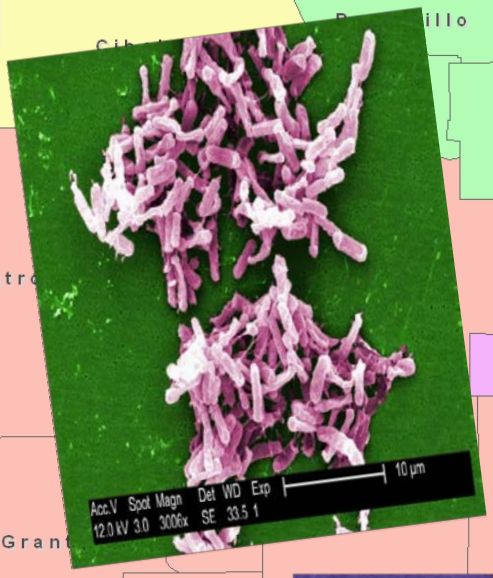
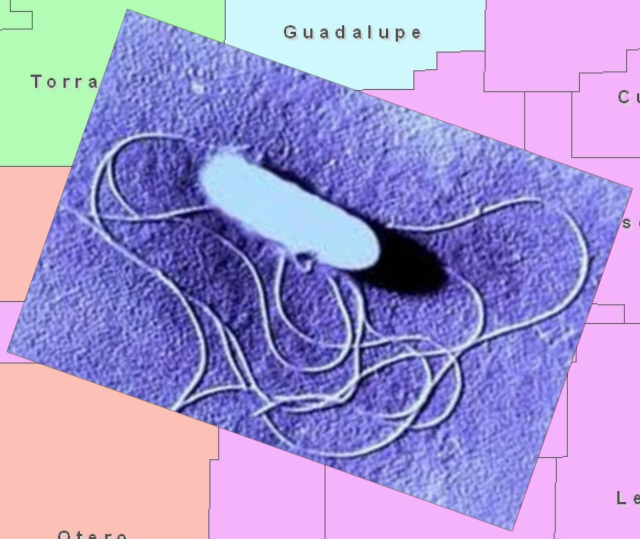
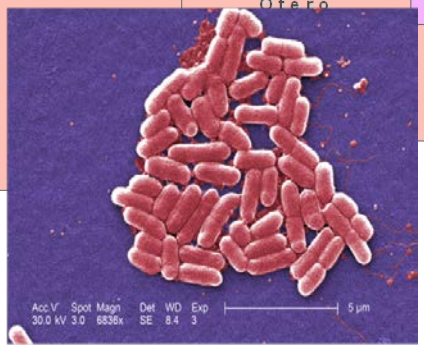
Infectious Diseases in New Mexico

2012 Annual Report







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Introduction

The New Mexico Department of Health (NMDOH) tracks outbreaks and conducts investigations to protect the public health of New Mexicans and for reporting to the Centers for Disease Control and Prevention (CDC). In addition to outbreaks of notifiable diseases, suspected foodborne or waterborne illness, acute illness of any type involving many people in the same geographical area, and any illness of public health significance also are investigated under the New Mexico (NM) Administrative Code 7.4.3.13.

This report highlights some of the infectious disease outbreaks and selected conditions occurring in NM during 2011. The chapters cover a range of topics including: a rabies epidemic in the skunk population in southeastern NM; NM's experience in the multi-state Listeriosis outbreak associated with cantaloupes; Shiga toxin-producing *Escherichia coli* infections; an update on healthcare-associated infections in NM; a new surveillance program for *Clostridium difficile;* and the ongoing challenge of responding to increasing pertussis cases throughout the state. Appendix A provides a summary of notifiable disease rates in NM during 2011. Appendices B-E provide additional information, including a glossary, acronym definitions, methods, and notifiable diseases in NM for 2011.

This report has been prepared by NMDOH infectious disease epidemiology and partner University of New Mexico staffs. In addition, significant contributions from others within NMDOH including Scientific Laboratory Division (SLD) personnel, public health nurses (PHNs), and regional epidemiologists, are critical to ongoing surveillance and investigation of infectious diseases in NM. The cooperation and active assistance from other organizations (e.g., healthcare providers, educational institutions) and individuals (e.g., infection preventionists) statewide also have been vitally important in conducting investigations and monitoring infectious diseases throughout the state.

Chapter 1: Animal Rabies Outbreak in Eddy County, New Mexico, 2011-2012

Sandra Melman MS, Elizabeth VinHatton BA, BS, Megin Nichols DVM, MPH, Paul Ettestad DVM, MS

Highlights

- Beginning in late 2011 and continuing into 2012, Eddy County, New Mexico (NM) experienced an unusually high number of animals testing positive for rabies.
- Forty-two dogs, multiple cats, ten sheep, and two horses were euthanized after exposure to wild animals testing positive for rabies.
- Twenty-six people required post-exposure prophylaxis after potential exposure to rabid animals.
- Domestic animal vaccination remains the most effective method of preventing rabies in animals and reducing the risk of exposure in humans.

Background

Rabies is a preventable viral disease of mammals sometimes transmitted to humans through rabid animal bites. Although human deaths in the United States (US) are rare, worldwide more than 55,000 people die from rabies each year[1]. Prior to 1960, the majority of animal rabies in the US occurred among domestic animals[2]. Today more than 80% of reported US animal rabies occurs in wildlife, with skunks, raccoons, bats, and foxes being the most frequently diagnosed[3-5]. Rabid wild animals may manifest behavioral changes, including daytime activity among nocturnal animals and aggressive behavior, increasing the likelihood of contact with humans and their pets[6]. Humans are at risk of exposure to rabies directly from infected wild animals, with bats responsible for the majority of human rabies cases in the US[7]. Another mode of transmission is from exposure to unvaccinated pets that have encountered a rabid wild animal and become infected.

Rabies Outbreak in New Mexico

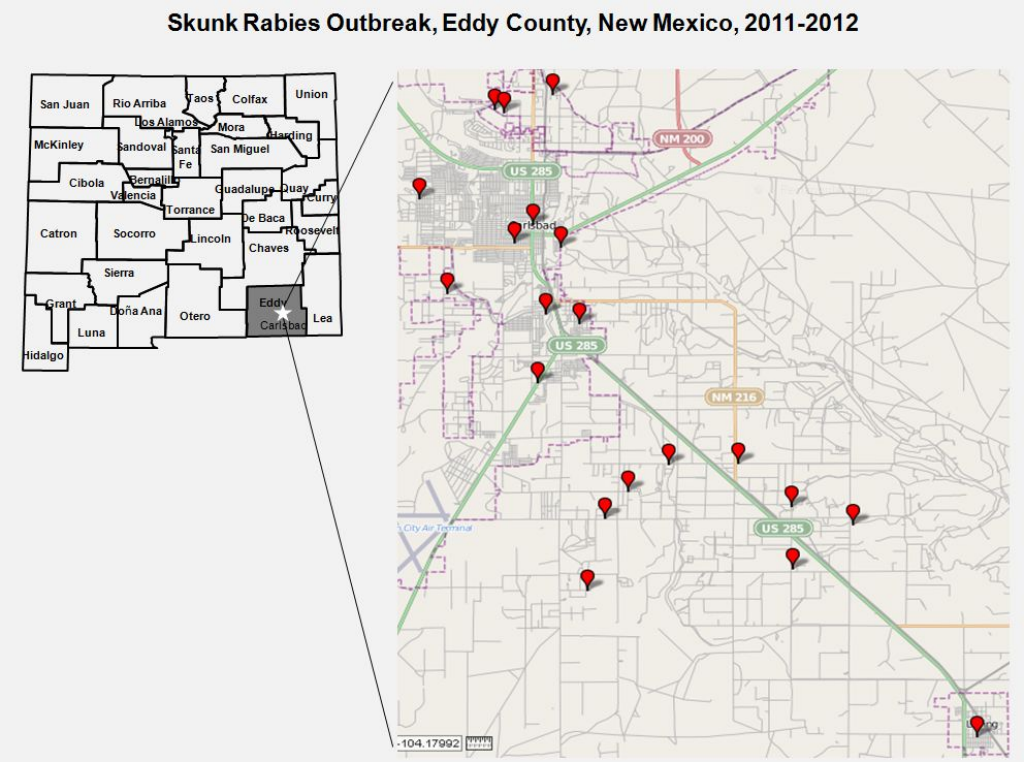
Beginning in December 2011 and continuing into 2012, Eddy County (located in southeastern NM) experienced an unusually high number of animals testing positive for rabies. Thirty-five rabid skunks, two foxes, and two dogs from Eddy County tested positive for rabies at the New Mexico Department of Health (NMDOH) Scientific Laboratory Division (SLD). All of these infected animals had a south-central skunk rabies virus variant. This variant is one of four skunk rabies variants occurring in North America.

Photograph: Skunk

Most of these rabid animals from 2011 to 2012 were found in or around a 12-mile radius of the city of Carlsbad in Eddy County after they had been killed by or were in a fight with owned dogs. Other animals were tested because they were displaying erratic behavior (e.g., walking through town in daylight or acting aggressively towards people or domestic animals). As a result of exposure to these infected animals, 26 people required rabies post-exposure prophylaxis.

This number of rabid animals is greater than 20 times the yearly average. There have been 67 rabid skunks identified from Eddy County since 1966, an average of 1.5 rabid skunks per year. Prior to the 2011/2012 outbreak, there have only been six dogs testing positive for rabies in Eddy County since 1966; the last rapid dog was reported in 2001. Figure 1 shows the distribution of rabid skunks in Eddy County during the outbreak.

