



North Carolina Department of Health and Human Services
Division of Public Health

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Memorandum

Date: August 6, 2013

To: Megan M. Davies, MD
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From: Kristin M. Sullivan, MPH
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North Carolina Division of Public Health

Through: Zack Moore, MD, MPH
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Subject: **Measles Outbreak Associated with a Traveler to India, April-June, 2013**

We are submitting this memorandum as the final outbreak report to the North Carolina Division of Public Health.

Summary

A measles outbreak began in April of 2013 when an unvaccinated traveler became symptomatic after returning from India to North Carolina. Transmission from this patient resulted in an additional 22 cases of measles identified with onsets ranging over a five-week period. Cases were identified among residents of three North Carolina counties and in a visiting out-of-state resident. Control of the outbreak required extensive resources from state and local public health and resulted in the identification and investigation of over 1,000 contacts. The outbreak was first identified on April 14 and declared over on June 19.

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Background

On April 14, 2013, local and state public health officials were notified of suspected measles infections among two unvaccinated members of a family residing in Stokes County, North Carolina. The two suspected cases were household contacts of an unvaccinated individual who had developed similar symptoms after returning to the US from a three-month visit to India. This person, later identified as the source case, had previously sought medical attention for his illness. However, measles was not suspected until two weeks later when the two index cases sought medical attention at a local emergency department.

The Cone Health Systems Public Health Epidemiologist first reported the suspected cases to the Guilford County Health Department, since the source case had been hospitalized in Guilford. The Communicable Disease Branch (CDB) was notified and facilitated contact between the Stokes County Health Department (county of residence of suspected cases) and the Immunization Branch (IB). Investigation of the suspected cases on April 14th revealed that the family was from the Prabhupada Village in Stokes County. The village is a rural Hare Krishna community of approximately 25 families. These families were largely unvaccinated, although some residents had been vaccinated against measles. Measles was confirmed in the two suspected cases by testing at the State Laboratory of Public Health (SLPH) on April 16, 2013.

Methods

On April 14, public health officials from the Stokes County Health Department, Guilford County Health Department, IB and CDB initiated an outbreak investigation. Soon after, the Orange County Health Department became involved when a resident of the county was identified as having had close contact with the source case.

At the state level, a support structure was established to provide guidance and streamlined communications to the local health departments and the public. From April 14 through April 29, IB led the investigation and response with support from the CDB. On April 29, lead was transferred to CDB due to the impending transfer of vaccine-preventable disease surveillance and control activities to CDB (scheduled for May, 2013 before the measles outbreak occurred). Field teams from IB and CDB were sent to counties to provide additional support. The Incident Command System was activated on April 29 and the Public Health Command Center was opened in support of the investigation and response.

Control of the measles outbreak was established primarily through rapid epidemiological investigation of cases, use of isolation and quarantine, and the use of post-exposure prophylaxis (PEP). Given the extent of the outbreak and the number of organizations involved, clear communication strategies were needed to ensure accurate, timely information dissemination regarding the status of the outbreak. Details of the control strategies and communication measures are provided below.

Case investigation. The 2013 CSTE measles case definition was used to classify patients for investigation and control purposes. Control measures were implemented for all patients suspected of having measles even if laboratory results were pending or unavailable. These measures included isolating any suspected or known case until four days after rash onset; collecting specimens for laboratory confirmation and molecular characterization; and initiating contact investigations for the cases. Sample written isolation orders were provided by CDB for use by local health departments (see appendix).

To provide guidance to local health departments and clinicians in the affected and surrounding communities, the NC DPH issued two memos early in the outbreak (see appendix). A provider memo was issued on April 17 to alert providers to the outbreak and to provide guidance on managing suspected cases of measles. The NC State Laboratory of Public Health (NC SLPH) issued a memo on April 19 detailing appropriate specimen

collection, shipment and testing information. The memo requested collection of serum ≥ 72 hours after rash onset for IgM testing, as well as a throat and nasopharyngeal swabs and urine for viral culture and PCR.

An epidemic curve and line list were created by CDB to characterize the outbreak and to manage the clinical, laboratory and epidemiological details of each suspected and confirmed case.

Contact investigations. Detailed contact investigations were completed for all suspected, probable and confirmed cases. A contact of a measles case was defined as any person sharing air space with a case during his/her infectious period for up to two hours after a case had occupied that space. Exposure through shared air handling systems also needed to be considered in some instances. Ill contacts with acute, febrile rash illness, consistent with the incubation period of measles, were considered suspect cases and managed as described above. Contact investigations of asymptomatic, exposed individuals focused on determining susceptibility; preventing or modifying illness through the use of PEP; and limiting spread through quarantine of susceptible contacts.

Immunity status was assessed for all contacts. Contacts were considered to be presumptively immune to measles if they had any of the following: (1) birth before 1957, (2) written documentation of at least one dose of MMR (2 for healthcare workers), or (3) a positive measles IgG titer demonstrating evidence of previous immunization or disease. Immune contacts were educated about the signs and symptoms of measles and instructed to self-monitor for 21 days following their exposure.

Susceptible contacts eligible to receive MMR were offered vaccine. Except in healthcare settings, unvaccinated persons who received their first dose of MMR vaccine within 72 hours of exposure were allowed to return to child care, school or work provided all persons without documentation of immunity had been excluded. Susceptible contacts who did not receive the vaccine within 72 hours after exposure, were quarantined from the 5th through the 21st day after exposure. Healthcare workers without documentation of presumptive immunity who did not receive their *second* dose of MMR within 72 hours were subject to exclusion from the healthcare setting for the same time period.

IG was recommended for high-risk contacts such as susceptible pregnant women, infants, and immunocompromised individuals if it could be administered within six days of the last exposure. Although the receipt of IG can extend the incubation period of measles, IG recipients were subject to quarantine for the same duration (days 5 – 21) as other susceptible contacts.

Guidance on determining immunity to measles, the timing and administration of PEP, and quarantine requirements were summarized and sent to the local health departments on May 2 (see appendix).

MMR Use Policy. A memo issued on April 19 (see appendix) stated that the liberal use of state-supplied MMR vaccine had been authorized by the IB and was available to all affected counties and their neighboring counties. Liberal use allowed the counties to administer MMR universally to anyone for whom it was recommended, regardless of insurance status, as long as MMR was available. This policy was in effect from April 19 – June 18.

Surveillance. Enhanced surveillance for measles cases was initiated at the start of the outbreak and continued for two incubation periods following the last onset (ending June 18th). Public Health Epidemiologists initiated active surveillance in their respective facilities. Provider memos, sent on April 17 and May 13 (see appendix), reminded providers to consider measles in patients presenting with febrile rash illness.

Communication. Multiple channels were used during the outbreak to facilitate communications among the involved parties. Alerts were sent to local, state and national public health leaders through Epi-X and the NC Health Alert Network. The IB and CDB communicated regularly with local health officials through emailed situation reports and regular conference calls.

