSEY PUBLIC HEALTH AND ENVIRONMENTAL LABORATORY

SPECIMEN COLLECTION FOR DIAGNOSIS OF MEASLES

I. ANTIBODY DETECTION

Submission of specimens to the Virology Laboratory at the PHEL must first be approved and coordinated through a VPDP staff member by calling 609.826.4860. Technical questions about specimen collection can be addressed to the Virology Laboratory at 609.984.2622.

Specimen type:	**Serum for IgM antibody (serology for acute infection).**
Collection procedure	Venipuncture. Serum-separator tubes (SST) preferred, red-top tubes acceptable.
Optimum collection time	Acute specimen should be collected ≥ 3 days after rash onset. Follow-up specimens for additional testing may be required.
Transportation container	Serum only, in polystyrene (plastic) tube, or centrifuged blood in SST.
Volume	2 mL serum; ≥ 0.5 mL may be acceptable for young children.
Transport	Cold, use ice packs. **DO NOT FREEZE.**

IMPORTANT! To avoid loss or misdirection of the specimen within the 8-story state laboratory building, PLEASE FILL OUT THE MICROBIOLOGY LAB SUBMISSION FORM AS COMPLETELY AS POSSIBLE AND ENCLOSE WITH THE SPECIMEN.

Download and complete the virus serology requisition form (SRD-1):

http://www.state.nj.us/health/forms/srd-1.pdf

(See next page directions for collection of viral isolates.)

NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
NEW JERSEY PUBLIC HEALTH AND ENVIRONMENTAL LABORATORIES

II. VIRAL ISOLATION

Please note: Urine, nasal, or blood culture specimens should not be substituted for serum specimens for serological measles diagnosis. When collecting specimens for viral isolation, please try to collect both urine and nasopharyngeal specimens, with blood being collected for viral isolation only under certain circumstances.

Specimen type	**Urine**
Collection procedure	Collect clean void, first morning urine.
Optimum collection time	Preferably within 5 days of rash onset, and not later than 16 days, unless immunosuppressed. (In this case, consult with state laboratory about timing of specimen collection.)
Transportation container	Sterile plastic screw-capped container.
Volume	50–100 mL
Transport	Cold, on wet ice or use ice packs. **DO NOT FREEZE.** Should be received at the lab within 24 hours of collection.

Specimen type	**Nasopharynx swab**
Collection procedure	Collect specimen by using two cotton/dacron swabs. Insert one swab into both anterior nares; rotate swab and remove. Insert second swab into pharynx, rotate swab and remove.
Optimum collection time	Preferably within five days of rash onset, and not later than five days, unless immunosuppressed. (In this case, consult with state laboratory about a timing of specimen collection.)
Transportation container	Cotton/dacron swabs in viral transport media (VTM). Commercially available kits containing swabs and VTM are acceptable. If commercial kits are not used, you may place both swabs into any type of VTM. **Keeping swabs moist is most important.**
Volume	3 mL of VTM
Transport	Cold, on wet ice or ice packs. **DO NOT FREEZE.** Should be received at the lab within 48 hours of collection.

Specimen type	**Blood culture** (least desirable specimen)
Collection procedure	Venipuncture
Optimum collection time	Within 7 days of rash onset, unless immunosuppressed.
Transportation container	Green-top tube (heparinized)
Volume	5 mL of blood
Transport	Cold, on wet ice or ice packs. **DO NOT FREEZE**. Should be received at the lab within 24 hours of collection.