Figure 1. Map of Skunk Rabies Outbreak, Eddy County, New Mexico, 2011-2012



After each had been exposed to an animal testing positive for rabies, 42 dogs, multiple cats, two horses, and a flock of ten sheep were released by their owners for euthanasia. Euthanasia or strict isolation for six months under local animal control agency supervision is mandated by state regulation for inadequately vaccinated or unvaccinated animals exposed to known rabid animals[8]. Thirty-three other exposed dogs were up to date on their vaccinations and required a booster dose of rabies vaccine and were confined and observed for 45 days.

Although no people were exposed to the rabid wild animals, 19 people, including ten children, were exposed to two rabid dogs. All these people received rabies post-exposure prophylaxis (PEP). Rabies PEP is a regimen for the prevention of rabies that involves administration of human rabies immune globulin (HRIG), which is given only once, and a series of four rabies vaccinations. One unvaccinated dog displayed photophobia, behavior changes, lethargy, and fearfulness approximately three weeks after killing a skunk at the owner's house. Four other animals in the house were considered exposed: one unvaccinated adult male dog; one unvaccinated adult cat; and two puppies too young for vaccination. All were released to animal control by the owners for euthanasia due to their inadequate vaccination history and confirmed exposure to a rabid animal. The second dog, with a history of one dose of rabies vaccine in 2004 at eight months old, displayed excessive salivation, lack of coordination, inability to remain upright, shaking, and eyes rolling back. The dog died at a veterinary hospital two days after presentation. There was no known history of

exposure to a skunk for this dog and no evidence of any wounds. Multiple other animals in the house were considered exposed: one unvaccinated adult dog; two unvaccinated horses; and, multiple unvaccinated cats. All exposed animals were released to animal control by the owners for euthanasia.

Seven additional people in Eddy County received rabies PEP since January 2012. In six of the cases, the individuals received unprovoked bites from stray dogs that could not be found after 72 hours of searching by animal control officers. The seventh person was scratched by the tooth of a coyote.

The south-central skunk rabies variant is known to be maintained in enzootic levels in skunk populations throughout southeastern Arizona, southern NM, and Texas, where epizootic outbreaks periodically occur[5]. Studies have shown that rabies in skunks peaks in the winter or early spring, possibly corresponding with increased transmission rates during breeding and dispersal seasons[4,7]. The larger and denser the skunk population, the more likely it is for skunks to wander into urban and suburban areas in search for food and water. This increases the chances of exposure to domestic animals and humans.

The canine rabies variant has been eliminated from the US through an extensive vaccination program of dogs, cats, and ferrets. However, unvaccinated domestic animals are susceptible to other rabies variants[9]. Most human exposures to rabies occur via contact with unvaccinated domestic animals that have been exposed to a rabid wild animal. In this outbreak investigation, 25 of the 26 individuals who received PEP had contact with dogs, and only one had contact with a wild animal (coyote). This illustrates why avoidance of direct contact between domestic animals and wildlife is important for prevention of human rabies cases.

Conclusions

Domestic animal vaccination, mandated by law in the State of New Mexico[8], remains the most effective method of preventing rabies in animals and reducing risk of exposure in humans. Rabies in fully or partially vaccinated dogs and cats is uncommon, but can occur[10]. Of the two rabid dogs found during this outbreak, one had a single dose of rabies vaccine in its lifetime. It has been observed that as high as 9% of vaccinated dogs may have an inadequate serological response to the vaccine[11,12].

The lives of more than 50 pets and livestock could have been saved during this outbreak if these animals had been adequately vaccinated prior to exposure to a rabid animal. The NMDOH recommends domestic animal vaccination, avoidance of wildlife, and elimination of food, water, and shelter that could attract wildlife to help prevent exposure to rabid animals.

Acknowledgements

The authors would like to thank Carlsbad and Eddy County animal control officers and veterinarians, SLD staff conducting rabies testing, and the NMDOH pharmacy staff who supplied PEP for exposed individuals.

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Chapter 2: Multistate Listeriosis Outbreak, 2011: The New Mexico Perspective

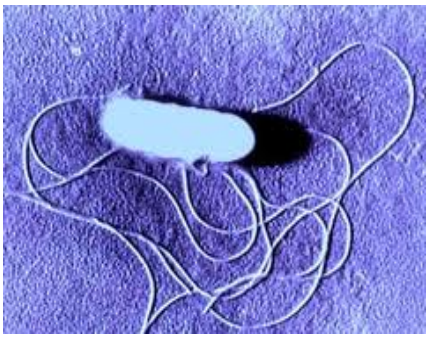
Carol Conroy PhD, MPH, Paul Ettestad DVM, MS, Chad Smelser MD

Highlights

- Although *Listeria monocytogenes* is commonly found in pre-cooked foods, human infections are rare.
- In 2011 New Mexico (NM) became part of a multistate outbreak of listeriosis with 15 confirmed cases.
- The outbreak was attributed to consumption of contaminated cantaloupes grown at a single farm in southeastern Colorado.

Background

Listeriosis is a serious infection caused by eating food contaminated with *Listeria monocytogenes*. Symptoms of infection include fever, headaches, vomiting, diarrhea, and can lead to severe illness including sepsis, meningitis, and death. These bacteria are widespread in the environment and can be found most often in soft cheeses, unpasteurized milk, undercooked poultry, deli meats, and many other foods. Unlike other bacteria, *L. monocytogenes* can continue to grow in refrigerated foods. These bacteria have flagella that contribute to their ability to aggregate on the surface of foods, forming a "biofilm" that resists cleaning and disinfection.



Photograph: *Listeria monocytogenes* bacterium

The incubation period is long compared with other enteric pathogens (e.g., *Salmonella, Shigella, and Escherichia coli*) ranging from 3 to 70 days, with a median of three weeks. Immunocompromised people, pregnant women, and the elderly are at greatest risk for severe illness from *Listeria*. Pregnant women themselves may only experience mild symptoms, but they are at risk of fetal death and premature delivery. Although exposure to these bacteria is common, this disease occurs rarely. From 2006 through 2010, only 24 laboratory-confirmed cases were identified in NM. As with other

foodborne illness, thoroughly cooking raw meat, washing raw fruits and vegetables, avoiding unpasteurized dairy products, and using proper hand washing practices can reduce the risk of infection. Individuals at high risk are especially advised to avoid eating soft cheeses, deli meats, uncooked or smoked seafood, and unpasteurized dairy products.

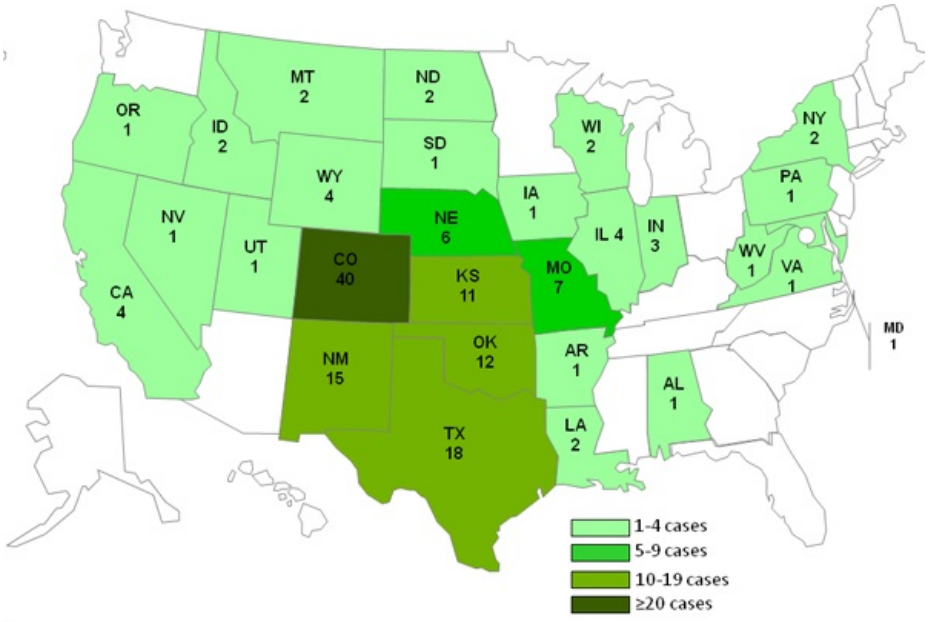
Multistate Listeriosis Outbreak

NM launched an investigation on September 6, 2011 after three cases of listeriosis were reported to the New Mexico Department of Health (NMDOH) within one week. Other states, including Colorado, also had identified a greater than expected number of cases in early September, 2011. Soon afterwards, the CDC PulseNet program revealed four matching pulsed field gel electrophoresis (PFGE) patterns (i.e., DNA fingerprinting) from infected patients in multiple states, indicating a multistate outbreak.

Clinical specimens from NM were tested at the NMDOH's Scientific Laboratory Division (SLD) and sent to CDC to determine if PFGE patterns matched infected patients reported by other states. Interviews were conducted with affected patients or their family members to assess food exposures and to characterize illness.

NM had 15 cases of Listeriosis associated with the multistate outbreak traced to consumption of contaminated cantaloupes grown and distributed by a single farm in southeastern Colorado. Nationally, there were a total of 147 cases from 28 states as shown in Figure 2.