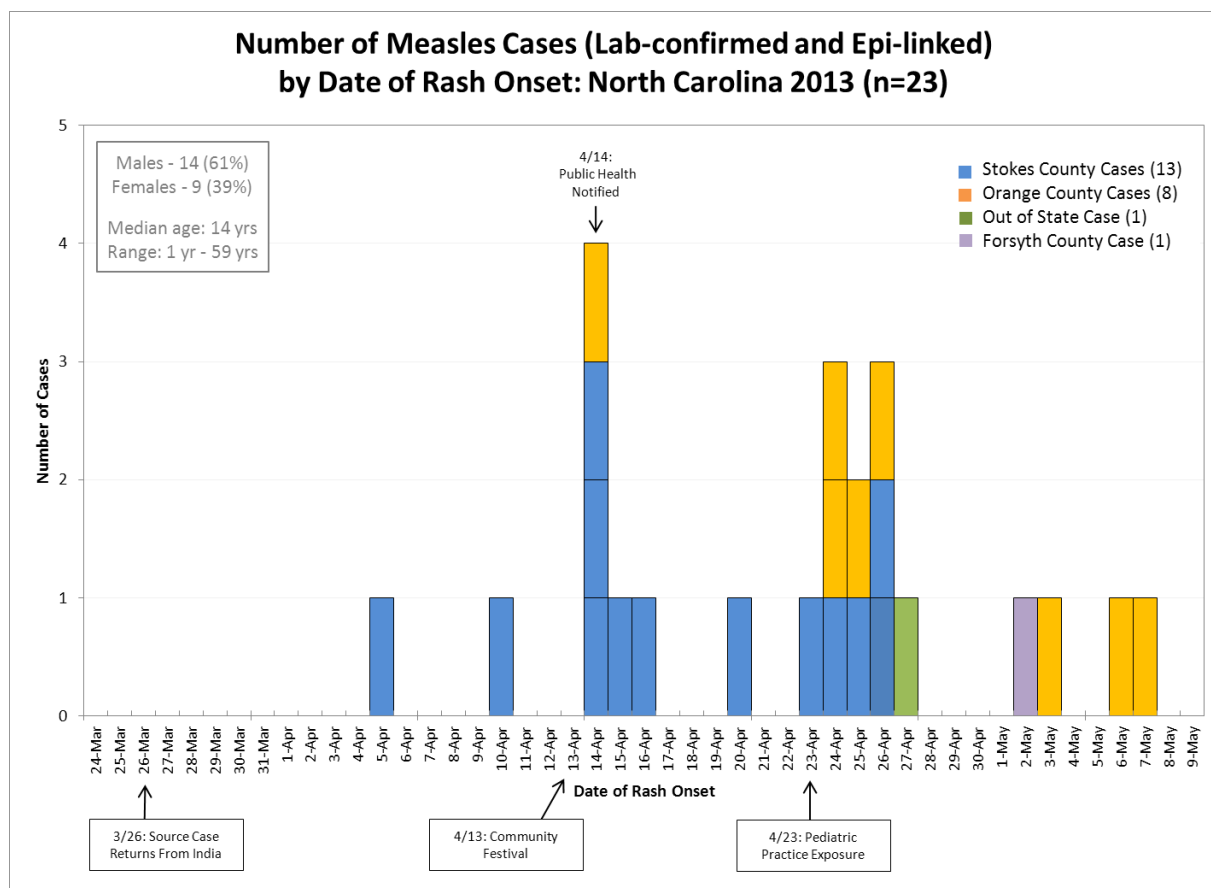
Other written communication tools were used to keep the public, provider and public health community informed of the outbreak status. Public notices such as press releases, provider updates, vaccination availability, and laboratory guidance were used to provide relevant information in a timely manner. These communication tools are described above and can be found in the appendices.

Results

Importation of the measles virus into North Carolina in an unvaccinated traveler in April of 2013 led to the first outbreak of measles in our state since 1989. Exposure to the source case led to three generations and 22 subsequent import-linked cases with onsets occurring over a five-week period in April and May. Rash onset dates and case counts are presented in the epidemic curve in Figure 1.

Cases were identified among residents of Stokes County (n=13, 57%), Orange County (n=8, 35%), and Forsyth County (n=1, 4%), and in one out-of-state resident exposed in Stokes County (n=1, 4%). The out-of-state resident remained isolated in Polk County for the duration of his illness.

Figure 1. Number of Laboratory-Confirmed and Epi-Linked Measles Cases in North Carolina by Date of Rash Onset, April–May 2013



Patient characteristics. Patient characteristics are summarized in Table 1. Patients ranged in age from 1-59 years with a mean age of 17 years. Sixty-one percent (n= 14) of patients were male. The majority of cases were white (70%), followed by other (17%), and Asian (13%). Ethnicity was known for 18 patients; two (9%) reported Hispanic ethnicity.

Eighteen cases (78%) occurred among unvaccinated persons, with a majority of these being members of the index patient's community. Three patients (13%) had documentation of a complete two-dose series of MMR vaccination. Vaccination status could not be determined for two patients (9%).

Table 1. Patient Characteristics of Measles Cases

Characteristic	n 23
Mean Age (range)	17 (1-59 y)
Sex	
Male	14 (61%)
Female	9 (39%)
Race	
White	16 (70%)
Other	4 (17%)
Asian	3 (13%)
Ethnicity	
Hispanic	2 (9%)
Non-Hispanic	16 (70%)
Unknown	5 (22%)
Vaccination Status	
Unvaccinated	18 (78%)
2 doses MMR	3 (13%)
Unknown	2 (9%)

Clinical Features and Complications. The 2013 measles clinical case definition was used to assess suspected cases of measles. The clinical case definition is provided below. Patients presenting with a generalized, maculopapular rash lasting at least three days with accompanying fever $\geq 101^{\circ}\text{F}$ plus either cough, coryza or conjunctivitis met the definition. Epidemiologically-linked cases needed only to have fever of any degree or rash of any duration to be classified as confirmed cases.

2013 Measles Case Definition (CSTE Position Statement(s): 12 ID 07)

Clinical Description, An acute illness characterized by:

- Generalized, maculopapular rash lasting ≥ 3 days; and
- Temperature $\geq 101^{\circ}\text{F}$ or 38.3°C ; and
- Cough, coryza, or conjunctivitis.

Fifteen cases (61%) met the clinical case definition for measles, two (9%) did not but involved febrile rash illness in persons who were epi-linked to case-patients, and six (30%) were unknown (measured temperature not taken (n=5) or duration of rash not documented (n=1)). One case that did not meet the clinical case definition was in a fully vaccinated person who was a household contact to a lab-confirmed case. This patient did not report cough, conjunctivitis or coryza. The other case that did not meet clinical case definition was in an unimmunized patient who had received PEP on the day of exposure. This patient reported only a two-day rash duration. All cases reported fever and rash.

Measured temperature was available for 18 patients and averaged a highest recorded temperature of 103°F degrees (range $101\text{--}104^{\circ}\text{F}$). In 21 patients with documented rash duration, the average length was 6 days (range 2 – 14 days). Cough, conjunctivitis, or coryza was reported in 22 (96%) patients. Of the 23 measles

cases, 20 (87%) patients reported cough, 21 (91%) reported coryza, and 17 (74%) reported conjunctivitis. Koplik spots were reported in 8/18 (44%) patients.

Clinical features and complications associated with the measles cases are presented in Table 2. The most commonly reported complication was diarrhea, occurring in 10/22 (45%) patients. Two patients (9%) were hospitalized, one with respiratory complications and one with thrombocytopenia. The average length of stay for these two patients was 2.5 days (range 2 – 3 days).

Table 2. Clinical Features and Complications of Measles Cases

	n	n known	%
Clinical			
Highest Recorded Temperature, mean	103°F	18	--
Rash Duration, mean	6 d	21	--
Cough	20	23	87%
Coryza	21	23	91%
Conjunctivitis	17	23	74%
Koplik Spots	8	18	44%
Complications			
Diarrhea	10	22	45%
Pneumonia	0	23	0%
Thrombocytopenia	1	10	10%
Hospitalized	2	23	9%
Duration of Hospitalization, mean	2.5 d	2	--

Transmission. The exact source of transmission for many cases in this outbreak was difficult to determine due to the small community in which most cases resided and the likelihood of multiple exposures. However, household exposures likely were the source for the majority of cases in this outbreak. With the exception of an undefined community exposure (described below), most cases could be classified into three subsequent generations of cases. First generation cases resulted from exposures in the household in which the source case resided. Second generation cases were likely a result of either subsequent household exposures to first generation cases or to exposure at a community festival attended by at least five patients during their communicable periods. Third generation cases were limited to a single household.

An additional case, not identified as a contact through household exposure or through community festival attendance, was identified nine days after public health investigations began. This patient was an unvaccinated child who lived in the community who presented to her pediatrician for evaluation on April 23 with fever and rash. Infection control precautions were not taken at this visit and a number of patient and healthcare worker exposures occurred. This exposure resulted in a case of measles in an unvaccinated waiting room contact.

Laboratory Confirmation. Sixteen measles cases (70%) were laboratory confirmed by serological testing, PCR, culture or a combination of these methods. Table 3 shows the types of confirmation testing. Molecular characterization of specimens collected from eight patients identified measles genotype D8; a type known to be circulating in India where the source case had traveled. PCR was also used to rule out vaccine reaction in those receiving MMR as PEP who developed fever and rash shortly after vaccination. Two patients receiving PEP were both culture positive and PCR positive for genotype D8. Typing for one patient could not identify the exact genotype, but identified clade D, thereby ruling out vaccine reaction (clade A).