Attachment B

Recommendations for Measles Immunization

Category	Recommendations
Unimmunized, no history of measles (12–15 mo of age)	A two-dose schedule (with MMR) is recommended if born after 1956. The first dose is recommended at 12–15 mo of age; the second is recommended at 4–6 y of age
Children 6–11 mo of age in epidemic situations	Immunize (with monovalent measles vaccine or, if not available, MMR); reimmunization (with MMR) at 12–15 mo of age is necessary, and a third dose is indicated at 4–6 y of age
Children 4–12 y of age who have received only 1 dose of measles vaccine at ≥ 12 mo of age	Reimmunize (one dose) ***unless*** serologic proof of immunity
Students in college and other post-high school institutions who have received only 1 dose of measles vaccine at ≥ 12 mo of age	Reimmunize (one dose) ***unless*** serologic proof of immunity
History of immunization before the first birthday	Consider susceptible and immunize (two doses) ***unless*** serologic proof of immunity
History of receipt of inactivated measles vaccine or unknown type of vaccine, 1963–1967	Consider susceptible and immunize (two doses) ***unless*** serologic proof of immunity
Further attenuated or unknown vaccine given with IG	Consider susceptible and immunize (two doses) ***unless*** serologic proof of immunity
Allergy to eggs	Immunize; no reactions or severe anaphylaxis likely (see Attachment C for details)
Neomycin allergy, non-anaphylactic	Immunize; no reactions likely
Severe hypersensitivity (anaphylaxis) to neomycin or gelatin	Avoid Immunization
Tuberculosis	Immunize; vaccine does not exacerbate infection
Measles exposure	Immunize and/or give IG, depending on circumstances
HIV-infected	Immunize (two doses), unless severely immunocompromised
Personal or family history of seizures	Immunize; advise patient of slightly increased risk of seizures
Immunoglobulin or blood recipient	Immunize at the appropriate interval (interval is product dependent*)

*Please refer to the table "Suggested Intervals Between Administration of Immunoglobulin Preparations and Measles-Containing and Varicella Vaccines" (Attachment D).

Adapted from Pickering LK, ed. Measles. In: American Academy of Pediatrics. *2006 Red Book: Report of the Committee on Infectious Diseases*. 27th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2006:446.

Attachment C

A. Measles, Mumps, Rubella (MMR) Vaccine Fact Sheet

1. Allergy Reactions to Egg-related Antigens

Hypersensitivity to eggs is not a contraindication per the American Academy of Pediatrics (AAP) and the Advisory Committee on Immunization Practices (ACIP). Current measles and mumps vaccines (but not rubella vaccine) are derived from chicken embryo fibroblasts and do not contain significant amounts of ovalbumin. Gelatin in the vaccine may be the cause of many allergic reactions. Recent studies indicate that those with an egg allergy, even anaphylaxis, are at low risk for anaphylaxis following MMR. Skin testing with diluted vaccine is **NOT** predictive of an allergic reaction to vaccine.

Recommendations

- Routinely vaccinate those with an egg allergy with any of these vaccines:
    - Monovalent measles vaccine.
    - Monovalent mumps vaccine.
    - Monovalent rubella vaccine (rubella vaccine is not grown in chicken embryo cell culture), or
    - MMR vaccine.

  (Sensitivity to eggs is still a contraindication for influenza and yellow fever vaccines.)

- After vaccination:
    - Observe for 90 minutes
    - If they have a significant hypersensitivity reaction post vaccination:
        1) Test for serologic immunity to measles, mumps and rubella. If immune, then they do **NOT** need a second dose of MMR vaccine.
        2) Evaluate and consider performing a skin test before receiving a second dose. Perform skin test on those who are not immune.

2. Allergic Reactions to Neomycin and Gelatin

Neomycin allergy most often manifests as a contact dermatitis. Non-anaphylactic reactions to either neomycin or gelatin are **NOT** contraindications to MMR vaccine. However, persons who have experienced true anaphylactic reactions to topically or systemically administered neomycin, or to gelatin, should receive MMR vaccine only in settings where such reactions can be managed, and after consultation with an allergist or immunologist.

3. MMR Vaccine and Autism, Associated Disorders, and Inflammatory Bowel Disease

The Institutes of Medicine Immunization Safety Review Committee has concluded that the recent increases in autism and related disorders are not attributable to MMR vaccine. The AAP convened a panel of experts that also found that the available evidence does not support that MMR vaccine causes autism, associated disorders, or inflammatory bowel disease.

4. Acute Arthritis and Arthralgia

Arthralgia (joint pain) and arthritis can occur in **susceptible** individuals post-vaccination with MMR. Joint pain has been reported in 0.5% of children. Up to 25% of post-pubertal females may develop arthralgia and up to 10% may develop transient arthritis. Symptoms of acute arthritis arthralagia are much less common post-vaccination then with natural disease. If joint symptoms do occur, post-vaccination, they generally begin one to three weeks post vaccination, are transient, and last only one to 21 days.

Recommendations
Because the potential risks of a susceptible woman having a child with congenital rubella syndrome far outweigh risks of joint pain, vaccinate susceptible women of childbearing age or women without adequate written documentation of vaccination or serologic immunity.

5. Thrombocytopenia Purpura

Reports of adverse reactions in the United States and other countries indicate that MMR can rarely cause clinically apparent thrombocytopenia within two months of vaccinations. Reported cases have been transient and benign in outcome. The estimated number of cases is two per one million doses distributed in the United States.