Figure 2. Map of Listeriosis cases in 2011 Multistate Outbreak



Source: http://www.cdc.gov/listeria/outbreaks/cantaloupes-jensen-farms/082712/map.html

A case (infected patient) was defined as illness due to *Listeria monocytogenes* with a specimen collection date from July 31, 2011 through October 31, 2011 and a two-enzyme PFGE match to one of the outbreak strains[1]. CDC and the Food and Drug Administration (FDA) worked with 28 states, including NM, to characterize the outbreak, determine how the cantaloupes were contaminated, and to prevent further exposure.

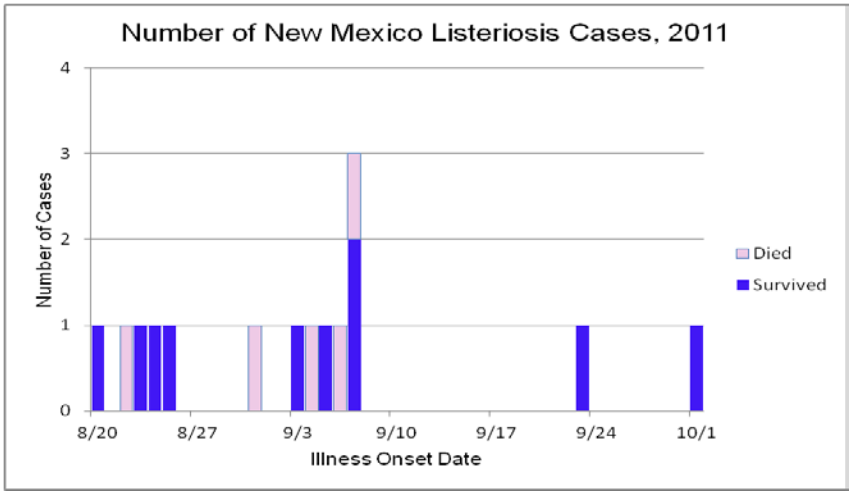
Of the nationwide cases, 33 people died and 99% were hospitalized. This listeriosis outbreak resulted in more deaths than any other foodborne outbreak since 1998[2]. As Table 1 shows, NM cases were similar to all United States (US) cases. The US fatal cases had a median age of 81 years and ranged from 48-96 years old. NM fatalities were slightly younger with a median age of 77 and ranged from 61-96 years old. All of the infected NM patients had underlying conditions including cancer, heart disease, liver disease, diabetes, and blood disorders making them susceptible to *Listeria* infections. All 15 NM patients were hospitalized.

Table 1. Characteristics of Listeriosis cases for New Mexico and United States associated with 2011 Multistate Outbreak

	New Mexico cases (N=15)	All United States cases (N=147)
Age range, median	43-96 years, 78	<1-96 years, 78
Male	53.3%	42.0%
Hospitalized	100.0%	99.0%
Deaths	33.3%	22.4%

NM cases had illness onset from late August until early October (Figure 3). Onset of illness for US cases occurred from July 31, 2011 until October 27, 2011.

Figure 3. Illness Onset Date for New Mexico Listeriosis Cases, 2011



Patient interviews in NM and other states found cantaloupe consumption was the common exposure and, more specifically, cantaloupes grown and distributed by a single farm in Colorado were associated with illness. Samples of cantaloupes from homes and stores tested positive for *Listeria* and matched the PFGE patterns of *Listeria* cultured from the patients. Traceback activities conducted to determine the source and distribution of the implicated cantaloupe showed cantaloupes from a single farm in southeastern Colorado were responsible for the outbreak. Inspections of the farm and environmental sampling from the farm's packing facility showed the cantaloupes in the fields tested negative for *Listeria* but became contaminated in the washing, packing, and cold storage facility. Low level, sporadic contamination from the agricultural environment and cantaloupes coming from the field may have allowed *Listeria* to become established in the packing facility and cold storage.

Conclusions

Although a rare disease, listeriosis can cause very serious illness resulting in death, miscarriage, and fetal death. This multistate outbreak included 15 NM patients, five of whom died. Contaminated cantaloupes from a single farm in southeastern Colorado were the source of exposure for all cases in this outbreak. Additional information about the nationwide Listeriosis outbreak in 2011 and the timeline of events can be found at: http://www.cdc.gov/listeria/outbreaks/cantaloupes-jensen-farms/082712/index.html.

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Chapter 3: Shiga Toxin-producing *Escherichia coli* (STEC) Infection

Sarah Khanlian MPH and Sarah Lathrop DVM, PhD

Highlights

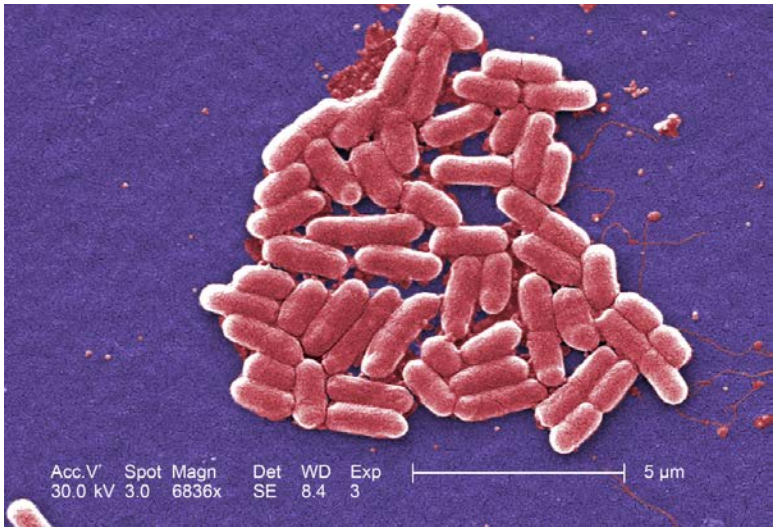
- Shiga toxin-producing *Escherichia coli* (STEC) infections occurring in children can have serious, life-threatening complications.
- New Mexico (NM) conducts active surveillance for STEC infections.
- STEC are typically divided into two categories based on serotype: O157 and non-O157, with non-O157 rates increasing in both NM and the United States.

Background

Escherichia coli (*E. coli*) are a large and diverse group of bacteria and most do not cause illness. Shiga toxin-producing *E. coli (*STEC) causes disease by producing a toxin (Shiga toxin) that may damage the intestinal lining. Illness caused by STEC typically begins 3-4 days after infection, starting with watery diarrhea that may become bloody. Other symptoms include abdominal pain, nausea, and vomiting. About 5%-10% of people with STEC infection develop Hemolytic Uremic Syndrome (HUS), a potentially life threatening complication. This complication can lead to chronic kidney failure (requiring kidney transplant) or even death. Children under the age of five years and the elderly are more likely to develop HUS. Antibiotics are not recommended for treating STEC infections because antibiotic use during *E. coli* O157 infections has been associated with an increased risk of HUS in children[1]. Treatment of patients with known STEC diarrheal symptoms is typically supportive in nature (e.g., rehydration). Because of the severity of illness and the lack of effective treatment, prevention measures are critical to decreasing morbidity and mortality associated with STEC infections.

STEC infections commonly result from handling or eating raw or undercooked ground beef or drinking unpasteurized milk. Shiga toxin-producing *E. coli* also may be passed from person to person. Infection may occur from improper hand washing following contact with infected animals or surfaces contaminated with feces from an infected animal or person.

STEC are typically divided into two categories based on serotype: O157 and non-O157. Examples of non-O157 serotypes are O26, O111, and O103. Previously, the most common STEC in the United States was *E. coli* O157, although the trend is changing. Non-O157 infections have previously been less commonly reported and have resulted in less severe infection than the O157 serotype. Most laboratories use enzyme immunoassay (EIA) to identify a Shiga toxin-producing bacteria with confirmation provided by a culture identifying the serotype.



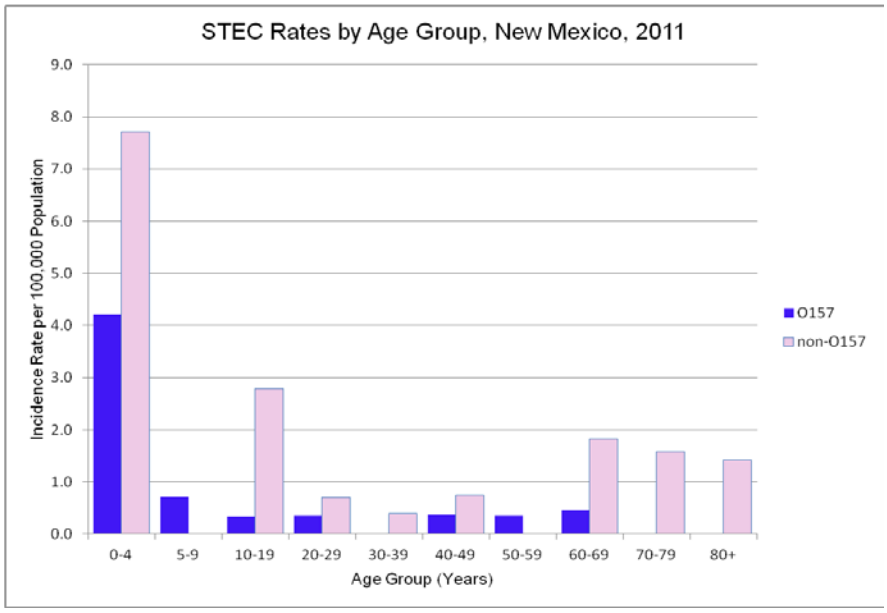
Photograph*: E. coli* O157 by Janice Haney Carr, CDC

STEC Infections in New Mexico

Surveillance for STEC infections is conducted in NM under the notifiable disease reporting requirement and through the Foodborne Diseases Active Surveillance Network (FoodNet) Program. NM is one often states conducting active surveillance for foodborne illness through a collaborative project (FoodNet) with the Centers for Disease Control and Prevention (CDC), the Food Safety and Inspection Service (FSIS), the United States Department of Agriculture (USDA), and the United States Food and Drug Administration (FDA). Since 2004, FoodNet has been conducting active, population-based statewide surveillance for enteric pathogens, including Shiga toxin-producing *E. coli*. Data presented here are from FoodNet, which collects data separately for O157 and non-O157 cases.