Table 3. Method of Laboratory Confirmation among Measles Cases

Laboratory Confirmation Type				
IgM Result	PCR Result	Culture Result	n	%
POS	NP	NP	7	44%
POS	POS (D8)	NEG(5), NP(1)	6	38%
NC	POS (D8)	POS	2	13%
NP	POS (D_)	NEG	1	6%
Total			16	100%

POS: Positive, NEG: Negative, NP: Not Performed, NC: Non-contributory due to recent vaccination

Isolation, Quarantine and Contact Investigations. The isolation of cases and quarantine of exposed, susceptible contacts served as a primary control measure during the outbreak. Isolation orders were issued to 30 suspected or confirmed cases of measles from five counties (see Table 4 for county-level detail). Exposure to these cases led to the investigation of over 1,000 identified contacts from nine counties. Reaching these contacts was highly resource intensive, as all identified contacts had to be contacted, notified of the potential exposure, evaluated for immunity, assessed for rash illness and offered and administered vaccine or IG if appropriate. Quarantine orders were issued to 89 susceptible contacts who were not vaccinated with MMR within 72 hours of exposure. Quarantined contacts were asked to refrain from public activity from five days after the first exposure through 21 days after the last exposure. Estimates provided by the local health departments suggest that nearly 2,300 staff hours were spent on contact investigations and other outbreak-related activities at the local level.

Exposures occurred in a variety of settings, including schools, community events and multiple healthcare facilities. An inpatient and emergency department exposure at a single hospital alone led to the identification of 178 exposed patients and 350 exposed healthcare workers. Other healthcare exposures included outpatient medical settings, urgent care offices, a local health department and a pediatric practice exposure that led to transmission in a waiting room. Exposures also occurred in several public venues, including a large music festival and a sporting event. Because contacts could not be directly identified in these instances, broad public notifications were required to inform the public of potential exposures.

Table 4. County Estimates of Isolation and Quarantine Orders Issued, Contacts Exposed and Staff Hours Spent on Outbreak Investigation and Response

County	Isolation Orders Issued		Quarantine Orders Issued		Exposed Contacts	Local Health Department Estimates of Time Spent on Outbreak
	Written	Verbal	Written	Verbal		
Alamance LHD	0	0	0	8	62	6
Davidson LHD	0	0	1	0	1	Not provided
Davie LHD	0	0	0	0	0	15
Forsyth LHD	2	0	8	0	235	457
Guilford LHD	0	0	3	0	618	225
Orange LHD	0	10	12	3	40	260
Person LHD	0	0	0	0	0	0
Polk LHD	4	0	2	0	6	20
Randolph LHD	0	0	0	0	0	614
Rockingham LHD	0	0	0	0	0	5
Rutherford LHD	0	0	0	0	2	80
Stokes LHD	13	0	44	6	83	500
Surry LHD	0	1	2	0	2	100
Total	19	11	72	17	1,049	2,282

State-supplied MMR distribution and administration. Liberal use of MMR vaccine was approved by the Immunization Branch for 20 counties in the state (two associated counties were also included because of health districting). The Immunization Branch shipped a total of 2,600 doses of MMR vaccine and 73 doses of IG related to this outbreak. MMR was administered to 1,557 people (60% of shipped doses) and IG was administered to 13 people (18% of shipped doses). Table 5 shows MMR and IG doses shipped and administered by county.

Table 5. MMR and Immune Globulin Doses Shipped and Administered, by County

Liberal Use Counties / Heath Districts	TOTAL SHIPPED		TOTAL ADMINISTERED		
	MMR	IG	MMR	IG	
	doses	doses	doses	(mL)	#ppl
Alamance LHD	100	8	11	0	0
Caswell LHD	0	0	0	0	0
Chatham LHD	20	0	13	0	0
Davidson LHD	50	0	68	0	0
Davie LHD	50	0	0	0	0
Durham LHD	0	0	47	0	0
Forsyth LHD	200	15	292	3	2
Pediatric Practice (Forsyth Co.)	20	15	15	22	10
Granville LHD	0	0	0	0	0
Guilford LHD	0	5	107	0	0
Guilford LHD High Point	0	0	17	0	0
Henderson LHD	100	0	88	0	0
McDowell LHD	0	0	0	0	0
Orange LHD	100	12	0	0	0
Person LHD	50	0	0	0	0
Polk LHD	40	0	22	0	0
Randolph LHD	550	0	273	0	0
Rockingham LHD	300	0	37	0	0
Rutherford LHD	40	0	16	0	0
Stokes LHD	250	18	245	2	1
Surry LHD	700	0	304	0	0
Transylvania LHD	30	0	2	0	0
Vance LHD	0	0	0	0	0
Yadkin LHD	0	0	0	0	0
Total	2,600	73	1,557	27	13

Conclusions

Although measles is no longer endemic in the United States, international importation of the measles virus continues to occur, as was the case in this outbreak. This outbreak, identified on April 14, 2013, was the first outbreak of measles in North Carolina in almost 25 years.

Twenty-three cases of measles were identified in April and May of 2013 related to this outbreak. Extensive local and state resources were necessary to limit the spread and end transmission of the virus. The use of epidemiological investigations, post-exposure prophylaxis, and isolation and quarantine were crucial in doing so. Cooperation from many groups throughout the state, including healthcare providers and facilities, emergency medical services, the media and the public in affected communities was also necessary to end the outbreak. The outbreak was declared over on June 19, following a surveillance period of 42 days after the last onset.

Measles remains endemic in many countries around the globe. Because of this, the importation of measles virus will continue to occur. As we saw in this event, these importations can lead to outbreaks particularly among pockets of unvaccinated, susceptible individuals. Local health departments and providers should be

aware of any pockets of susceptible individuals in their communities and maintain increased suspicion of measles for any unvaccinated travelers presenting with febrile rash illness following international travel. Rapid case identification along with maintenance of high immunization rates will be fundamental in preventing future measles outbreaks.

Appendix

- 1.** 2013 Measles Case Definition
- 2.** Provider Memo (April 17)
- 3.** NC DHHS Press Release I (April 18)
- 4.** Measles Outbreak Key Points (April 19)
- 5.** NC SLPH Measles Testing Guidelines (April 19)
- 6.** NC Immunization Branch Liberal Use Memo (April 19)
- 7.** Recommendations for the use of Isolation and Quarantine Orders (April 19)
- 8.** Recommended Control Measures for Voluntary Quarantine (April 19)
- 9.** Sample Measles Isolation Order (April 19)
- 10.** Sample Measles Quarantine Order (April 19)
- 11.** NC DHHS Press Release II (April 30)
- 12.** Recommendations for Vaccine and IG, 2nd version (May 2)
- 13.** Provider Memo (May 13)

Measles (Rubeola)

2013 Case Definition

CSTE Position Statement(s): 12-ID-07

Clinical Description

An acute illness characterized by:

- Generalized, maculopapular rash lasting ≥ 3 days; **and**
- Temperature $\geq 101^\circ\text{F}$ or 38.3°C ; **and**
- Cough, coryza, or conjunctivitis.

Case Classification

Probable

In the absence of a more likely diagnosis, an illness that meets the clinical description with:

- No epidemiologic linkage to a confirmed case of measles; **and**
- Noncontributory or no measles laboratory testing.

Confirmed

An acute febrile rash illness[†] with:

- Isolation of measles virus[‡] from a clinical specimen; or
- Detection of measles-virus specific nucleic acid[‡] from a clinical specimen using polymerase chain reaction; or
- IgG seroconversion[‡] or a significant rise in measles immunoglobulin G antibody[‡] using any evaluated and validated method; or
- A positive serologic test for measles immunoglobulin M antibody[‡] §; or
- Direct epidemiologic linkage to a case confirmed by one of the methods above.

[†] Temperature does not need to reach $\geq 101^\circ\text{F}/38.3^\circ\text{C}$ and rash does not need to last ≥ 3 days.

[‡] Not explained by MMR vaccination during the previous 6-45 days.

§ Not otherwise ruled out by other confirmatory testing or more specific measles testing in a public health laboratory.

Case Classification Comment(s)

CDC does not request or accept reports of suspect cases so this category is no longer needed for national reporting purposes.

Epidemiologic Classification

Internationally imported case: An internationally imported case is defined as a case in which measles results from exposure to measles virus outside the United States as evidenced by at least some of the exposure period (7–21 days before rash onset) occurring outside the United States and rash onset occurring within 21 days of entering the United States and there is no known exposure to measles in the U.S. during that time. All other cases are considered U.S.-acquired.

U.S.-acquired case: An U.S.-acquired case is defined as 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.

U.S.-acquired cases are subclassified into four mutually exclusive groups:

- **Import-linked case:** Any case in a chain of transmission that is epidemiologically linked to an internationally imported case.
- **Imported-virus case:** A case for which an epidemiologic link to an internationally imported case was not identified, but for which viral genetic evidence indicates an imported measles genotype, i.e., a genotype that is not occurring within the United States in a pattern indicative of endemic transmission. An endemic genotype is the genotype of any measles virus that occurs in an endemic chain of transmission (i.e., lasting ≥ 12 months). Any genotype that is found repeatedly in U.S.-acquired cases should be thoroughly investigated as a potential endemic genotype, especially if the cases are closely related in time or location.
- **Endemic case:** A case for which epidemiological or virological evidence indicates an endemic chain of transmission. Endemic transmission is defined as a chain of measles virus transmission that is continuous for ≥ 12 months within the United States.