However, based on these case reports, the risk of vaccine-associated thrombocytopenia may be higher for those who have had a previous episode of thrombocytopenia, especially if it occurred in temporal association with MMR vaccination.

Recommendations
If an individual has a prior history of thrombocytopenia

- Check for serologic immunity (if immune, vaccination is **NOT** indicated)
- Assess risk and benefit of vaccination. In most cases, the benefits of vaccination outweigh the risks.

6. Altered Immune Status

Enhanced replication of vaccine viruses may occur in persons who have immune deficiency diseases and in other persons who are immunocompromised. For some of these conditions, all affected persons are severely immunocompromised. For other conditions (e.g., HIV infection), the degree to which the immune system is compromised depends on the severity of the condition, which in turn depends on the disease or treatment stage. Ultimately, the patient's healthcare provider must assume responsibility for determining whether the patient is severely immunocompromised on the basis of clinical and laboratory assessment. MMR vaccine should not be administered to severely immunocompromised patients.

7. MMR Vaccine for HIV-Infected Individuals

Because measles can be severe and often fatal in patients with HIV infection, MMR vaccine is recommended for people with asymptomatic HIV infection who are not severely immunocompromised. Severely immunocompromised HIV-infected patients, as defined by low CD4+ T-lymphocyte counts (considering age), should not receive measles-containing vaccine because vaccine-related pneumonia has been reported.

a) Prevaccination HIV testing is **NOT** recommended.

b) Administer MMR vaccine for routine immunization of individuals with asymptomatic HIV infection who do not have evidence of severe immunosuppression.

c) Consider MMR vaccine for all symptomatic HIV-infected persons who do not have evidence of severe immunosuppression, as defined in the following table.

Measles-containing vaccines are contraindicated in those with the following:

Age Group	Total CD4+ Count	*or*	CD4+ as a % of Total Lymphocytes
< 12 months	< 750/mcL	*or*	< 15%
1–5 years	< 500/mcL	*or*	< 15%
6–12 years	< 200/mcL	*or*	< 15%
≥ 13 years	< 200/mcL	*or*	< 14%

d) It is now recommended that **severely immunocompromised HIV-infected individuals** (as defined by low CD4+ counts or low percentage of CD4+ circulating lymphocytes—see table) should **NOT** receive MMR or other measles-containing vaccines.

e) Because the immunologic response to vaccines is often poor in HIV-infected patients, the first dose of MMR should be given as early as possible after 12 months of age. This will increase the chance of an adequate immune response before further deterioration of the immune system can occur.

f) Give the second dose of MMR 4 weeks after the first. This will increase the likelihood of seroconversion.

g) During outbreak situations only, consider giving the first dose of monovalent measles vaccine or MMR vaccine, if single measles antigen is not available, at six to 11 months of age to those infants who are not severely immunocompromised. Remember, these children must be revaccinated with two doses of MMR beginning at 12 months of age as described in section 6.C.3.

h) Administer MMR vaccine to health contacts of severely immunocompromised persons.

8. Live Virus Vaccines and Immunosuppressive Therapy

a) After chemotherapy and other immunosuppressive therapy (except steroids—see b) below), MMR vaccine should not be given for ≥ 3 months.

b) For patients on steroids, live virus vaccines should be deferred as outlined in the following table:

Guidelines for Administration of Live Virus Vaccines and Steroid Therapy *

Steroid Therapy	Recommendations for Deferral
High-dose systemic steroids daily or on alternate days for ≥ 14 days (≥ 2mg/kg QD or ≥ 20 mg QD of prednisone)	Defer live virus vaccines for ≥ 1 month after treatment has stopped.
High-dose systemic steroids daily or on alternate days for < 14 days (≥ 2 mg/kg QD or ≥ 20 mg QD prednisone)	Can give live virus vaccines immediately after treatment is discontinued. However, some experts recommend deferring until two weeks after treatment has stopped, if possible.
Low or moderate doses of systemic steroids given daily or on alternate days (< 2 mg/kg QD or < 20 mg QD of prednisone); or Physiologic maintenance doses of steroid (replacement therapy)	Can give live virus vaccines on treatment.
Topical, aerosol, or local injections of steroids (e.g., skin, aerosol, eyes, intra-articular, bursal, tendon injections)	Can give live virus vaccines on treatment. However, if this therapy is prolonged and there is any clinical or laboratory evidence of immunosuppression, defer for ≥ 1 month after treatment has stopped.
Individuals with a disease that in itself is considered to suppress the immune response and who are receiving systemic or locally acting steroids	Should not give live virus vaccines, except in special circumstances.