During 2004-2011, there were 61 laboratory culture positive cases of serotype O157 STEC and 100 non-O157 serotype cases in NM. Rates among children <5 years old are higher for most gastrointestinal infections, including STEC. The non-O157 serotype rate for 2011 in this age group was almost twice that of O157, as shown in Figure 4. During 2011, two (4.6%) children with STEC infections developed HUS in NM.

Figure 4. STEC Rates by Age Group, New Mexico, 2011



As the following figures show, non-O157 STEC cases are increasing in the NM population whereas O157 STEC rates and HUS rates have been relatively stable. Other states also have noted an increase in non-O157 STEC rates and attribute this to increasing use of the more sensitive toxin assay test for non-O157 STEC infections[2].

Figure 5. Number of STEC Cases, New Mexico, 2004-2011

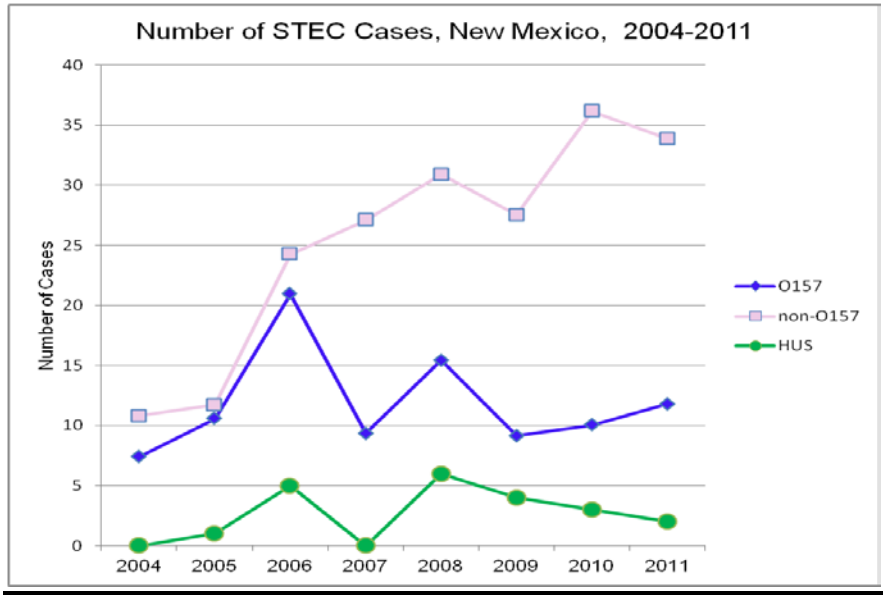
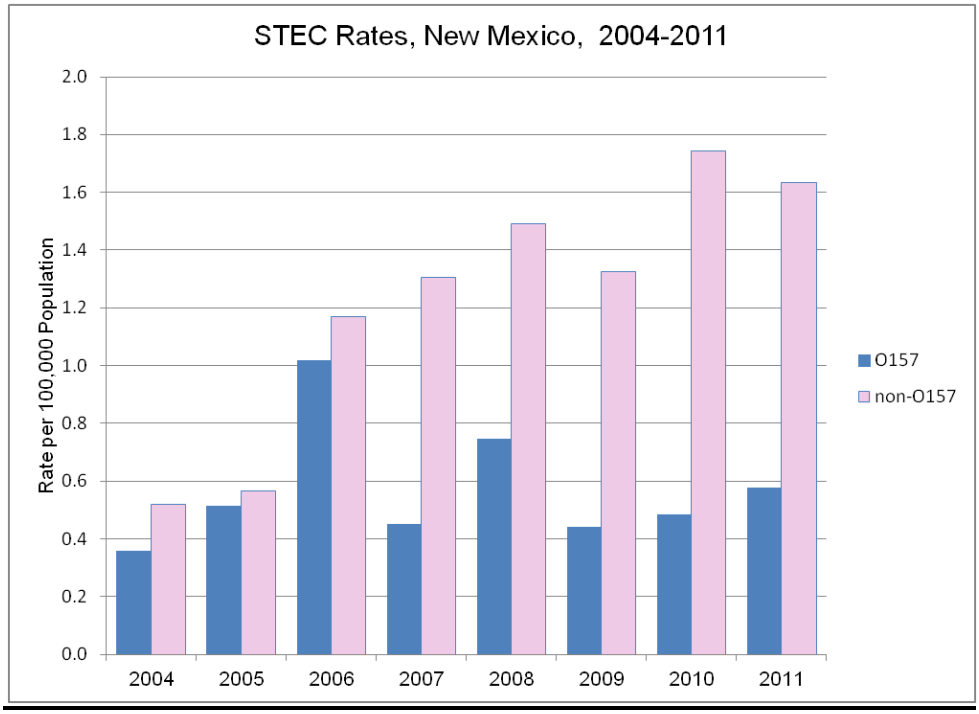


Figure 6. STEC Rates, New Mexico, 2004-2011



Conclusions

STEC cause disease by producing a toxin (Shiga toxin) that may cause damage to the intestinal lining. This is a serious foodborne pathogen that may result in HUS, a potentially life-threatening complication. STEC are categorized by serotype: O157 and non-O157 (including O26, O111, and O103). Although the rates of non-O157 STEC infections are increasing, the epidemiology of this serotype remains less understood.

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Chapter 4: Healthcare-associated Infections

Joan Baumbach MD, MPH, MS, Lisa Bowdey BA, Deb Thompson MD, MPH

Highlights

- Many healthcare-associated infections are preventable.
- Central line-associated bloodstream infection surveillance methods and collaborative prevention efforts have improved in NM.
- New Mexico (NM) is initiating *Clostridium difficile* infection surveillance.

Background

Healthcare-associated infections (HAI) may be acquired by patients in healthcare settings during the course of receiving treatment for other conditions. Many healthcare-associated infections are preventable through proven practices. The Centers for Disease Control and Prevention (CDC) has identified HAI as a priority for improving the quality of healthcare and patient safety throughout the United States. NM continues its initiative to monitor and prevent healthcare-associated infections. Targeted HAI in NM include central line-associated bloodstream infections and laboratory confirmed *Clostridium difficile* infections. Influenza vaccination rates of healthcare personnel are monitored because these staff may be a potential source of influenza to their patients.

Healthcare-associated Infections in New Mexico

NM has an HAI Prevention Plan guiding surveillance and prevention of healthcare-associated infections, submission of data at state and national levels, and reports to the public. This plan was developed by a Healthcare-associated Infections Advisory Committee with participation by consumers, the Association for Professionals in Infection Control and Epidemiology, the NM Hospital Association, NM hospitals, HealthInsight NM (the state healthcare quality improvement organization), local representation from the Society for Healthcare Epidemiology of America, and the NM Department of Health.

In 2011, there were 38 acute and long-term acute care facilities in NM voluntarily participating in healthcare-associated infection monitoring, prevention activities, or special research projects. In early 2012, it became mandatory for all acute care facilities to submit data for central line-associated bloodstream infections (CLABSI) and laboratory confirmed *Clostridium difficile* infections. A central line is a tube placed in a large vein for giving fluids or medications, drawing blood, or for monitoring purposes. A CLABSI occurs when a patient has a central line and then acquires an infection in the

blood. *Clostridium difficile* infection causes diarrheal illness that can be healthcare-associated and very serious. It is linked to 14,000 American deaths each year. Those most at risk are older adults who take antibiotics and receive medical care. Through the Emerging Infections Program, NM is developing the infrastructure for *Clostridium difficile* infection surveillance in selected counties. Twenty-two intensive care and non-intensive care units from 15 hospitals reported laboratory confirmed *Clostridium difficile* infections in 2011.

Photograph: Hand washing

CLABI surveillance methods and collaborative prevention efforts have improved in NM. Based on data submitted during 2011 by 20 NM hospitals, 53 percent fewer central line-associated bloodstream infections were observed than predicted from national reference data. Facility-specific outcomes for hospitals that met specified criteria are included in the full NM HAI report available at: www.nmhealth.org/HAI. Additional information on *Clostridium difficile* surveillance is included in Chapter 5 of this report.

The NM healthcare personnel influenza vaccination rate for the 2011-2012 flu season was 79.3% compared with the NM 2010-2011 flu season rate of 60.4%. The 2011-2012 rate exceeded the national Healthy People 2014-2015 interim goal of 70%. Facility-specific rates are included in the above referenced HAI report.

