

Measles Outbreak Associated with Foreign Travel — Finney County, January 2012



Background

On January 10, 2012, the Finney County Health Department (FCHD) was notified of two patients presumptively diagnosed with measles. The patients, an adult and a child from the same household, had developed symptoms of fever, fatigue, malaise, and rash shortly after returning to Finney County after traveling to a foreign country where measles is endemic. FCHD informed the Kansas Department of Health and Environment's Infectious Disease Epidemiology and Response section (KDHE) at 10:00 A.M. the same day. FCHD, with the assistance of KDHE, immediately began an investigation to identify the source of measles and prevent further transmission of disease.

Methods

FCHD worked with the patients' health care providers to obtain clinical and laboratory information, and interviewed the patients regarding their symptoms and activities since returning to Finney County.

Presumptive serology testing was initially performed on blood specimens by the patients' healthcare providers through a private laboratory using either enzyme-linked immunosorbent assay (ELISA) or enzyme-linked immunoassay (EIA). Nasopharyngeal and throat swabs were collected by FCHD and sent to the Kansas Health and Environmental Laboratories (KHEL) for additional molecular testing using a polymerase chain reaction (PCR) test. Specimens that were preliminarily positive by PCR at KHEL were forwarded to the Centers for Disease Control and Prevention (CDC) for genotyping.

According to criteria set by the Council of State and Territorial Epidemiologists (CSTE), a positive laboratory test is considered confirmatory of the presence of measles by any of the following: serologic test for measles immunoglobulin M antibody; or significant rise in measles antibody level by any standard serologic assay; or isolation of measles virus from a clinical specimen; or detection of measles-virus specific nucleic acid by polymerase chain reaction.

Since both patients had been symptomatic for ten days and had been hospitalized for six of those days, FCHD began active case finding and a contact investigation to identify others in the community that may have been exposed. Contacts were assessed for potential exposure during the infectious period of the two index cases (December 31st, 2011–January 7th, 2012) and for risk of measles acquisition based on age (too young to be vaccinated), immune status (potential for immunosuppression), and documented vaccination status. Based on the documented vaccination status, if a person previously had two doses of a measles-containing vaccine they were considered protected. If they had one dose (typically 95% effective), a booster was recommended. If they had no documented vaccine history they were considered susceptible, and immunoglobulin (IG) or vaccine was offered, depending on length of time from exposure. Exposure was defined as being in an enclosed environment with a confirmed case, or for up to two hours after a person with measles was present.

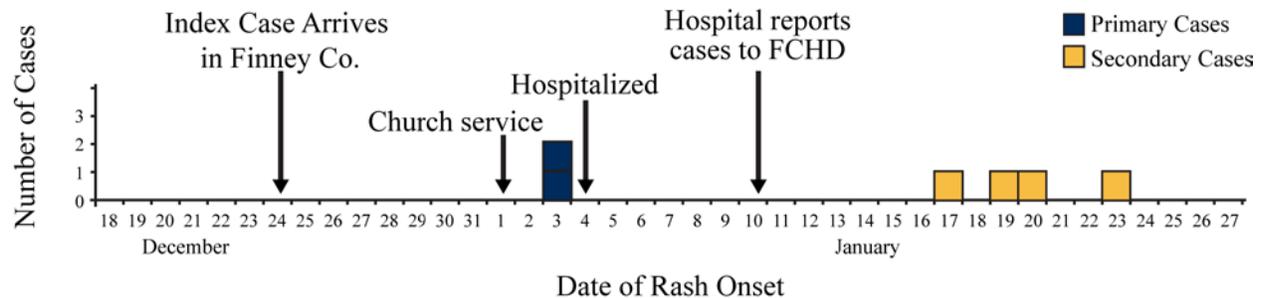
As additional cases were identified, their exposure history was assessed to identify both epidemiologic linkage to the known cases, and to identify additional susceptible contacts. This included assessing exposures at medical clinics, a community church, a movie theater, a regional sporting event, and a nearby rural community with unknown but potentially low vaccination rates.

Public messaging to the community through in-person communications, radio communications and press releases were utilized to provide education and identify any additional potential cases.

Results

During the course of the investigation, six cases of measles were identified: two with primary (index) cases of measles that were internationally imported and four with secondary cases of measles. All six ill persons were residents of Finney County. The two persons that were index cases arrived in Finney County, after foreign travel, on December 24th, 2011 (Figure 1). They began to develop general symptoms of illness on December 31st. On January 1st, 2012, during their infectious period, they attended a church service. They developed a rash on January 3rd; they were hospitalized the next day. FCHD and KDHE were notified about the two persons with measles on January 10th, 2012.

Figure 1: Epidemiological curve of confirmed cases by rash onset date (n=6).



All four secondary cases had documented exposure to the two index cases. Two ill persons lived in the same household as the index cases. One secondary case was in an adult infected at the church, and another was in a healthcare worker infected at a hospital. The ages of the six ill persons ranged from 1 to 31 years (median age, 15). Five were male.