***Steroid therapy is** not **a contraindication for administration of** killed **vaccines.**

9. MMR Vaccine and Pregnant Women

MMR vaccine is contraindicated in pregnant women because of the theoretical risk to the fetus. To date, there are no data demonstrating any ill effects on developing fetuses. Current data, estimated risk and recommendations are outlined below.

- **Rubella**—There is NO evidence that rubella vaccine causes congenital rubella syndrome. However, pregnant women should not be immunized because of the theoretical risk to the fetus, estimated to be 1.6%, based on data accumulated by CDC on 226 susceptible women who received the current RA27/3 vaccine strain during the first trimester. Only 2% of the babies had asymptomatic infection, but **none** had congenital defects. This risk is substantially less than the ≥ 20% risk for congenital rubella syndrome associated with maternal infection in the first trimester of pregnancy. In view of these observations, receipt of rubella vaccine in pregnancy is NOT an indication for termination of pregnancy.

- **Mumps**—There is no evidence that mumps vaccine will cause mumps infection in an unborn fetus. Live mumps vaccine can infect the placenta, but the virus has NOT been isolated from fetal tissue.
- **Measles**—There is NO evidence that measles vaccine will cause measles infection in an unborn fetus.

Recommendations

- **Screening**—Routine prevaccination pregnancy testing is **NOT** recommended. The American College of Obstetricians and Gynecologists, ACIP, and AAP state that it is sufficient to screen by asking a woman whether she is pregnant.
- **Patient advice**—Women should be informed of the theoretical risk to the fetus if they are pregnant or plan to become pregnant within one month following vaccination. In view of this theoretical risk, they should be advised not to become pregnant for one month following MMR vaccine.
- **Documentation**—Date of last menstrual period and the advice given to the patient may be documented in the woman's chart.

10. MMR and Tuberculosis Testing

Measles vaccination may temporarily suppress tuberculin reactivity. If testing cannot be done the day of MMR vaccination, the tuberculosis test should be postponed for 4 to 6 weeks after the measles/MMR vaccination was administered.

11. Invalid Doses

Doses of measles, mumps, or rubella vaccines conforming to the following criteria are considered **invalid**:

- Received before first birthday
- Received after recent receipt of IG (please refer to Attachment D)
- Killed measles vaccine
- Killed measles vaccine followed by live vaccine within three months (both doses are invalid)
- Measles vaccine of unknown type received prior to 1963–1967
- Simultaneous receipt of IG and either a further attentuated measles vaccine (i.e. containing Schwartz or Moraten strains) or measles vaccine of unknown type
- Killed mumps vaccine
- Mumps vaccine of unknown type received prior to 1979
- Live rubella vaccine accompanied by IG

Revaccination with MMR is recommended for eligible individuals, such that at least two valid doses of measles-containing vaccine, one of mumps, and one of rubella are documented, or serologic proof of immunity for all three antigens is evident.

Attachment D

Use of Immune Globulin (IG)

A. Indications for IG in Susceptibles With Contraindications to Measles Vaccine

IG given ≤ 6 days postexposure can modify disease or prevent illness. It is unlikely to be effective if given > 6 days postexposure. IG should be considered for all immunocompromised patients. If patients are severely immunocompromised, IG should be given, regardless of past history of vaccination (unless they have serologic proof of immunity). IG is also indicated for susceptible pregnant women and infants < 12 months of age with contraindications to measles-containing vaccine or one of its components. The dose of IG depends on the underlying medical condition of the patient, as outlined below:

1. IG 0.25 mL/kg IM (maximum 15 mL) should be given to

- Susceptible pregnant women;
- Immunocompromised individuals (non–HIV-infected) who are not severely immunosuppressed;
- Susceptible asymptomatic HIV-infected individuals (with CD4+ cell counts > 200) if exposed > 3 to 6 days prior (if exposed ≤ 3 days prior, they should receive MMR);
- Infants < 12 months of age;
- Those with anaphylactic reactions to neomycin or gelatin; and
- Those with other contraindications for measles-containing vaccine; egg hypersensitivity is **NO LONGER** considered a contraindication.