Conclusions

NM healthcare facilities continually demonstrate a commitment to patient safety within their facilities and also collaborate to share best practices for surveillance and prevention of HAI for the entire state. HAI data were voluntarily submitted for 2011 and beginning in 2012 select healthcare-associated infections became reportable to the NM Department of Health. Moving forward, the NM HAI annual report will include information on HAI that is mandated to be reported as well as other conditions that are voluntarily reported.

Chapter 5: Clostridium difficile Infection (CDI) Surveillance

Erin Phipps, DVM, MPH

Highlights

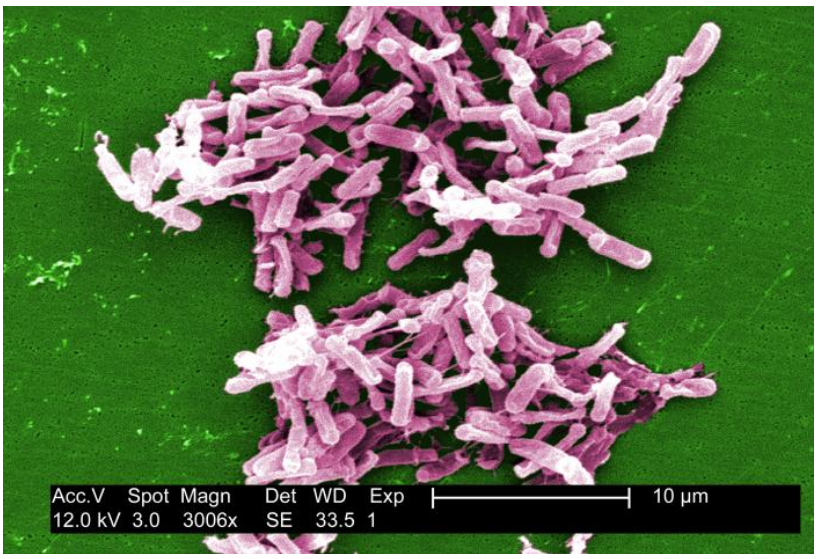
- *Clostridium difficile* (*C. difficile)* is recognized as one of the most important healthcare-associated infections today, and many cases also occur in the community among people who have not been hospitalized.
- The New Mexico (NM) Emerging Infections Program is conducting active, population-based surveillance for *C. difficile* in Bernalillo County.
- Less than half of new *C. difficile* infections in Bernalillo County are classified as healthcare facility-associated.

Background

Clostridium difficile is a spore forming, anaerobic, gram-positive bacterium that can cause disease in both humans and animals. Infection can result in asymptomatic colonization or lead to a wide range of clinical outcomes, from mild diarrhea to fulminant colitis and even death. While *C. difficile* infection (CDI) has traditionally been associated with healthcare settings (e.g., hospitalization or residence in a long term care facility), many cases occur in the community in people not previously hospitalized.

This organism is found naturally in a small percentage of healthy adults. The absence of clinical symptoms may be due to colonization with a non-toxigenic strain or to the presence of healthy intestinal flora limiting the presence of these bacteria to low levels. In one study, researchers isolated *C. difficile* from 7.6% of asymptomatic adults and found persistent carrier rates ranging from 4% to 15% among different population groups[1]. It is well-recognized that infants are commonly colonized with *C. difficile*. A recent study noted often healthy infants had acquired *C. difficile* and were colonized for several months during the first year of life. Another study conducted in two childcare facilities found 45% of healthy infants 18-36 months of age were positive for CDI[2].

Residence in healthcare facilities has been recognized as a risk factor for acquiring CDI. Among asymptomatic hospitalized adults, 10% to 30% have been found to be colonized with *C. difficile*[3]. One study found toxin-producing strains of *C. difficile* in 52% of asymptomatic long-term care facility residents[4]. While the importance of asymptomatic carriers in the transmission of *C. difficile* is unclear, it is important to recognize that this could be a potential source of infection, particularly for vulnerable populations such as the elderly.



Photograph: *Clostridium difficile* stool sample culture by Janice Haney Carr, CDC

C. difficile can form spores that can persist in the environment for months or years and are resistant to a variety of harsh conditions, including stomach acid and many commercial disinfectants. Persistent environmental contamination and re-contamination from patients, together with concentrated vulnerable populations, such as the elderly, those with suppressed immune systems, and those on antibiotics (resulting in alterations in intestinal flora), has resulted in CDI becoming one of the most important healthcare-associated infections (HAI) today. In fact, *C. difficile* may now be a more common cause of HAI than Methicillin-resistant *Staphylococcus aureus* (MRSA)[5].

Surveillance of *C. difficile* in New Mexico

The Centers for Disease Control and Prevention (CDC) Emerging Infections Program (EIP) in collaboration with ten states conducts active, population-based surveillance for a variety of pathogens. In 2011, NM joined other states and began CDI surveillance in Bernalillo County. The goals of this surveillance are to:

- Determine the incidence of community–and healthcare–associated CDI;
- Describe the epidemiology of community–and healthcare–associated CDI; and,
- Characterize *C. difficile* strains, especially from community–associated cases.

Currently, positive *C. difficile* laboratory tests in Bernalillo County, NM residents are reported by the testing laboratory to the CDI program. Incident cases (the first positive test or a positive test >8 weeks after any prior positive tests) in adults and children one year of age or older are then followed up with a review of their medical record. Information is collected on healthcare exposures, clinical findings, underlying conditions, and medication history. Cases are classified into one of three categories:

- Healthcare facility onset: Positive tests greater than three calendar days after admission to a healthcare facility;
- Community-associated: Positive specimens collected in an outpatient clinic or within three calendar days after admission to a healthcare facility with no documented overnight stay in a facility within the previous 12 weeks; or,
- Community-onset healthcare facility-associated: Community-onset cases that had an overnight stay in a healthcare facility within the previous 12 weeks.

Community-associated cases are eligible for a voluntary telephone interview. This interview collects detailed information regarding healthcare contacts, household contacts (including their healthcare exposures), travel history, animal exposures, and past medical history.

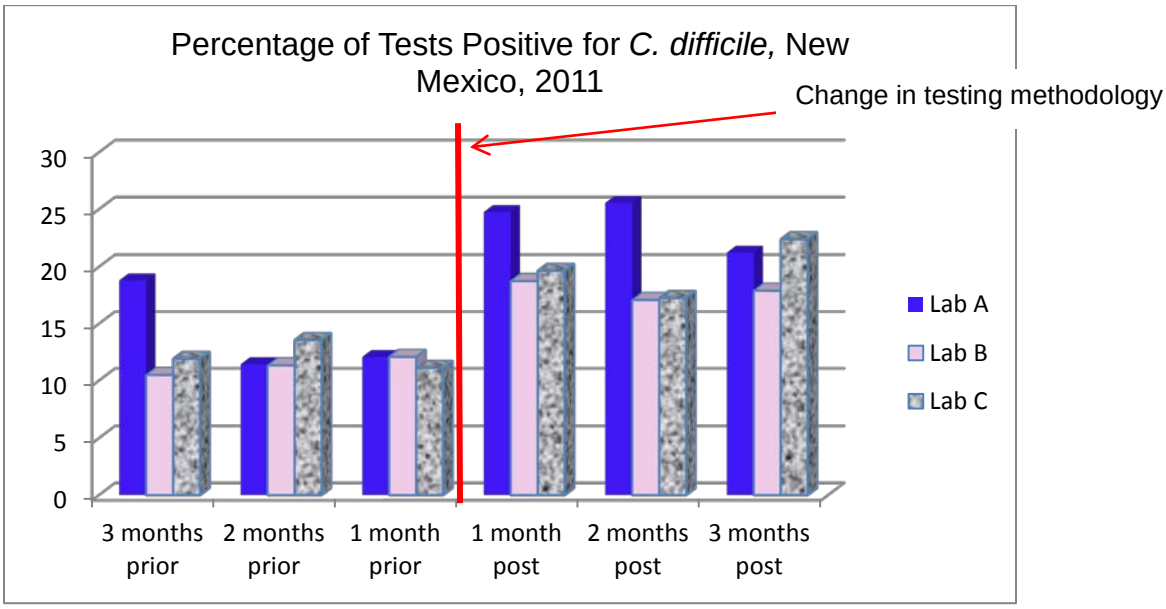
All data collected through medical record review and health interviews are stored in a de-identified database at the CDC. Additional details regarding the surveillance methodology can be found at http://www.cdc.gov/hai/eip/cdiff_techinfo.html.

Laboratory Testing of *C. difficile* in New Mexico

The lack of a 'criterion standard' test that is practical for rapid diagnosis of CDI in the clinical setting has resulted in the availability of several different tests for the diagnosis of *C. difficile.* Recently, Nucleic Acid Amplification Tests (NAAT) such as polymerase chain reaction (PCR) have become commercially available for the diagnosis of CDI. Many laboratories have adopted this more sensitive type of test, which has impacted incidence rates, including here in NM. Over the past year, three laboratories that serve Bernalillo County, NM have changed their testing methods for CDI. Although all had been using an Enzyme Immunoassay (EIA) toxin antibody test, each changed to a different and more sensitive test. As Figure 7 shows, the result was that while each laboratory decreased the number of tests run by about 25% (due to more stringent rejection policies as well as fewer duplicate tests due to the greater confidence in negative test results), the number of positive tests increased in all three labs by about 120%, and the percentage of samples tested that were positive increased about 160%.