Epidemiologic Classification, continued

- **Unknown source case:** A case for which an epidemiological or virological link to importation or to endemic transmission within the U.S. cannot be established after a thorough investigation. These cases must be carefully assessed epidemiologically to assure that they do not represent a sustained U.S.-acquired chain of transmission or an endemic chain of transmission within the U.S.

Note: Internationally imported, import-linked, and imported-virus cases are considered collectively to be import-associated cases.

States may also choose to classify cases as out-of-state-imported when imported from another state in the United States. For national reporting, however, cases will be classified as either internationally imported or U.S.-acquired.



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Laura Gerald, M.D., M.P.H.
State Health Director

April 17, 2013

To: All North Carolina Health Care Providers
From: Megan Davies, MD, State Epidemiologist
Re: **Measles Outbreak in North Carolina (1 page)**

Summary:

Seven cases of measles have been identified among residents of Stokes and Orange Counties. The index case developed symptoms on April 4, shortly after returning from a trip to India. The diagnosis of measles was confirmed by the State Laboratory of Public Health on April 16. The most recent case developed symptoms on April 14. All seven cases have occurred among persons who were not vaccinated against measles.

Local health departments in Stokes, Orange, Polk and Guilford Counties are investigating exposures to these cases that occurred in a variety of public and private settings. Although every effort is being made to identify all contacts, it is possible that additional cases could occur among unrecognized contacts. The incubation period for measles is usually about 10 days from exposure to fever (range, 7–18 days) and 14 days from exposure to rash (range, 7–21 days).

Recommendations:

The following recommendations are provided for North Carolina clinicians in order to rapidly identify any additional cases and control the spread of infection:

- Clinicians are urged to consider the diagnosis of measles in anyone presenting with a febrile rash illness and clinically compatible symptoms (cough, coryza, and/or conjunctivitis).
- Clinicians who suspect measles should immediately contact their local health department or the state Communicable Disease Branch (919-733-3419; available 24/7) to discuss laboratory testing and control measures.
- Any patient presenting with a febrile rash illness should be immediately isolated, using airborne isolation precautions if possible. The infectious period for measles lasts from four days before to four days after rash onset.
- Unvaccinated persons who have been exposed to a person with measles should be advised to stay home for 21 days from the last exposure and limit contact with others to avoid spreading illness.

As a reminder, vaccination with the measles/mumps/rubella (MMR) vaccine is the best way to protect against measles. Clinicians are encouraged to provide MMR to all unvaccinated patients who are eligible for this vaccine. Please contact your local health department or the North Carolina Immunization Branch (919-707-5550) with any questions.

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Pat McCrory, Governor

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For Immediate Release

April 18, 2013

Contact: Office of Public Affairs 919-855-4840

RALEIGH – Public health officials from the N.C. Department of Health and Human Services are working with local health departments to investigate an outbreak of measles. To date, seven cases have been identified in residents of Stokes and Orange Counties. Local public health departments are contacting other people who might have been exposed to these cases and providing vaccine to limit the spread of infection.

“Measles is very uncommon in North Carolina, so many people aren’t aware of the symptoms,” said Dr. Laura Gerald, State Health Director. “Measles spreads quickly, particularly in children and adults who aren’t vaccinated. We want to make the public aware of this outbreak so individuals can take steps to protect themselves and their families.”

Measles is a highly contagious disease that is spread through the air by coughing and sneezing. It also can be transmitted through contact with secretions from the nose or mouth of an infected person. Initial symptoms may include fever, runny nose, watery red eyes and cough. After a few days, a rash appears on the head and spreads over the entire body. Measles can lead to pneumonia and other complications, especially in young children. The disease poses serious risks for pregnant women, including miscarriage and premature birth.

Although the early symptoms of measles can be similar to those of many other infections, Dr. Gerald recommends that anyone with fever, runny nose, watery red eyes and a cough, should stay at home and limit contact with others to avoid spreading illness. If you develop a rash or if your symptoms worsen, call your doctor or seek medical care. If you do seek medical care, call your doctor’s office or health care facility before you go so they can prepare for your visit and protect other patients from exposure.

Measles can be prevented by the combination MMR (measles, mumps and rubella) vaccine. It is important for all individuals 12 months of age and older to be vaccinated.

“Vaccine is readily available,” said Dr. Gerald. “Anyone interested in getting vaccinated should contact their primary health care provider or their local health department.”

More information about measles is available at <http://epi.publichealth.nc.gov/cd/diseases/rubeola.html>

Measles Outbreak – Key Points 4/19/2013

Outbreak Summary

- The North Carolina Division of Public Health is assisting local health departments in investigating an outbreak of measles among residents of Stokes and Orange Counties.
- The first person to become sick developed symptoms on April 4th after returning from a trip to India.
- Eight cases have been identified so far, including 3 adults and 5 children. It is likely that more cases will be identified as the investigation continues.
- Most cases have been in people who had not been vaccinated against measles.
- Local health departments are working to identify everyone who was exposed to these eight cases and take steps to prevent further spread. These steps include providing vaccine to unvaccinated contacts, monitoring exposed contacts for symptoms, and keeping unvaccinated exposed people away from others until 21 days after their exposure.

Measles Vaccine

- Measles can be prevented by the combination MMR (measles, mumps, and rubella) vaccine. Two doses of MMR separated by at least four weeks are routinely recommended for all children. Adolescents and adults should receive two doses of MMR if not fully vaccinated.
- MMR can prevent illness in people who have been exposed to measles if it is given within 3 days after the exposure.
- Effective April 18, 2013, and until further notice, the North Carolina Immunization Program has initiated a “liberal use” policy for state-supplied MMR vaccine in counties where measles cases have been identified, counties where contacts have been identified, and geographically adjacent counties.
 - The affected counties are: Alamance, Caswell, Chatham, Davidson, Durham, Forsyth, Granville, Guilford, Henderson, Orange, Person, Polk, Randolph, Rockingham, Rutherford, Stokes, Surry, Transylvania, and Yadkin.
 - For persons these counties, health departments may administer state-supplied MMR vaccine to anyone for whom it is recommended, regardless of insurance status, as long as supplies are available.
 - In general, contacts who have not received two doses of measles-containing vaccine on or after the first birthday are considered susceptible.

- If the patient's MMR status is unknown or undocumented, the person may receive two doses of state-supplied MMR 28 days apart. If there is a known history of a single dose, the patient may receive a second dose of MMR.

General Measles Information

- Measles is a highly contagious disease caused by a virus.
- Measles spreads through the air by breathing, coughing or sneezing. It is so contagious that anyone who is exposed to it and is not immune will probably get the disease.
- Symptoms of measles usually start about 10 days after exposure to the virus.
- The first symptoms of measles include fever, cough, runny nose and red eyes. Rash begins a few days later, usually starting on the head and spreading to the whole body.
- About one out of 20 children with measles will get pneumonia. For every 1,000 children who get measles, one or two will die.



**North Carolina Department of Health and Human Services
State Laboratory of Public Health**

Pat McCrory
Governor

Aldona Z. Wos, M.D.
Ambassador (Ret.)
Secretary DHHS

Scott J. Zimmerman, DrPH, MPH, HCLD (ABB)
Laboratory Director

NCSLPH Measles Specimen Collection and Testing Guidelines, 4/19/2013 3:42 PM

Testing Criteria for Measles: All suspect or probable cases of measles must be reported to the **Immunization Branch at (919) 707-5550 for prior approval for laboratory testing.** Individuals presenting with fever, cough, coryza and/or conjunctivitis, and a rash are considered suspect cases.

Testing Systems Employed: Serological specimens will be evaluated at the NCSLPH using an Indirect Immunofluorescent Antibody (IFA) test to detect IgM and IgG antibody. **IgM and IgG IFA is the preferred test.** Nasopharyngeal (NP) swabs, throat swabs, and urine will be processed for viral isolation (NCSLPH) and if indicated, PCR analysis (CDC VPD Project).