2. IG 0.50 mL/kg IM (maximum 15 mL) should be given to

Symptomatic HIV-infected individuals who are severely immunosuppressed (those with CD4+ cell counts < 200 or equivalent CD4+ counts for children) regardless of past history of immunization, unless they have serologic proof of immunity.

3. If IGIV (100–400 mg/kg) has been given ≤ 3 weeks before exposure

That individual should be considered protected, and no additional IG is needed. However, some experts recommend an additional dose of IGIV if ≥ 2 weeks have elapsed since the last dose.

NOTE: Although IG can modify illness, INDIVIDUALS REMAIN SUSCEPTIBLE AND CAN STILL BECOME INFECTIOUS AND MUST BE ISOLATED OR EXCLUDED.

B. Immune Globulin and Live Vaccines

1. **IG can inhibit the immune response to some live vaccines. After an individual has received IG or other blood products, these vaccines should be deferred for the appropriate time interval, after IG administration, as outlined below:**

- Measles vaccine**—**interval is IG-dose dependent and measles-containing vaccines should be deferred for
    - ≥ 5 months, if received the 0.25 mL/kg dose;
    - ≥ 6 months, if received the 0.50 mL/kg dose;
    - three to 11 months, if received any other blood product. Please refer to the table "Suggested Intervals Between Administration of Immunoglobulin Preparations and Measles-Containing and Varicella Vaccines."
- **Mumps vaccine—**should be deferred ≥ 3 months.
- **Rubella vaccine—**should be deferred ≥ 3 months.
- **Varicella vaccine—**interval is IG-dose dependent and vaccine should be deferred for three to 11 months, depending on the blood product reserves. Please refer to the table "Suggested Intervals Between Administration of Immunoglobulin Preparations and Measles-Containing and Varicella Vaccines."
- **Oral Polio Vaccine and Oral Typhoid Vaccine—**response to this vaccine is **not** affected by IG or blood products.
- **Live viral vaccines—**response to these vaccines is not affected by Respiratory Syncytial Virus immune globulin (RSVIG) IM.
- **Inactivated vaccines—**response to these vaccines is **not** affected by IG or blood products.

2. **Conversely, if MMR and varicella vaccines were given before IG or blood products, these products should be deferred for ≥ 2 weeks (if possible). This allows adequate immune response to develop. If these products cannot be deferred for ≥ 2 weeks, the individual should be either revaccinated or tested for serologic immunity and revaccinated after the interval specified in the table "Suggested Intervals Between Administration of Immunoglobulin Preparations and Measles-Containing and Varicella Vaccines."**

New Jersey Department of Health and Senior Services

Suggested Intervals Between Administration of Immunoglobulin Preparations and Measles-Containing and Varicella Vaccines

Product/Indication	Dose (Including mg [IgG]/kg Body Weight)	Recommended Interval Before Measles or Varicella Vaccination (Months)
Respiratory syncytial virus immune globlulin (RSVIG) monoclonal antibody (Synagis™)	15 mg/kg intramuscularly (IM)	None
Tetanus (TIG)	250 units (10 mg IgG/kg) / IM	3
Hepatitis A (IG)		
Contact prophylaxis or international traveler < 3months	0.02 mL/kg (3.3 mg IgG/kg) / IM	3
International travel 3-5 months	0.06 mL/kg (10 mg IgG/kg) / IM	3
Hepatitis B prophylaxis (HBIG)	0.06 mL/kg (10 mg IgG/kg) / IM	3
Rabies prophylaxis (RIG)	20 IU/kg (22 mg IgG/kg) / IM	4
Varicella prophylaxis (VZIG)	125 units/10 kg (20–40 mg IgG/kg) / IM (max. 625 units)	5
Measles prophylaxis (IG)		
Standard contact (ie nonimmunocompromised)	0.25 mL/kg (40 mg IgG/kg) / IM	5
Immunocompromised contact	0.50 mL/kg (80 mg IgG/kg) / IM	6
Blood transfusion		
Red blood cells (RBCs), washed	10 mL/kg (negligible IgG/kg) / IV	0
RBCs adenine-saline added	10 mL/kg (10 mg IgG/kg) / IV	3
Packed RBCs (Hct 65%)	10 mL/kg (60 mg IgG/kg) / IV	6
Whole blood (Hct 35%-50%)	10 mL/kg (80–100 mg IgG/kg) / IV	6
Plasma/platelet products	10 mL/kg (160 mg IgG/kg) / IV	7
Cytomegalovirus intravenous immune globulin (IGIV)	150 mg/kg maximum IV	6
Respiratory Syncytial Virus Prophylaxis IGIV	750 mg/kg / IV	9
IGIV		
Replacement therapy for immune deficiencies	300-400 mg/kg IV	8
Immune thrombocytopenic purpura	400 mg/kg IV	8
Immune thrombocytopenic purpura	1,000 mg/kg IV	10
Kawasaki disease	2 grams/kg IV	11