While these clinical laboratory diagnostic changes have caused an apparent increase in CDI reported rates, it is important to note that these rates more closely reflect the true incidence of CDI in the Bernalillo County population. Hopefully, more rapid and accurate diagnosis will likely enable clinicians to more effectively treat true cases and control transmission, ultimately leading to a decrease in incidence rates in the future.

Figure 7. Percentage of Tests Positive for *C. difficile*, New Mexico, 2011



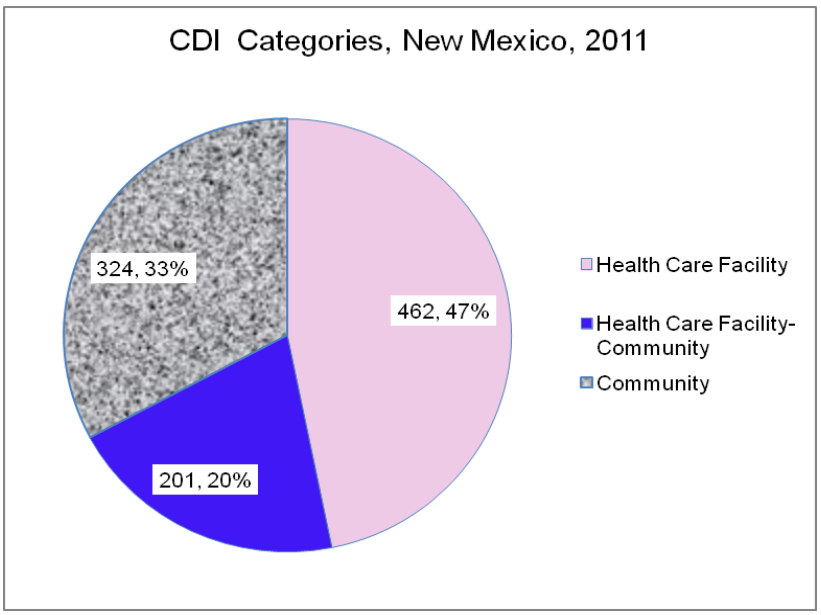
A convenience sample of clinical isolates is collected and submitted to the CDC for culturing and further analyses, including molecular subtyping and antimicrobial susceptibility testing. These microbiologic characteristics can then be linked to the information gathered in medical record reviews and health interviews, enabling us to assess any differences in the distribution of strains by case classification (i.e., healthcare facility- vs. community-associated), risk factors, or severity of infection.

Epidemiology of *C. difficile* in New Mexico

As of November 2012, over 1,700 incident cases were identified from 103 medical providers. Just over half of those cases were hospitalized at ten hospitals, one-quarter were diagnosed at 1 of 59 outpatient clinics, and another quarter were diagnosed through an extended-care facility, home health, or hospice provider. About half of CDI cases had been admitted to a hospital at the time of, or within a week after, their positive test. Of those, one-third had been admitted because of their CDI.

Figure 8 shows almost half of CDI cases in NM had infections associated with hospitalization or residence at a long term care facility. The figure excludes 89 cases whose medical records were unavailable.

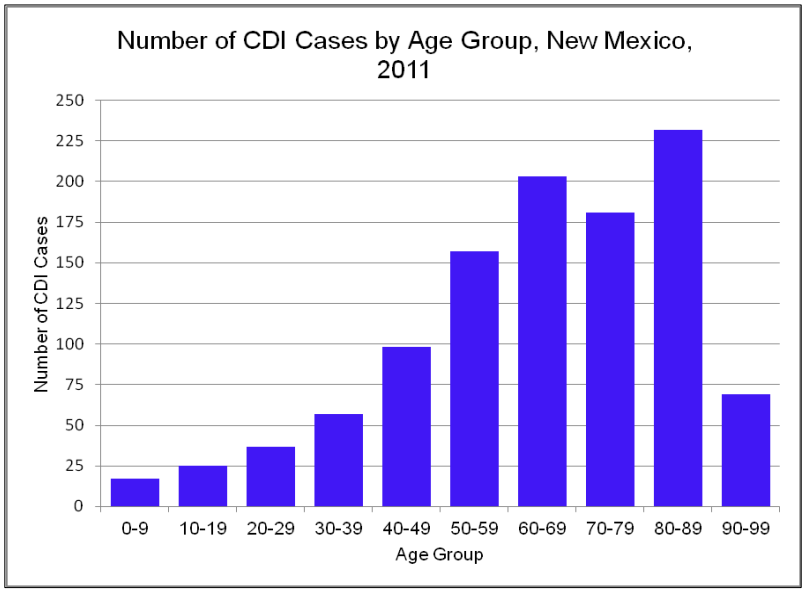
Figure 8. CDI Categories, New Mexico, 2011



Preliminary data from 2011 show that slightly more than half (55.7%) of the incident cases in Bernalillo County, NM are female.

Although adults over 65 years account for approximately half of cases, young adults and children have a substantial burden of disease as well, with one-quarter of the cases being under 50 years of age (Figure 9).

Figure 9. Number of CDI Cases by Age Group, New Mexico, 2011



Conclusions

CDI can result in asymptomatic colonization or lead to a wide range of clinical outcomes, from mild diarrhea to fulminant colitis and even death. CDI has traditionally been associated with healthcare settings (e.g., hospitalization or residence in a long term care facility), and many cases are now known to also occur in the community. CDI is becoming one of the most common HAI. NM is participating as 1 of 10 states to collect detailed information on people with CDI to better understand how to characterize, prevent, and treat this infection. It is expected that more rapid and accurate diagnosis will enable clinicians to more effectively treat cases and control transmission, thereby leading to a decrease in numbers of new cases.

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Chapter 6: Whooping Cough (Pertussis) in New Mexico, 2011

David Selvage, MHS, PA-C, Julianna Ferreira RN, MSN, MPH, Chad Smelser MD

Highlights

- Whooping cough is a highly contagious disease that can be prevented by vaccination.
- Although 69% of New Mexico (NM) cases occurred in Bernalillo County, all regions of the state reported cases in 2011.
- Current prevention priorities include providing post-exposure prophylaxis (PEP) to high-risk close contacts (especially infants).

Background

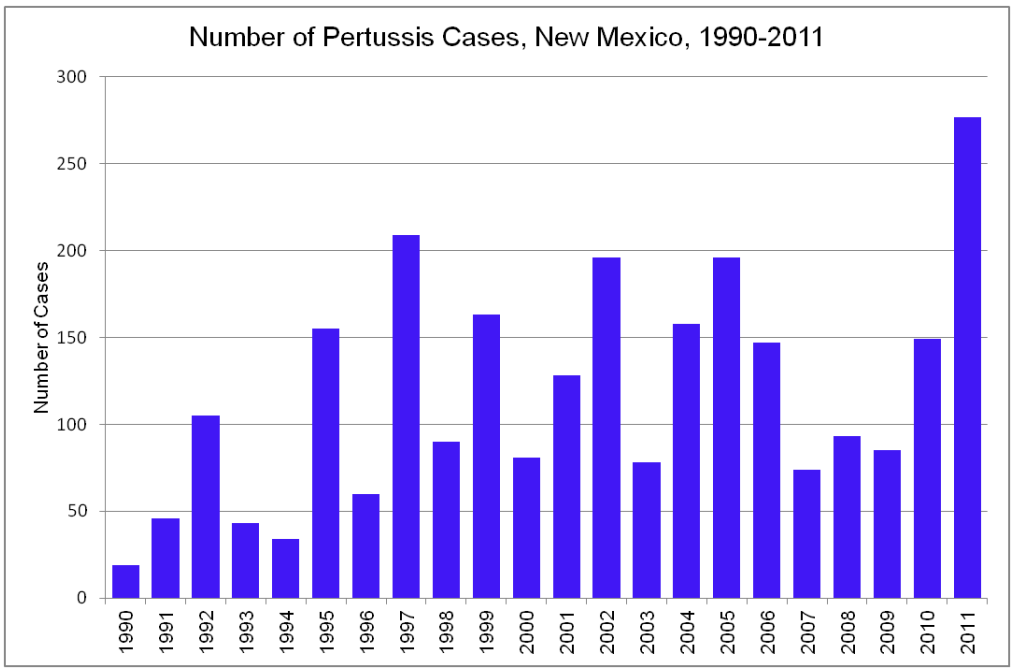
Pertussis, commonly known as whooping cough, is spread by close contact with the respiratory secretions of infected individuals. The bacterium causing pertussis, *Bordetella pertussis*, is a gram-negative bacillus that is only known to cause disease in humans. Clinically, pertussis is defined as a cough illness lasting at least two weeks with one or more of the following associated symptoms: paroxysms of coughing, post-tussive vomiting, or an inspiratory "whoop." The cough associated with pertussis may last for months, despite treatment, and may result in disrupted sleep, ongoing absence from work or school, pneumonia, rib fractures, and incontinence. Infants are at greatest risk of complications, including hospitalization, encephalopathy, seizures, and death. The risks to infants guide public health action surrounding pertussis. All pertussis prevention and response measures, including vaccination of adults, are conducted in order to protect vulnerable infants who lack complete immunity. This disease can be prevented by vaccinations beginning in infancy with boosters as adolescents and adults.

Pertussis in New Mexico

Pertussis is highly contagious. Attack rates are reported to be as high as 90% among non-immune household contacts of infected individuals. Despite the availability of a vaccine to prevent disease, pertussis remains endemic worldwide. Since the 1980s, pertussis incidence has increased significantly in the United States.