SPECIMENS SHOULD BE COLLECTED AT THE FIRST CONTACT WITH A SUSPECTED CASE

Specimen	Test	Specimen Volume	Shipment	Expected TAT
Serum*	IgM and IgG IFA, preferred	1 – 3 mls	Refrigerated (4°), place on cold packs	1 – 2 days
NP or Throat Swab	Viral Culture** PCR	2mls VTM	Refrigerated (4°), place on cold packs	Culture: 1 - 2 weeks PCR: 3 – 6 days
Urine	Viral Culture** PCR	15 mls (20 – 35 mls preferred)	Refrigerated (4°), place on cold packs	Culture: 1 - 2 weeks PCR: 3 – 6 days

*Note: Optimal collection for this specimen type is ≥ 3 days post-onset of rash. Collection prior to this time may result in a false negative test due to the lack of detectable levels of IgM and IgG immunoglobulin.

**Note: Measles virus isolation is most 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 7 following rash onset.

SPECIMEN COLLECTION AND STORAGE

- Collection instructions for viral culture:
 - Nasopharyngeal Swab – Carefully swab the posterior nasopharyngeal area via the external nares with a dry sterile tipped swab. Break off the swab tip into a vial containing 2 ml of viral transport medium. Screw the cap on tightly.
 - Throat Swab – Vigorously rub the posterior wall of the pharynx with a dry, sterile, swab. The swab should not touch the tongue or buccal mucosa. Break off the swab tip into a vial of viral transport medium. Screw the cap on tightly.
 - Urine: Collect clean voided urine. Transfer to a plastic shipping tube.
- All specimen types should be refrigerated promptly after collection. Temporary storage and transport temperature should be 4° - 8°C. DO NOT FREEZE.
- Clearly label each specimen with patient's first and last name, either date of birth, SSN, or other unique identifier, specimen source, and collection date.
- Complete the appropriate specimen submission forms and **request Measles testing only during times of active Measles surveillance:**
 - Serological specimens: DHHS# 3445, found at <http://slph.ncpublichealth.com/Forms/DHHS-3445.pdf>
Include the statement: "Prior approval/consultation received from:" with the name of the individual in Immunization Branch proving approval.
 - Swabs and urine for culture: DHHS# 3431, found at <http://slph.ncpublichealth.com/Forms/DHHS-3431.pdf>
- Do not use calcium alginate tipped OR wooden shafted swabs. Calcium alginate may inactivate some viruses. Wooden shafts may be toxic to viruses.
- Screw caps on tightly to prevent leakage of specimens.

SHIPPING OF DIAGNOSTIC SPECIMENS (PLEASE NOTE THE CHANGE OF ADDRESS)

- Ship specimen(s) to the State Laboratory the same day collected.
- Wrap the properly labeled inoculated transport medium (primary container) or serological specimen in absorbent material, i.e. paper towel, and place into a leak proof secondary container (50ml conical tubes).
- Place two frozen ice packs in the shipping container.
- Place secondary container(s) containing specimen(s) between the ice packs.
- Place completed forms in plastic bag and slide into space at narrow end of ice pack.
- Ship specimens to:
Attention: Virology/Serology
North Carolina State Laboratory of Public Health
4312 District Drive
Raleigh, NC 27607-5490
- Ship specimens by the fastest means possible. Transit time of less than 24 hours will optimize virus detection.

Please contact Myra Brinson (919-807-8835) or Joey Johnson (919-807-8821) at the NCSLPH if you have questions regarding sample collection or shipment.

www.ncdhhs.gov • www.publichealth.nc.gov • <http://slph.ncpublichealth.com>

Location: 4312 District Drive • Raleigh, NC 27607 • Tel 919-733-7834 • Fax 919-733-8695

Mailing Address: 1918 Mail Service Center • PO Box 28047, Raleigh, NC 27611-8047

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**North Carolina Department of Health and Human Services
Division of Public Health**

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Governor

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Ambassador (Ret.)
Secretary DHHS

Laura Gerald, M.D., M.P.H.
State Health Director

April 19, 2013

MEMORANDUM

TO: North Carolina Immunization Program (NCIP) Providers

FROM: Beth Rowe-West, RN, BSN, Head *BRW*
Immunization Branch

SUBJECT: Measles Vaccine Availability for Outbreak

The purpose of this memo is to notify you that, as of today, eight cases of measles have been identified among residents of Stokes and Orange Counties as well as outline the expansion of MMR (measles, mumps, and rubella) vaccine during this outbreak. The primary strategy for control of measles outbreaks is achieving a high level of immunity (2 doses) in the population affected by the outbreak.

Effective April 18, 2013, and until further notice, the NCIP has initiated a "liberal use" policy for state-supplied MMR vaccine **administered at the affected local health departments (LHDs) only**. Affected counties include those where measles cases have been confirmed or suspected, counties where contacts have been identified, and geographically adjacent counties. The affected counties are: Alamance, Caswell, Chatham, Davidson, Durham, Forsyth, Granville, Guilford, Henderson, Orange, Person, Polk, Randolph, Rockingham, Rutherford, Stokes, Surry, Transylvania, and Yadkin. Because this is a rapidly changing outbreak situation, we will re-evaluate the need to expand this coverage area daily.

For persons in the counties listed above, LHDs may administer NCIP-provided MMR vaccine universally, that is, to anyone for whom it is recommended, regardless of insurance status, as long as supplies are available. In general, contacts who have not received two doses of measles-containing vaccine on or after the first birthday (doses should be given at least one month/28 days apart) are considered susceptible. If the patient's MMR status is unknown or undocumented, the person may receive two doses of state-supplied MMR 28 days apart. If there is a known history of a single dose, the patient may receive a second dose of MMR. For complete MMR recommendations, go to: <http://www.cdc.gov/mmwr/preview/mmwrhtml/00053391.htm>.

Attached you will find the memo sent recently by Megan Davies, MD, State Epidemiologist, outlining additional details regarding the measles outbreak. Additional information may be found on our website at: www.immunize.nc.gov.

Note: If you anticipate needing vaccine, remember that changes occurring to the Center for Disease Control and Prevention's vaccine ordering system will result in a vaccine ordering blackout beginning next week. You must order before 3 p.m. on April 24, 2013 to receive vaccine during this blackout period. Ordering will resume on May 6, 2013.

If there are questions about ordering vaccine, please contact our Help Desk at 1-877-873-6247. For general measles questions, please contact our main office number, 919-707-5550.

Cc:	SMT	Field Staff	Central Office Staff	Vaccine Manufacturers	Steve Shore	Maclyn Powell
		Gregg Griggs	Taryn Edwards	Terri Pennington	Joy Reed	Peter Graber
		Ann Nichols				

Attachment

www.ncdhhs.gov • www.publichealth.nc.gov • www.immunize.nc.gov

Tel 919-707-5550 • Fax 919-870-4824

Location: 5601 Six Forks Road • Raleigh, NC 27609

Mailing Address: 1917 Mail Service Center • Raleigh, NC 27699-1917

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Recommendations for Use of Isolation and Quarantine Orders Specific to Measles Outbreak 2013

Background

Under North Carolina law, the “ local health director shall ensure that control measures prescribed by the Commission have been given to prevent the spread of all reportable communicable diseases or communicable conditions and any other communicable disease or communicable condition that represents a significant threat to the public health.” **§ N.C. GS 130A-144 (e)**

In this statute, the local health director has the responsibility and the authority to take action to control diseases that are threats to public health. This does not require the health director to explicitly issue isolation and/or quarantine orders when an infected or exposed individual agrees to voluntarily comply with control measures. This is referred to as a voluntary detention or restriction of movement or action.

In addition to **§ NC GS 130A-144**, the “State Health Director and a local health director are empowered to exercise quarantine and isolation authority. Quarantine and Isolation authority shall be exercised only when and so long as the public health is endangered, all other reasonable means for correcting the problem have been exhausted, and no less restrictive alternative exists.” **§ N.C. GS 130A-145(a)**

When voluntary detention or restriction of movement or action is not working, the local health director or designee, at his or her sole discretion, may initiate involuntary detention of a person for purposes of isolation or quarantine. Isolation and quarantine orders are generally issued when an infected or exposed person refuses to comply with voluntary detention and other control measures.

ISOLATION ORDERS are used for sick individuals while infectious, i.e., individuals who are confirmed cases of measles or epi-linked to a confirmed case. QUARANTINE ORDERS are used for individuals who are not sick yet, but potentially exposed to measles and may be incubating the illness.

ISOLATION and QUARANTINE ORDERS are indicated when all other reasonable means for preventing the spread of the illness have been exhausted.