Note on <u>other</u> live vaccines: Blood and other antibody-containing products (except washed red blood cells) can also diminish the response to rubella vaccine and potentially to mumps vaccine. Therefore, after IG preparations or other antibody-containing products are received, mumps and rubella vaccines should be deferred for ≥ 3 months. If RSV-IGIV is given, mumps, rubella, and varicella vaccines should be deferred for ≥ 9 months. If RSV-IM is given, no deferral is needed for any live virus vaccines.

Adapted from: Centers for Disease Control and Prevention. General Recommendations on Immunization: Recommendations of the Advisory Committee on Immunization Practices (ACIP) and the American Academy of Family Physicians (AAFP). *MMWR. Morb Mortal Wkly Rep. 2002;RR-2:7. (RR-2): 7.*

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New Jersey Department of Health and Senior Services
P. O Box 361
Trenton, NJ 08625-0361

Lab ID No.

REQUEST FOR IMMUNOLOGICAL/ISOLATION SERVICES
-VIRAL TESTING UNIT-

COMPLETE ALL INFORMATION - MUST BE LEGIBLE TO AVOID PROCESSING DELAYS!

Name (Last, First, MI) | Zip Code | Patient ID/SSN

Address | City

Sex ☐ Male ☐ Female | DOB / / | Ethnicity ☐ Hispanic/Latino ☐ Non-Hispanic/Non-Latino

Race
☐ White (European, No. African, Middle Eastern) ☐ Native Hawaiian or Other Pacific Islander ☐ Asian
☐ American Indian or Alaskan Native ☐ Black or African American ☐ Other

Specimen Type

	Date/Time		Date/Time
☐ Serum		☐ Sputum	
☐ Plasma (EDTA)		☐ Swab	
☐ CSF		☐ Lesion/Vesicle Aspirate	
☐ Nasal Wash		☐ Stool	
☐ Throat Wash		☐ Biopsy/Autopsy	
☐ Broncheoalveolar Lavage/Wash		☐ Other:	

Onset Date | Pertinent Clinical Information (brief history, clinical findings, relevant lab data)

Tests Requested

Viral Serology Screens
90420 ☐ Rubella (German Measles) IgG
90430 ☐ Rubeola (Measles) IgG
90440 ☐ Mumps IgG
90550 ☐ Varicella IgG
90560 ☐ Cytomegalovirus IgG
90570 ☐ Toxoplasmosis IgG
90580 ☐ Epstein Barr Virus IgG
90590 ☐ Mycoplasma IgG
90600 ☐ Herpes Group IgG

Viral Isolation Testing
90710 ☐ CMV
90720 ☐ HSV
90730 ☐ Influenza
90740 ☐ Parainfluenza
90750 ☐ RSV
90760 ☐ Varicella
90770 ☐ Adenovirus
90780 ☐ Vaccinia
90790 ☐ Enterovirus
90700 ☐ Other

Current Infection/Outbreak Investigation
90425 ☐ Rubella IgM
90430 ☐ Rubeola IgM
90455 ☐ Varicella IgM
90565 ☐ Cytomegalovirus IgM
90575 ☐ Toxoplasmosis IgM

Hepatitis Testing
90610 ☐ Hepatitis A Total Antibody
90630 ☐ Hepatitis B Surface Antigen
90640 ☐ Hepatitis B Surface Antibody
90650 ☐ Antibody to Hepatitis B Core Antigen
90660 ☐ Hepatitis C Antibody
90670 ☐ Quantitative Hepatitis B Antibody

☐ Other Tests (specify): _____

Date/Time Received

Physician Name (Print)

Submitter Information
_____ (Name)
_____ (Address)
_____ (City) (State) (Zip)

Physician Telephone Number
( ) -

Physician Fax Number (including area code)
(if you would like results faxed)
( ) -

SRD-1
AUG 04

REQUEST FOR IMMUNOLOGICAL/ISOLATION SERVICES
-VIRAL TESTING UNIT-
(SRD-1) FORM

INSTRUCTIONS

- Complete one (1) form for each patient.
- Provide all information requested on the form.
- Please include additional patient information as warranted in the "Pertinent Clinical Information" box on the form.