Pertussis incidence peaks every 3 to 5 years nationally and this same trend has also been observed in NM. In 2011 there were more cases reported to the New Mexico Department of Health (NMDOH) than in any other year over the past two decades as shown in Figure 10.

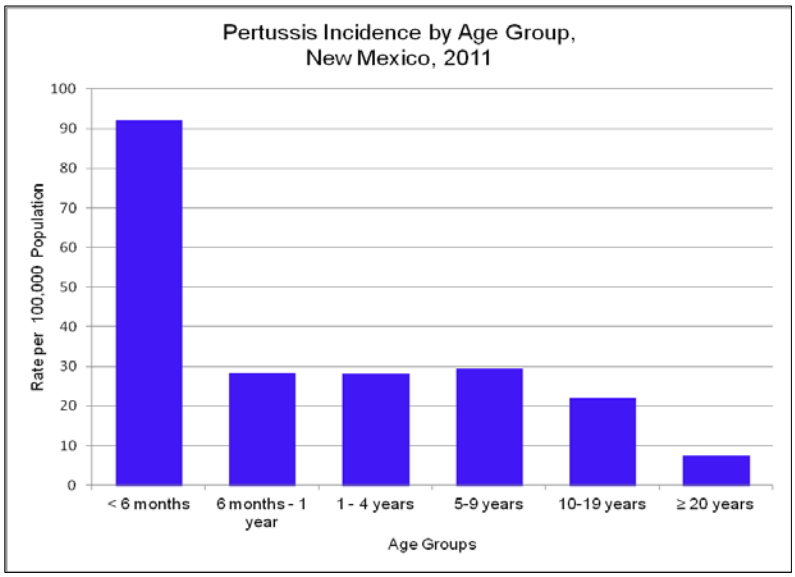
Figure 10. Number of Pertussis Cases, New Mexico, 1990-2011



Pertussis incidence rates in NM vary by season, with the greatest incidence occurring during the fall, followed by another smaller peak in the winter. The reasons for this pattern are unclear, but may be related to children returning to school after summer and winter breaks. Increased close contact between children in school probably increases transmission, while reporting by school personnel contributes to improved case detection. In 2011, the number of reported cases by month compared with the previous 5-year monthly average increased beginning in February and remained above historical averages for every month of the year except June and July. This increase has continued unabated in 2012.

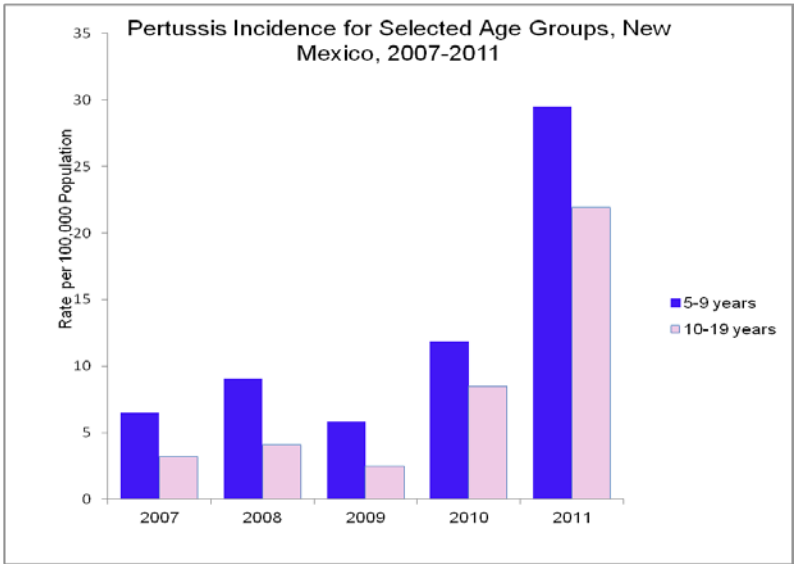
Rates of pertussis are consistently highest among infants, particularly infants less than six months of age. The rate for infants less than six months of age in 2011 was more than three times higher than rates for any other age group (Figure 11).

Figure 11. Pertussis Incidence by Age Group, New Mexico, 2011



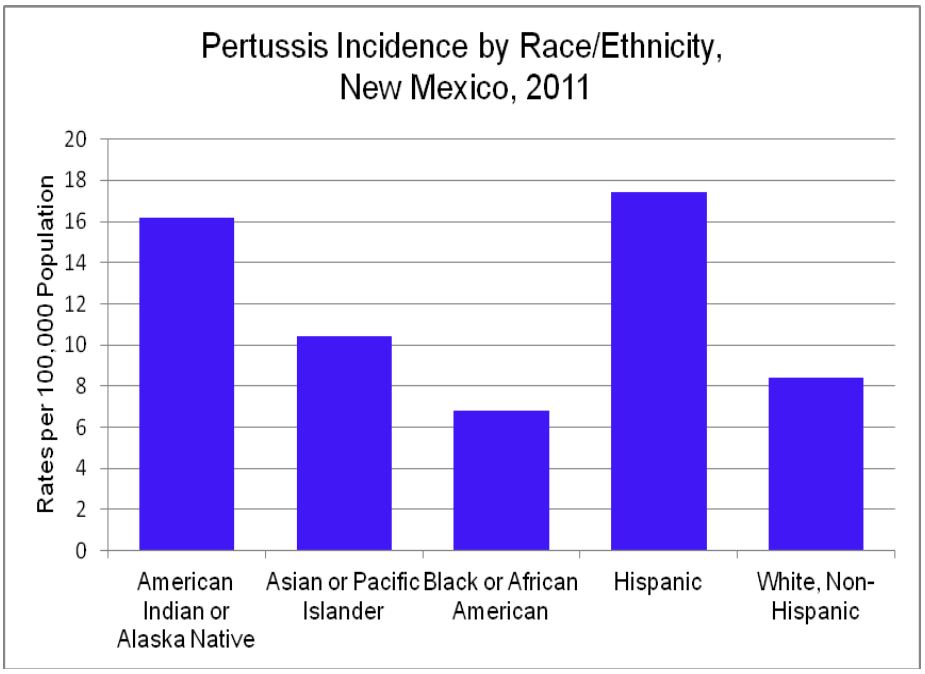
The increase in rates among school-aged children in 2011 compared with recent years mirrors the trend observed nationally. Rates among school-aged children in both the 5-9 and 10-19 year old age groups have increased dramatically since 2007 (Figure 12). In 2011, the mean age of cases was 19.8 years; the median age was 13.2 years. Recent evidence suggests that the factors contributing to the rise among school-aged children include early waning immunity associated with DTaP vaccine, increased rates of unvaccinated children attending school, and better detection of cases resulting from improved laboratory testing methods[1-3].

Figure 12. Pertussis Incidence for Selected Age Groups, New Mexico, 2007-2011



NM pertussis incidence rates vary by race/ethnicity as shown in Figure 13. The reasons for higher pertussis rates among American Indians and Hispanics in 2011 are unclear, but may be related to higher household densities among these groups[4]. Since attack rates among non-immune household contacts can be as high as 90%, the likelihood of transmission increases with more non-immune people living in a household. Additional analysis is being conducted to try to explain the relationship between race/ethnicity and pertussis.

Figure 13. Pertussis Incidence by Race/Ethnicity, New Mexico, 2011



Although, 69% of cases occurred in Bernalillo County as part of a countywide outbreak, all regions in NM reported pertussis cases in 2011. Rates among counties reporting cases varied from a low of 1.0/100,000 population (Dona Ana County) to a high of 30.6/100,000 (San Miguel County).

The importance of investigating even a single pertussis case relates to identifying high risk contacts or others who are symptomatic and may need treatment. An example of this occurred in July 2011 when a sick child with pertussis, attending a day camp in Bernalillo County for middle school aged children, was identified. The day camp administration initially thought there were no other symptomatic campers or staff. However, upon further investigation 13 additional cases were identified among staff and campers. And, over 110 contacts to these cases required prophylaxis to prevent acute illness or were treated with antibiotics if they were already sick. Cases were followed for several weeks until the camp ended and the school year resumed a few weeks later.

Conclusions

As NM's experience in 2011 demonstrates, the incidence of this disease is increasing, even among highly immunized populations such as school-aged children and adolescents. The sheer volume of cases requires that public health agencies, including NMDOH, adopt a targeted approach to case and contact management focusing on identification and PEP of high-risk close contacts (i.e., infants and pregnant women). There is no evidence to support antimicrobial prophylaxis of non-high risk contacts or non-household contacts. Consequently, NMDOH instituted the following changes in the management of cases beginning in 2011:

- Prioritize providing PEP to high-risk close contacts.
- Increase emphasis on surveillance for additional cases whenever a confirmed or probable case is identified.
- Increase emphasis on vaccinating all contacts, especially adults.