Immediate Control Measures for a Measles Outbreak

Control measures used during a measles outbreak investigation are universally accepted and essential to stop the spread of this highly contagious, potentially fatal viral respiratory illness. These measures will not be discussed in this document, but include:

- 1) Rapid identification and reporting of all confirmed or suspected cases
 - a) Isolation (airborne if possible) until 4 days after rash onset
 - b) Arrange for testing at state lab if appropriate
- 2) Rapid identification and reporting of all contacts to confirmed or suspect cases
 - a) Provide post-exposure prophylaxis
 - i) MMR within 72 hours of last exposure

Recommendations for Use of Isolation and Quarantine Orders Specific to Measles Outbreak 2013

- ii) Immune globulin for high-risk contacts within 6 days of last exposure (infants, pregnant women, immunocompromised)
 - b) Provide MMR to all unvaccinated contacts (even if beyond 72 hours)
 - c) Implement quarantine of susceptible/unvaccinated contacts for 21 days from last exposure (several options for local health directors depending on specific situation)
- 3) Risk Communication

Additional Considerations

- ISOLATION & QUARANTINE ORDERS should be issued in conjunction with an assessment process that addresses the burden on the individual and the agency to comply with restrictions and monitor compliance with the order.
- When feasible, the agency should explore the need for emergency funds to assist with food and lodging.
- Issues that a LHD must consider when deciding whether to **Recommend** or **Require** compliance are:
 1. Nature and severity of negative consequences resulting from the failure of an individual comply with control measures;
 2. Consider the benefits gained by approaching control measures systematically in multijurisdictional outbreaks; and
 3. The culture of the community and individuals and groups within the community.
 4. All Control Measure Recommendations and ISOLATION & QUARANTINE ORDERS should include a description of the disease, its symptoms and should clearly state why the control measures are necessary. The explanation should state how adherence to the control measures/orders will benefit the individual and the community.

Alternatives to ISOLATION & QUARANTINE ORDERS

A local health director may opt to use clearly written control measures in the form of a strongly worded recommendation for potentially exposed individuals. Use of the recommendations may be more practical and more acceptable in large, multi-jurisdictional outbreaks of measles. The local health director may solicit a signature from the individual to document that the control measures were provided.

See attached samples:

Sample Measles Specific ISOLATION ORDER

Sample Measles Specific QUARANTINE ORDER

SAMPLE Recommendations for Voluntary Quarantine

HEALTH DEPARTMENT LETTERHEAD

SAMPLE RECOMMENDATIONS FOR VOLUNTARY QUARANTINE (Measles)

You may have been exposed to measles. Your exposure requires further public health investigation. Measles is a disease associated with fever, runny nose, watery red eyes and cough. After a few days, a rash appears on the head and spreads over the entire body. Measles is a highly contagious disease that may be passed from person to person mostly through the air by coughing and sneezing. It can also be transmitted through contact with secretions from the nose or mouth of an affected person. A person who is not vaccinated against measles or has not had measles earlier in his or her life and was exposed to measles may have measles as a result, and may transmit the infection to others even before having any symptom. Although rare, serious respiratory or neurologic complications may happen and possibly result in death. Pregnant women exposed to measles may also experience complications. If measles spreads in the community, it could have severe public health consequences.

Unvaccinated persons who have been exposed to a person with measles are strongly advised to stay at home for 21 days after the last exposure and limit contact with others to avoid spreading the illness.

It usually takes about 10-21 days to develop symptoms of measles after exposure to the virus.

You have agreed to remain at [insert home address] until [insert date] and comply with the following control measures to help prevent the spread of measles in the community:

- Remain in your home until _____.
- Avoid contact with any persons other than those in your household. Do not attend any gatherings or group meetings. You should not have any visitors to your home.
- Contact the health department immediately if you develop symptoms.
- Call a doctor or seek medical care if a rash develops.
- Before seeking medical care, call ahead and get instructions from the provider before arriving at the medical office, clinic or hospital.
- If a medical emergency arises and you need to call 911, inform the First Responders that you may have measles.

If you plan to move to a new address or leave the county, you are asked to notify _____ County Health Department and prior to moving. You may contact the Health Department by calling: _____.

The staff of this Health Department remains available to provide assistance and counseling to you concerning your possible exposure to measles and to these control measures.

Thank you for your cooperation.

Local Health Director _____ Date _____

I received the original copy of these recommended control measures:

Patient Signature Date

HEALTH DEPARTMENT LETTERHEAD

SAMPLE MEASLES ISOLATION ORDER (Suspected to Have Disease)

You are suspected of having measles. Measles is a disease associated with fever, runny nose, watery red eyes and cough. After a few days, a rash appears on the head and spreads over the entire body. Measles is a highly contagious disease that may be passed from person to person mostly through the air by coughing and sneezing. It can also be transmitted through contact with secretions from the nose or mouth of an affected person. A person who is not vaccinated against measles or has not had measles earlier in his or her life and was exposed to measles may have measles as a result, and may transmit the infection to others even before having any symptom. Although rare, serious respiratory or neurologic complications may happen and possibly result in death. Pregnant women exposed to measles may also experience complications. If measles spreads in the community, it could have severe public health consequences.

I, _____(name), Health Director of _____County Health Department, pursuant to authority vested in me by North Carolina General Statute (G.S.) 130A-145, issue this ISOLATION ORDER to _____(patient name) DOB: _____.

You are required to remain at [insert home address] until [insert date].

You have been properly informed and counseled by _____, R.N., Communicable Disease Nurse with the _____County Health Department regarding the control measures for _____. Failure to comply with the control measures is a violation of G.S. 130A-145.

You are required to:

- Remain in your home until _____.
- Avoid contact with any persons other than those in your household. Do not attend any gatherings or group meetings. You may not have any visitors to your home.
- Contact the health department immediately if you develop symptoms.
- Call a doctor or seek medical care if a rash develops.
- Before seeking medical care, call ahead and get instructions from the provider before arriving at the medical office, clinic or hospital.
- If a medical emergency arises and you need to call 911, inform the First Responders that you may have measles.

If you fail to comply with this ISOLATION ORDER, you will be subject to prosecution for a misdemeanor offense pursuant NC law (G.S. 130A-25) and punishable by up to two (2) years imprisonment.

If you plan to move to a new address or leave the county, you are required to notify _____ County Health Department and obtain prior approval. You may contact the Health Department by calling:_____.

The staff of this Health Department remains available to provide assistance and counseling to you concerning measles and compliance with this ISOLATION ORDER.

You may petition the Superior Court for review of the restriction of your freedom of movement contained in this ISOLATION ORDER pursuant to G.S. 130A-145(d).

The authority of this ISOLATION ORDER to restrict your freedom of movement expires in 10 days unless extended or modified by a court pursuant to G.S. 130A-145.

Local Health Director _____ Date _____

Issued by: _____ Date _____

I have received the original copy of this order: _____

Patient Signature

Date

Guidance for Local Health Departments

Measles Outbreak 2013

N.C. Division of Public Health

Communicable Disease Branch

19 April 2013

MODEL MEASLES QUARANTINE ORDER (Suspected Exposure)

You may have been exposed to measles. Your exposure requires further public health investigation. Measles is a disease associated with fever, runny nose, watery red eyes and cough. After a few days, a rash appears on the head and spreads over the entire body. Measles is a highly contagious disease that may be passed from person to person mostly through the air by coughing and sneezing. It can also be transmitted through contact with secretions from the nose or mouth of an affected person. A person who is not vaccinated against measles or has not had measles earlier in his or her life and was exposed to measles may have measles as a result, and may transmit the infection to others even before having any symptom. Although rare, serious respiratory or neurologic complications may happen and possibly result in death. Pregnant women exposed to measles may also experience complications. If measles spreads in the community, it could have severe public health consequences.

I, _____ (name), Health Director of _____ County Health Department, pursuant to authority vested in me by North Carolina General Statute (G.S.) 130A-145, issue this QUARANTINE ORDER to _____ (Person's name) DOB: _____.

You are required to remain at [insert home address] until [insert date].

You have been properly informed and counseled by _____, R.N., Communicable Disease Nurse with the _____ County Health Department regarding the control measures for measles. Failure to comply with the control measures is a violation of G.S. 130A-145.

You are required to:

- Remain in your home until _____.
- Avoid contact with any persons other than those in your household. Do not attend any gatherings or group meetings. You may not have any visitors to your home.
- Contact the health department immediately if you develop symptoms.
- Call a doctor or seek medical care if a rash develops.
- Before seeking medical care, call ahead and get instructions from the provider before arriving at the medical office, clinic or hospital.
- If a medical emergency arises and you need to call 911, inform the First Responders that you may have measles.