Viral Isolation:

- Collect specimens aseptically as soon as possible after onset or at autopsy. Label each specimen with patient identification information, type of specimen(s), date of collection. Refrigerate samples immediately and deliver to the New Jersey Department of Health and Senior Services, Public Health and Environmental Health Laboratories as soon as possible.* Maintain cold chain throughout delivery process. If delivery will be delayed, specimens should be frozen at -70° C. Stool specimens submitted for Norovirus testing should be refrigerated only. Do not add fixatives or preservatives to samples.

Viral Serology:

- Collect acute specimen via venipuncture into appropriate tube (red top, serum separator) within 7 days of onset. Convalescent samples should be drawn similarly 14 to 21 days after the acute sample. Store specimens at 2-8° C until they can be delivered to the Lab. If specimen will not be delivered to the lab within 7 days, freeze serum samples at -20° C. Maintain the specimen cold chain during delivery.

***Delivery:**

Ground deliveries should be made to:

NJ Department of Health and Senior Services
Public Health and Environmental Laboratories
Specimen Receiving Unit
Warren and Market Streets
Trenton, NJ 08611

Exhibit II

New Jersey Department of Health and Senior Services
Vaccine Preventable Diseases Program
PO Box 369
Trenton, NJ 08625-0369

Case Status
☐ Confirmed
☐ Probable
☐ Suspect

MEASLES SURVEILLANCE WORKSHEET

Patient Name (Last, First)	Telephone No.	CDRSS #	E#

Street Address	City	Zip	County

Reporting Source	Treating Physician	Address of Physician	Telephone No.
Dates Physician Saw	**Name of Investigator**	**Name of Agency**	**Telephone No.**
Hospital	**Hospital Record Number**	**Hospital Address**	**Telephone No.**

Country of Birth	Birth Date	Age	Age Type
	__ __ / __ __ / __ __ *(mm/dd/yy)*	__ __ __ *(Unknown = 999)*	0 ☐ 0-120 Years 1 ☐ 0-11 Months 2 ☐ 0-2 Weeks 3 ☐ 0-28 Days 9 ☐ Age Unknown

Ethnicity	Race	Sex
H ☐ Hispanic N ☐ Not Hispanic U ☐ Unknown	N ☐ Native American/Alaskan Native A ☐ Asian/Pacific Islander B ☐ African American W ☐ White O ☐ Other U ☐ Unknown	M ☐ Male F ☐ Female U ☐ Unknown

Event Date	Event Type
__ __ / __ __ / __ __ *(mm/dd/yy)*	1 ☐ Onset Date 2 ☐ Diagnosis Type 3 ☐ Lab Test Date 4 ☐ Reported to County 5 ☐ Reported to State or MMWR Report Date 9 ☐ Unknown

Outbreak Associated	Reported	Imported	Report Status
__ __ __ *(Unknown = 999)*	__ __ / __ __ / __ __ *(mm/dd/yy)*	1 ☐ Indigenous 2 ☐ International 3 ☐ Out of State 9 ☐ Unknown	1 ☐ Confirmed 2 ☐ Probable 3 ☐ Not a Case 9 ☐ Unknown

CLINICAL DATA				COMPLICATIONS			
Symptoms	**Yes**	**No**	**Unknown**	**Symptoms**	**Yes**	**No**	**Unknown**
Any Rash If Yes, Date of Rash Onset: __ __ / __ __ / __ __ *(mm/dd/yy)* Rash Duration: ____ ____ *(0-30; 99 = Unknown)*				Otitis			
				Diarrhea			
				Pneumonia			
				Encephalitis			
				Thrombocytopenia			
Rash Generalized				Death			
Fever If Recorded, Highest Measured Temperature __ __ __ . __ Degrees F. *(36.0 – 110.0; 999=Unknown)*				Other Complications (If Yes, specify):			
Cough				Hospitalized? (If Yes, Days Hospitalized): __ __ __ *(0-998; 999 = Unknown)*			
Coryze							
Conjunctivitis							

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MEASLES SURVEILLANCE WORKSHEET, Continued