Ill persons experienced common measles symptoms (Table 1). Symptoms of fever, rash, and cough were reported for in all six persons. Conjunctivitis and coryza were reported in five persons. Two persons were hospitalized and all recovered from their illnesses without complications.

Table 1. Symptoms of measles reported among ill persons (n=6).

Symptom	# of Cases with Symptom (n=6)	% of Cases
Cough	6	100
Fever	6	100
Rash	6	100
Conjunctivitis	5*	100
Coryza	5*	100

**Presence of conjunctivitis and coryza was unknown for one case*

Table 2. MMR vaccination history of ill persons at time of exposure.

Vaccination status	# of ill persons (n=6)	% of Cases
No history	3*	50
One dose	1	17
Two doses	2*	33

**See discussion section*

Two specimens from two persons were positive for measles by PCR testing at KHEL. Specimens from five persons were positive for measles by PCR testing at the CDC and were genotyped as the B3 strain, which was consistent with endemic measles from the region where the index cases had traveled. A specimen from one person was positive for IgM antibodies.

Over 450 persons were assessed for potential exposures to the two index cases. Of those, at least 136 persons were determined not to have been exposed, and 314 persons were determined to be exposed in healthcare, church, and personal settings (Table 3).

Table 3. Number of persons identified per exposed groups by susceptibility and number of secondary cases.

Exposed Groups	# of Exposed	# of Secondary Cases*
Healthcare Workers	87	
Not susceptible	84	
Susceptible	3	1
Healthcare Patients and Visitors	87	
Not susceptible	80	
Susceptible	7	0
Church attendees	132	
Not susceptible	129	
Susceptible	3	1
Personal contacts	6	
Not susceptible	4	
Susceptible	2	2
Total	314	4

**The number of secondary cases is a subset of the number of exposed persons.*

Patient admission records for the emergency department were examined to identify susceptible contacts in the waiting room for up to two hours after the two persons with measles were present. Those persons were interviewed to identify any potential susceptible contacts. Admission records were also used to identify all patients in the hospital during the admission periods of the two patients with measles. The susceptibility of each patient was determined and interviews were conducted to identify additional visitors to the wards.

All hospital staff were assessed for susceptibility to measles. Immunosuppressed or inadequately vaccinated hospital-staff were excluded from work for 21 days. Adequate vaccination was defined as at least one dose of measles vaccine; those with only one dose were offered a booster. Excluded staff were allowed to return to work if they had a measles IgG antibody titer consistent with prior vaccination.

All contacts were provided education on the symptoms and incubation period of measles. Susceptible contacts were advised to notify their physician, and obtain vaccination or measles immunoglobulin as recommended by ACIP guidelines. Contacts that developed any symptoms consistent with measles were advised to stay home and contact medical care by phone if symptoms developed, or call ahead to the medical office if care was required. School age children and healthcare workers who refused vaccination were excluded for 21 days from school or work.

Discussion

During the outbreak, heightened awareness of measles in the community resulted in over-reporting of common childhood rash illness as suspect cases of measles. KDHE and the FCHD responded by developing supporting educational messaging and materials. Materials focused on informing the community about symptoms consistent with measles and steps to take if measles was suspected. One example of this included a cartoon developed for publication through a variety of media sources such as newspapers and websites (Figure 2). Other guidance documents and protocols focused on diagnosis, treatment recommendations, and reporting of suspected cases were developed by KDHE and distributed to medical providers.

Figure 2: Cartoon developed by KDHE for media publication.



The CDC's Advisory Committee on Immunization Practices (ACIP) recommends two doses of Measles, Mumps, and Rubella (MMR) vaccine separated by at least 1 month (i.e., a minimum of 28 days) and administered on or after the first birthday for all children and before entry into kindergarten and for certain high-risk groups of adolescents and adults.¹

All three persons who acquired measles with no history of MMR vaccination were eligible to receive the vaccine. One of these received one dose of the vaccine 14 days after the initial exposure, however, this was past the 72-hour window when MMR is effective for post-exposure prophylaxis.² Of the two persons who acquired measles with a history of two doses of MMR vaccine, one had received medical treatments that may have affected their immune response. The other person recalled receiving two doses of MMR vaccine prior to exposure, but did not have official vaccination records. Upon identification as a contact an antibody titer test revealed a low response against measles. An additional MMR dose was administered and their titer levels were retested. Unfortunately the low titer response persisted and they went on to develop measles.

Extensive federal, state, county, and private resources were utilized to respond to the outbreak and limit the potential transmission of illness (Table 4). Surrounding county health departments were involved in investigating suspected contacts who were potentially exposed to the persons with measles.

Table 4. Estimated personnel time and costs associated with the measles outbreak.