If you fail to comply with this QUARANTINE ORDER, you will be subject to prosecution for a misdemeanor offense pursuant NC law (G.S. 130A-25) and punishable by up to two (2) years imprisonment.

If you plan to move to a new address or leave the county, you are required to notify _____ County Health Department and obtain prior approval. You may contact the Health Department by calling: _____.

The staff of this Health Department remains available to provide assistance and counseling to you concerning your possible exposure to measles and compliance with this QUARANTINE ORDER.

You may petition the Superior Court for review of the restriction of your freedom of movement contained in this QUARANTINE ORDER pursuant to G.S. 130A-145(d).

Local Health Director _____ Date _____

Issued by: _____ Date _____

I have received the original copy of this order: _____
Patient Signature Date

Guidance for Local Health Departments
Measles Outbreak 2013
N.C. Division of Public Health
Communicable Disease Branch
19 April 2013

State Health Officials Continue Investigation and Control of Statewide Measles Outbreak

Pat McCrory, Governor

Aldona Z. Wos, M.D., Secretary

For Immediate Release

April 30, 2013

Contact: Public Affairs 919-855-4840

RALEIGH – North Carolina Department of Health and Human Services public health officials and staff from local health departments are now investigating 19 cases of measles in Stokes, Orange and Polk counties as part of an outbreak that was first reported in mid-April. Since the outbreak began, state and local public health authorities have notified more than 1,000 people in Stokes, Forsyth, Guilford, Orange, Polk and Chatham counties who may have been exposed to the disease.

Most of the cases are associated with people who live in or have visited the Prabhupada Village in Stokes County. As part of the investigation, public health investigators are identifying additional possible exposures based on information from current cases. Investigators have now determined that at least two confirmed cases attended the Shakori Hills GrassRoots Festival in Chatham County Friday evening April 19 through Sunday April 21 while infectious and before becoming ill.

“Most of the persons who became infected with measles were individuals both inside and outside this community were not vaccinated,” said Scott Lenhart, Stokes County Health Director. “This is an important reminder that anyone who has not been protected by immunization is highly susceptible to measles.”

Stokes County health officials and state public health officials are working closely with the Prabhupada Village community to avoid further spread of illness. Lenhart recommends that any individuals, especially those who are not vaccinated, avoid visiting the Prabhupada Village community until the outbreak is over. As an additional precaution, Stokes County health officials are advising that individuals who are not vaccinated should avoid any highly populated areas in Stokes County during the outbreak.

“Measles is an extremely infectious disease and spreads very quickly,” said Dr. Laura Gerald, State Health Director. “If you suspect you may be sick with measles, please call your healthcare provider before leaving home to avoid spreading the illness to people in doctors’ office or clinic waiting areas or in emergency departments.”

Measles is a highly contagious illness and unvaccinated populations are at highest risk of becoming sick when exposed to the measles virus. It can be spread through coughing, sneezing and contact with secretions from the nose, mouth and throat of an infected person. Initial symptoms of this illness may include a fever over 101 F degrees, runny nose, watery red eyes and a cough. After a few days, a rash will begin to appear on the face and spread over the entire body. Persons with measles are considered infectious four days before and four days after the rash appears.

Persons exposed to the measles virus who have not been vaccinated or have not had measles earlier in life are required to stay home for a period of time specified by public health officials because they can begin to pass the infection to others before they show signs of illness.

Measles can be prevented by the combination MMR (measles, mumps and rubella) vaccine. It is important for all individuals 12 months of age and older to get vaccinated.

Public health officials recommend immunization within 72 hours of exposure for those individuals who have not already been vaccinated to protect against developing the disease.

More information about measles is available at: <http://epi.publichealth.nc.gov/cd/diseases/rubeola.html>

**RECOMMENDATIONS FOR USE OF MEASLES VACCINE AND
MEASLES IMMUNE GLOBULIN IN OUTBREAKS**
Recommendations for Public Health Officials

Introduction

The primary strategy for prevention of measles outbreaks is achieving a high level of immunity in the population. A high level of immunity is generally achieved by giving two (2) doses of the measles, mumps, rubella (MMR) vaccine. Control of an outbreak combines the isolation of cases while infectious, rapid vaccination of susceptible, exposed persons and quarantine of unvaccinated, exposed persons.

General Recommendations

- Individuals who receive MMR vaccine or IG as Post Exposure Prophylaxis (PEP) should be monitored for signs and symptoms consistent with measles for at least one incubation period (up to 21 days after latest exposure).
- Only doses of vaccine with written documentation of the date of receipt should be accepted as valid. Verbal reports of vaccination without written documentation should not be accepted.

Routine Measles Vaccination Strategy in the United States

- MMR vaccine is given as a 2-dose series:
 - First dose: 12-15 months
 - Second dose: 4-6 years
- MMR (not including PEP) can be given to any person ≥ 12 months of age who is not fully vaccinated.
- MMR should not be given to infants < 12 months of age except as PEP.
- Individuals who have documented, written evidence of vaccination should be considered protected. Individuals with documentation do not need to have laboratory tests performed to evaluate immunity status.

Outbreak Measles Vaccination Strategy

MMR may provide some protection in susceptible individuals who have been exposed to measles if given within 72 hours after the FIRST exposure.

- **Discreet or Single Exposures:** Susceptible contacts who have had only one exposure to an ill individual and were not vaccinated within 72 hours of that single exposure should be quarantined.
- **Multiple or Continuous Exposures:** Some susceptible contacts may have multiple exposures or continuous exposure to an ill individual. This includes household contacts and school or playmate contacts. In this case, these susceptible individuals should be vaccinated within 72 hours of the FIRST exposure to the ill individual. If they were not vaccinated within 72 hours of the FIRST exposure, then they will need to be quarantined. As multiple or continuous exposure may be difficult to ascertain, please call NCDPH for guidance if questions arise.
- Children (≥ 1 years of age), adolescents and adults: Completion of a 2-dose series of MMR, separated by at least 28 days, is recommended for those not fully vaccinated.
- Except in healthcare settings, unvaccinated persons who receive their first dose of MMR vaccine within 72 hours of exposure may return to child care, school or work

RECOMMENDATIONS FOR USE OF MEASLES VACCINE AND MEASLES IMMUNE GLOBULIN IN OUTBREAKS

Recommendations for Public Health Officials

provided all persons without documentation of immunity have been excluded. All persons, including those vaccinated as part of the outbreak control program, should immediately report the onset of symptoms consistent with measles or its prodrome.

Accelerated schedule for infants:

- Infants (<1 year of age): Measles vaccination of infants as young as 6 months of age may be considered for PEP. MMR vaccine may be administered to children before the first birthday in this situation.
- Two (2) properly spaced, age-appropriate doses are still needed to complete the series (one dose at age 12-15 months and a second dose at 4-6 years of age).

Outbreak Measles Immune Globulin (IG)

Measles IG may provide some protection or reduce complications if given within 6 days of the most recent exposure to measles. The recommended dose of intramuscular administration of IG was recently increased from 0.25mL/kg to 0.50 mL/kg. †

Measles IG for PEP:

- Infants aged <12 months who have been exposed to measles should receive 0.50 mL/kg of body weight of IG given intramuscularly (maximum dose = 15 mL).
- Pregnant women without evidence of measles immunity who are exposed to measles should receive 400 mg/kg of IG given intravenously (IGIV).
- Severely immunocompromised‡ persons exposed to measles should receive 400 mg/kg of IG given intravenously (IGIV).
- IGIM (0.50 mL/kg of body weight; maximum dose = 15 mL) 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, etc.).
- After receipt of IG, individuals cannot return to healthcare settings. In other settings such as childcare, school, or work, factors such as immune status, intense or prolonged contact, and presence of at-risk population, should be taken into consideration before allowing these individuals to return. These factors may decrease the effectiveness of IG or increase the risk of disease and complications depending on the setting.
- Modified measles may occur in patients who received IG as postexposure prophylaxis and in young infants who have some residual maternal antibody. It is usually characterized by a prolonged incubation period, mild prodrome, and sparse, discrete rash of short duration. Similar mild illness has been reported among previously vaccinated persons.

† MMR ACIP recommendation on 13 Dec, 2012, Greg Wallace of the CDC Division of Viral Diseases explained the increase of dose of IG as PEP as follows: “The dose of immune globulin has increased. Previously it was 0.25 milliliters per kilogram. It has been increased to 0.5 milliliters per kilogram. And that’s because with very little circulating disease and most people having their immunity from vaccine the titers in the immune globulin preparations may not be as high as they were previously.”