LABORATORY

Was Laboratory Testing for Measles Done?	Date IgM Specimen Taken	Result
☐ Yes ☐ No ☐ Unknown	__ __ / __ __ / __ __ (mm/dd/yy)	P ☐ Positive E ☐ Pending N ☐ Negative X ☐ Not Done I ☐ Indeterminate U ☐ Unknown

Date IgG Acute Specimen Taken	Date IgG Convalescent Specimen Taken	Result
__ __ / __ __ / __ __ (mm/dd/yy)	__ __ / __ __ / __ __ (mm/dd/yy)	P ☐ Significant Rise in IgG N ☐ No Significant Rise in IgG I ☐ Indeterminate X ☐ Not Done E ☐ Pending U ☐ Unknown

Other Lab Result	Specify Other Lab Method
P ☐ Positive I ☐ Indeterminate E ☐ Pending N ☐ Negative X ☐ Not Done U ☐ Unknown	

VACCINE HISTORY

Vaccinated? (Received measles-containing vaccine?)	Number of doses received ON or AFTER 1st birthday:	If not vaccinated, what was the reason?
☐ Yes ☐ No ☐ Unknown		1 ☐ Religious Exemption 2 ☐ Medical Contraindication 3 ☐ Philosophical Objection 4 ☐ Lab Evidence of Previous Disease 5 ☐ MD Diagnosis of Previous Disease 6 ☐ Under Age for Vaccination 7 ☐ Parental Refusal 8 ☐ Other 9 ☐ Unknown

Vaccination Date ***(MM/DD/YY)***	**Vaccine Type Code** (A=MMR, B=Rubella, O=Other, U=Unknown)	**Vaccine Manuf. Code** (M=Merck, O=Other, U=Unknown)	**Lot Number**

EPIDEMIOLOGIC

Date First Reported to a Health Dept.	Date Case Investigation Started	Outbreak Related?	If Yes, Outbreak Name
__ __ / __ __ / __ __ (mm/dd/yy)	__ __ / __ __ / __ __ (mm/dd/yy)	☐ Yes ☐ No ☐ Unknown	

Transmission Setting (Where did this case acquire measles?)

1 ☐ Day Care 2 ☐ School 3 ☐ Doctor's Office 4 ☐ Hospital Ward 5 ☐ Hospital ER 6 ☐ Hospital Outpatient Clinic 7 ☐ Home 8 ☐ Work 9 ☐ Unknown 10 ☐ College 11 ☐ Military 12 ☐ Correctional Facility 13 ☐ Church 14 ☐ International Travel 15 ☐ Other

If Transmission Setting not among those listed and known, what was the transmission setting?

Were Age and Setting Verified? (Is age appropriate for setting, i.e., aged 49 years and in day care, etc.?

☐ Yes ☐ No ☐ Unknown

Source of Exposure for Current Case *(Enter State ID if source was an in-state case; enter Country if source was out of US; enter State if source was out-of-state)*:	Epi-Linked to Another Confirmed or Probable Case?	Is Case Traceable within 2 Generations to an International Import?
	☐ Yes ☐ Unknown ☐ No	☐ Yes ☐ Unknown ☐ No

CONTACT INFORMATION (FOR STATISTICAL USE)

Mother's Name	Telephone Number
Father's Name	**Telephone Number**

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MEASLES SURVEILLANCE WORKSHEET, Continued

ACTIVITY HISTORY FOR 18 DAYS BEFORE RASH ONSET AND 7 DAYS AFTER RASH ONSET	
Day -18	
Day -17	
Day -16	
Day -15	
Day -14	
Day -13	
Day -12	
Day -11	
Day -10	
Day -9	
Day -8	
Day -7	
Day -6	
Day -5	
Day -4	
Day -3	
Day -2	
Day -1	
Day 0 (Rash Onset)	
Day 1	
Day 2	
Day 3	
Day 4	
Day 5	
Day 6	
Day 7	

Clinical Case Definition:

A generalized rash lasting ≥ 3 days, a temperature ≥ 101.0° F (≥ 38.3° C), and cough, coryza, or conjunctivitis.

Case Classification:

Suspected: any febrile illness accompanied by rash.

Probable: a case that meets the clinical case definition, has non-contributory or no serologic or virologic testing, and is not epidemiologically linked to a laboratory-confirmed case.

Confirmed: a case that is laboratory confirmed or that meets the clinical case definition and is epidemiologically linked to a confirmed case. A laboratory-confirmed case does not need to meet the clinical case definition.

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