Agency	Personnel Hours	Personnel Costs	Additional Costs
State and federal	1008.5	\$39,375.81	\$4,916.35
FCHD	691.5	\$21,125.45	\$1,096.00
Hospital	858	\$8,640.00	\$1,250.00
Other county health departments	23	\$477.50	\$0.00
Total	2581	\$69,618.76	\$7,262.35
Grand Total			\$76,881.11

The cost of the outbreak response was high, not only in direct expenses, but also from indirect costs associated with the interruption of services provided to the community by medical providers, the hospital, and the county health departments. FCHD was forced to reschedule 64 patient appointments during the first week of the response alone, in order to adequately respond to the outbreak. Some health care workers had to be excluded from work. Schools had to evaluate students' immunization status, and exclude susceptible students from school. Additionally, the outbreak caused concern and anxiety in the community. Health care providers and patients incurred expenses for evaluating rash illnesses to rule out measles infection.

Conclusion

In January of 2012, six persons were diagnosed with measles. Two were associated with foreign travel to a region where measles was endemic. Four were associated with exposure to the two index cases in Finney County.

Public health efforts to identify and notify persons with potential exposure, especially among those who might be susceptible, were successful. All of the persons who later developed measles were identified and notified. Three of four persons were identified early on as potentially being exposed and susceptible, and were closely monitored for the development of symptoms of measles. The other susceptible contact, from the church, had received notification and education about measles before becoming ill and was aware of the need to notify their health care provider and public health officials when symptoms developed.

Measles is rare in regions of the world with high vaccination coverage. Sporadic cases of measles in the United States are attributed to foreign travel; travelers may spread the infection to unprotected persons after returning to the U.S.³

Measles is still common in many developing countries, where more than 20 million people are affected by measles each year. Approximately 158,000 people died from measles in 2011 — mostly children under the age of five. Measles remains one of the leading causes of death among young children globally, despite the availability of a safe and effective vaccine.³ Studies indicate that more than 99% of

persons who receive two doses of measles vaccine develop serologic evidence of measles immunity, which appears to be long-term and may be lifelong.²

When children are under 12 months of age, they are not yet able to be vaccinated for measles. Unvaccinated young children are at highest risk of measles and its complications, including death. Unvaccinated pregnant women are also at risk. Any non-immune person (who has not been vaccinated or was vaccinated but did not develop immunity) can become infected. This particularly includes persons who have suppressed immunological conditions.³

Measles infection is caused by the measles virus, a paramyxovirus within the genus *Morbillivirus*.² Measles virus normally grows in the cells that line the back of the throat and lungs.⁴ Measles is spread through direct contact with infectious droplets or by airborne spread of tiny droplets, which can remain suspended in the air and viable on surfaces for up to two hours after a person with measles has occupied the area. A person with measles is considered infectious from four days before the onset of the characteristic measles rash, or from one day before onset of the prodromal symptoms of fever, cough, and coryza (runny nose). The communicable period extends to four days after rash onset. For care providers, a blue and white spotted rash (enanthem) on mucous membranes, called Koplik spots, is strong clinical indication of the presence of measles. It usually occurs 1-2 days before an external rash begins on the body, and lasts 1-2 days after the start of the external rash. The external rash associated with measles is a generalized maculopapular erythematous rash and can last 5-6 days. It begins on the face or forehead and progresses downward to the trunk and lower extremities. The palms of the hands and soles of the feet are spared from rash. Individuals who are not vaccinated or have suppressed immunological conditions are also at risk.² Children under the age of one are particularly at risk, as they are not able to be vaccinated for measles until the age of one year.

There is no specific treatment for measles and most people recover within 2–3 weeks. However, particularly in malnourished children and people with reduced immunity; measles can cause serious complications, including blindness, encephalitis, severe diarrhea, ear infection and pneumonia.³

References:

- 1) Measles, Mumps, and Rubella Vaccine Use and Strategies for Elimination of Measles, Rubella, and Congenital Rubella Syndrome and Control of Mumps: Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR. May 22, 1998 / 47(RR-8);1-57.
- 2) Epidemiology and Prevention of Vaccine-Preventable Diseases, 12th ed. Pgs 173-192.
- 3) World Health Organization. MEASLES FACTSHEET. Accessed online at: <http://www.who.int/mediacentre/factsheets/fs286/en/index.html>. Page last updated: February 2013. Accessed on March 18, 2013.
- 4) Centers for Disease Control and Prevention. Overview of Measles Disease. Accessed online at: <http://www.cdc.gov/measles/about/overview.html>. Page last updated: April 13, 2012. Accessed on March 18, 2013.

Report by: Robert Geist, MPH, CIC (Kansas Department of Health and Environment) and Amy Peterson, DVM, PhD (Centers for Disease Control and Prevention, Epidemic Intelligence Service)

On: June 31, 2012

Investigation by:

Finney County Health Department

919 Zerr Rd.

Garden City, Kansas 67846

<http://www.finneycounty.org/index.aspx?nid=139>

Kansas Department of Health & Environment

Bureau of Epidemiology and Public Health Informatics

1000 SW Jackson St., Suite 210

Topeka, Kansas 66612

<http://www.kdheks.gov>