**RECOMMENDATIONS FOR USE OF MEASLES VACCINE AND
MEASLES IMMUNE GLOBULIN IN OUTBREAKS
Recommendations for Public Health Officials**

‡Severely immunocompromised patients include patients with severe primary immunodeficiency; patients who have received a bone marrow 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 cells/mm³ (age >5 years) and those who have not received MMR vaccine since receiving effective ART; some experts would include all HIV-infected persons, regardless of immunologic status or MMR vaccine history.

Liberal Use

Effective April 18, 2013, and until further notice, the NC Immunization Program (NCIP) has initiated a “liberal use” policy for state-supplied MMR vaccine administered at the affected local health departments only.

Affected counties include those where measles cases have been confirmed or suspected, counties where contacts have been identified, and geographically adjacent counties. The affected counties are: **Alamance, Caswell, Chatham, Davidson, Davie, Durham, Forsyth, Granville, Guilford, Henderson, Orange, Person, Polk, Randolph, Rockingham, Rutherford, Stokes, Surry, Transylvania, and Yadkin.**

For persons in the counties listed above, LHDs may administer North Carolina Immunization Program-provided MMR vaccine universally to:

- Anyone for whom it is recommended, regardless of insurance status, as long as supplies are available.
- In general, contacts who have not received two doses of measles-containing vaccine on or after the first birthday are considered susceptible (doses should be given at least one month/28 days apart).
- If the patient’s MMR status is unknown or undocumented, the person may receive two doses of state-supplied MMR 28 days apart.
- If there is a known history of a single dose, the patient may receive a second dose of MMR.

Isolation

Persons with confirmed or suspected measles should be isolated from 4 days before rash onset until four days after rash onset.

Quarantine

Non-immune persons who were exposed to a probable or confirmed measles case should be quarantined for 21 days after the last exposure, if they were not vaccinated with MMR within 72 hours of the FIRST exposure to the probable or confirmed measles case.

- Evidence of immunity for non-healthcare workers includes birth before 1957, documentation of at least one dose of MMR, or a positive measles IgG titer.

**RECOMMENDATIONS FOR USE OF MEASLES VACCINE AND
MEASLES IMMUNE GLOBULIN IN OUTBREAKS**

Recommendations for Public Health Officials

- Evidence of immunity for healthcare workers includes documentation of a positive measles IgG titer, laboratory confirmation of disease, two doses of MMR, or birth before 1957. CDC recommends that health-care facilities should recommend 2 doses of MMR vaccine during an outbreak of measles for unvaccinated personnel born before 1957 who lack laboratory evidence of measles immunity or laboratory confirmation of disease.

Non-healthcare workers who receive MMR post-exposure prophylaxis within 72 hours after FIRST exposure do not require quarantine. See ‘Outbreak Measles Vaccination Strategy’ section above for further details.

**RECOMMENDATIONS FOR USE OF MEASLES VACCINE AND
MEASLES IMMUNE GLOBULIN IN OUTBREAKS
Recommendations for Public Health Officials**

Testing

- Serologic testing is recommended for all suspected or epi-linked measles cases.
- Serologies drawn <3 days after rash onset might be unreliable and should be repeated ≥ 4 days after rash onset if negative.
- Serologies drawn 6-45 days after receipt of MMR cannot distinguish between vaccination and infection.
- Testing through the NC SLPH must be approved by the Communicable Disease Branch prior to submission. NC SLPH does not perform immunity testing.

Frequently Asked Questions (FAQs)

- 1. An individual was exposed to a confirmed case of measles more than 72 hours ago. There is no evidence that s/he has ever been vaccinated. Can the vaccine still be given to prevent illness?**

If more than 72 hours has passed since exposure, administration of the vaccine will not help prevent illness. It is important to make sure the individual monitors for signs and symptoms of measles and to seek medical care immediately. Prior to visiting a healthcare setting, the individual should notify his/her healthcare provider so precautions can be made to limit potential exposure in the healthcare setting.

Finally, the individual should stay home for 21 days and should not go out in the community. This measure is called quarantine. A quarantine order is a legal requirement issued under the authority of the local health director to limit the spread of an outbreak.

- 2. A child received the MMR at 8 months of age as a contact of a confirmed measles case. Does this count as the child's first dose of measles vaccination?**

No.

Children vaccinated before the first birthday should be revaccinated when they are 12–15 months old and again when they are 4–6 years of age. This is because the presence of residual maternal antibody may result in suboptimal vaccine efficacy when administered at an age younger than 12 months.

- 3. If an individual already had one (1) dose of MMR vaccine and did not receive a 2nd within 72 hours of exposure, does s/he need to be quarantined?**

No.

However, it is strongly recommended that he/she receive a second dose of MMR to complete the series. Quarantine may still be recommended if the individual will be returning to a setting where individuals at high risk for complications might be present.



North Carolina Department of Health and Human Services
Division of Public Health

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Governor

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State Health Director

May 13, 2013 (2 pages – previous version dated April 17, 2013)

To: All North Carolina Health Care Providers
From: Megan Davies, MD, State Epidemiologist *Megan Davies, MD*
Re: **Measles Outbreak in North Carolina – Provider Update**

Summary:

This memo is to update North Carolina providers regarding the first measles outbreak to occur in North Carolina in more than 20 years. As of May 13, 2013, 23 cases have been identified among residents of Stokes (13) and Orange (9) Counties and one out of state resident exposed in North Carolina. The index case developed symptoms on April 4, shortly after returning from a trip to India. Measles was suspected when household contacts developed symptoms, and diagnosis was confirmed by the State Laboratory of Public Health on April 16. The most recent case developed a rash on May 7. All cases have been epidemiologically linked.

As a reminder, measles, a highly infectious viral disease, is spread through coughing, sneezing, and contact with secretions from the nose, mouth, and throat of an infected person. The incubation period for measles is usually about 10 days from exposure to fever (range, 7–18 days) and 14 days from exposure to rash (range, 7–21 days). Typically, illness begins with fever $\geq 101^{\circ}\text{F}$, cough, coryza, and conjunctivitis. Koplik spots may be visible on the buccal mucosa. After 3–7 days of illness, this stage progresses to a maculopapular rash that begins on the face and generalizes to the rest of the body. Persons with measles are contagious from 4 days prior to rash onset through 4 days after rash onset.

The majority of cases in this outbreak have occurred among persons who were not vaccinated against measles. However, four cases have occurred among persons who had received at least one dose of measles, mumps, and rubella (MMR) vaccine. While measles can infrequently occur in vaccinated people who have close or prolonged exposure to another case, evidence from this outbreak and previous outbreaks shows that people who are not vaccinated remain at much higher risk of being infected.

Although every effort is being made to identify all contacts, it is possible that additional cases could occur among unrecognized contacts.

Recommendations:

The following recommendations are provided for North Carolina clinicians in order to rapidly identify any additional cases and control the spread of infection:

- Clinicians are urged to consider the diagnosis of measles in anyone presenting with a febrile rash illness and clinically compatible symptoms (cough, coryza, and/or conjunctivitis; Koplik spots).
- Clinicians who suspect measles should immediately contact their local health department or the state Communicable Disease Branch (919-733-3419; available 24/7) to discuss laboratory testing and control measures.

www.ncdhhs.gov • www.publichealth.nc.gov
Tel 919-707-5000 • Fax 919-870-4829

Location: 5605 Six Forks Road • Raleigh, NC 27609
Mailing Address: 1931 Mail Service Center • Raleigh, NC 27699-1931
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- Any patient with suspected or confirmed measles should be immediately isolated, using airborne isolation precautions if possible. Rooms occupied by a suspect or confirmed measles patient should not be used for 2 hours after the patient leaves.
- Notify EMS and/or the receiving facility prior to transporting or referring patients with suspected or confirmed measles to avoid additional exposures.
- Only healthcare workers with documented immunity to measles should attend to patients with suspected or confirmed measles.
- Healthcare personnel without evidence of immunity who are exposed to measles should be relieved from patient contact and excluded from the facility from the 5th day after the first exposure until the 21st day after the last exposure, regardless of whether they received vaccine or immune globulin (IG) after the exposure.

As a reminder, vaccination with MMR vaccine is the best way to protect against measles. Clinicians are encouraged to provide MMR to all unvaccinated patients who are eligible for this vaccine. Healthcare workers should be immunized with two doses of MMR, and this outbreak is an opportunity to verify compliance.

Additional clinical information for providers about measles is available at: <http://www.cdc.gov/measles/index.html>. Please contact your local health department or the North Carolina Communicable Disease Branch (919-733-3419) with any questions.