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Appendix A: Summary of Select Notifiable Diseases, New Mexico, 2011

	Number	Rate (per 100,000 population)
Foodborne Diseases		
Botulism, infant	2	0.1
Campylobacteriosis	370	17.8
Cholera	1	0.05
Cyclosporiasis	1	0.05
Cryptosporidiosis	136	6.6
Giardiasis	109	5.3
Hepatitis A, acute	7	0.3
Hemolytic uremic syndrome	2	0.1
Listeriosis	15	0.72
Salmonellosis	341	16.4
Shiga toxin-producing *Escherichia coli* (STEC)	43	2.1
Shigellosis	122	5.9
Typhoid fever (*Salmonella typhi*)	1	0.05
Yersiniosis	1	0.05
Vibrio parahaemolyticus	2	0.1
Vaccine Preventable Diseases		
Measles (Rubeola)	4	0.19
Mumps	1	0.05
Pertussis	275	13.3
Varicella (Chickenpox)	65	3.13
Bacterial Invasive Diseases		
Group A *Streptococcus*, invasive	171	8.2
Group B *Streptococcus*, invasive	218	10.5
Haemophilus influenzae, invasive	47	2.3
Neisseria meningitides (Meningococcal disease)	3	0.14
Streptococcal pneumoniae, invasive	331	16
Zoonotic Diseases		
Brucellosis	2	0.1
Dengue Fever	2	0.1
Ehrlichiosis, chaffeensis	1	0.05
Lyme disease	7	0.34

Hantavirus pulmonary syndrome	5	0.2
Malaria	5	0.2
Plague	2	0.1
Tularemia, human	7	0.34
Rabies, animal	19	0.92
West Nile virus neuroinvasive disease	3	0.14
West Nile virus non-neuroinvasive disease	1	0.05
Bloodborne Diseases		
Hepatitis B virus infection, chronic	135	6.5
Hepatitis B virus infection, acute	10	0.48
Hepatitis C virus infection, chronic or resolved	2,814	135.6
Hepatitis C virus infection, acute	16	0.77
Respiratory Diseases		
Coccidioidomycosis	75	3.6
Legionellosis	12	0.58

Appendix B: Glossary

Aggregate	Combined from multiple observations.
Anaerobic	Organisms not requiring oxygen for growth.
Asymptomatic	Person who is infected but not ill.
Attack Rate	Number of exposed people infected or ill divided by the total number of exposed people.
Bacillus	A rod-shaped bacterium.
Bacteria	Plural of bacterium.
Bacterium	A single-celled microorganism that can exist either as independent (free-living) organism or as a parasite (dependent on another organism for life).
Biofilm	Microorganisms adhering together on a surface.
Case	Person or animal identified as having a particular disease, infection, or condition under investigation.
Chronic	Long-term or ongoing disease.
Colonization	Presence of bacteria on a body surface (including mucosa surfaces) but not causing disease.
Contagious	Disease that is easily transmitted.
Criterion standard	Best available diagnostic test or criteria for scientific validity.
Encephalopathy	Disease or disorder of the brain.
Endemic	Disease or infectious agent present in a population or geographical area at all times.
Enteric	Pertaining to the small intestine.
Enzootic	Prevalent among animals within a geographic area.
Enzyme Immunoassay	Laboratory test that detects antigens.
Epidemic	Greater number of cases in a defined population or geographical area than normal.
Epizootic	An outbreak of disease affecting many animals of one kind at the same time.
Euthanasia	Humanely putting an animal to death.

Flagella	Lash-like appendage protruding from some cell walls.
Foodborne	Type of illness associated with eating contaminated food.
Fulminant	Occurring rapidly with great severity.
Gastrointestinal	Digestive system.
Gram-positive	Bacteria staining dark blue/purple by a Gram stain due to a peptidoglycan cell wall layer.
Hemolytic Uremic Syndrome	Disease characterized by microangiopathic hemolytic anemia, acute renal failure, and a low platelet count (thrombocytopenia).
Immunocompromised	Immune system is compromised or absent and not able to fight infectious diseases.
Incidence	The number of new cases of a specific disease occurring in a population during a specified time period.
Incubation period	The interval of time between the infection and the onset of symptoms of disease.
Infectious	Organism (e.g., bacterium, virus) capable of producing infection or disease.
Invasive	Disease that spreads to surrounding body tissues.
Lethargy	Mental or physical tiredness.
Long-term acute care facility	A hospital for patients requiring extended hospitalization.
Meningitis	Inflammation of the meninges (the three membranes that envelope the brain and spinal cord).
Morbidity	Illness.
Mortality	Death.
Paroxysms	Attacks or spasms of coughing.
Pathogen	Biological agent causing disease.
Photophobia	An abnormal sensitivity or intolerance to light.
Pneumonia	Lung infection.
Post Exposure Prophylaxis	Treatment started after exposure to a pathogen to prevent illness.
Post-tussive	Vomiting after coughing.
Prophylaxis	Treatment given to prevent disease in an exposed person or

	animal.
Pulse Field Gel Electrophoresis	Laboratory test to identify microorganisms based on DNA patterns.
PulseNet	National network of state laboratories, public health departments, and food regulatory agencies coordinated by the Centers for Disease Control and Prevention.
Risk factor	Anything that increases a person's chance of developing a disease.
Sepsis	Pathogenic microorganisms or their toxins in the blood or other body tissues.
Septic/Septicemia	Bacteria in blood.
Serologic	Relating to blood or other body fluids.
Serotype	Variation within a subspecies of bacteria or virus.
Spores	Reproductive cell produced by fungi.
Surveillance	On-going, systematic collection, analysis, and interpretation of health data.
Symptomatic	Showing symptoms of disease or injury.
Traceback	Following a food production chain to identify a common source.
Transmission	Spread of infectious diseases or pathogens.
Variant	New viral strains relating to an existing strain.
Zoonoses	Animal diseases that may be transmitted to humans.

Appendix C: Acronyms

CDC	Centers for Disease Control and Prevention
CSTE	Council of State and Territorial Epidemiologists
DTaP	Childhood vaccine for diphtheria, tetanus, and pertussis
EIA	Enzyme Immunoassay (laboratory test)
EIP	Emerging Infections Program
HUS	Hemolytic uremic syndrome
NM	New Mexico
NM-EDSS	New Mexico Electronic Data Surveillance System
NMDOH	New Mexico Department of Health
PEP	Post Exposure Prophylaxis
PHN	Public Health Nurse
STEC	Shiga toxin-producing *E. coli*
Tdap	Booster vaccine for tetanus, diphtheria, and pertussis
US	United States

Appendix D: Methods

Standard Council of State and Territorial Epidemiologists (CSTE) case definitions are used by NMDOH to classify the infectious diseases in this report.

Rates were calculated for January 1, 2011 through December 31, 2011 and displayed as numbers of cases per 100,000 population. The numerators represent the number of reported cases that were confirmed or, for some diseases, the number of confirmed plus probable cases. The data source used to obtain the numerators was the New Mexico (NM) National Electronic Data Surveillance System (NM-EDSS) or for STEC, the NM FoodNet Program. NM denominators were based on 2010 population estimates from the Geospatial and Population Studies (GPS) program, University of New Mexico. All data are considered provisional.

Appendix E: New Mexico Notifiable Diseases

NOTIFIABLE DISEASES OR CONDITIONS IN NEW MEXICO

7.4.3.13 NEW MEXICO ADMINISTRATIVE CODE

ALL REPORTS INCLUDING ELECTRONIC LABORATORY REPORTS OF NOTIFIABLE CONDITIONS MUST INCLUDE:

1. The disease or condition being reported;
2. Patient's name, date of birth/age, gender, race/ethnicity, address, patient's telephone numbers, and occupation;
3. Physician or licensed healthcare professional name and telephone number; and
4. Healthcare facility or laboratory name and telephone number, if applicable.

Laboratory or clinical samples for conditions marked with [*] are required to be sent to the Scientific Laboratory Division.

EMERGENCY REPORTING OF DISEASES OR CONDITIONS

The following diseases, confirmed or suspected, require **immediate reporting** by telephone to Epidemiology and Response Division at 505-827-0006. If no answer, call 1-866-885-6485.

Infectious Diseases

Anthrax*	*Haemophilus influenzae* invasive infections*	Rubella (including congenital)
Avian or novel influenza*	Measles	Severe Acute Respiratory Syndrome (SARS)*
Bordetella species*	Meningococcal infections, invasive*	Smallpox*
Botulism (any type)*	Plague*	Tularemia*
Cholera*	Poliomyelitis, paralytic and non-paralytic	Typhoid fever*
Diphtheria*	Rabies	Yellow fever

Other Conditions

Acute illnesses or conditions of any type involving large numbers of persons in the same geographic area	Severe smallpox vaccine reaction	Suspected waterborne illness or conditions in two or more unrelated persons*
Illnesses or conditions suspected to be caused by the intentional or accidental release of biologic or chemical agents*	Suspected foodborne illness in two or more unrelated persons*	Other illnesses or conditions of public health significance

Infectious Diseases in Animals

Anthrax	Rabies
Plague	Tularemia

ROUTINE REPORTING OF DISEASES OR CONDITIONS

Infectious Diseases (Report case within 24 hours to Epidemiology and Response Division at 505-827-0006; or contact the local health office)

Brucellosis	Hemolytic uremic syndrome	Relapsing fever
Campylobacter infections*	Hepatitis A, acute	Rocky Mountain spotted fever
*Clostridium difficile**	Hepatitis B, acute or chronic	Salmonellosis*
Coccidioidomycosis	Hepatitis C, acute or chronic	Shigellosis*
Colorado tick fever	Hepatitis E, acute	St. Louis encephalitis infections
Cryptosporidiosis	Influenza-associated pediatric death	*Streptococcus pneumoniae* invasive infections*
Cysticercosis	Influenza, laboratory confirmed hospitalization only	Tetanus
Cyclosporiasis	Legionnaires' disease	Trichinellosis
Dengue	Leptospirosis	Toxic shock syndrome
E. coli 0157:H7 infections*	Listeriosis*	Varicella
E. coli , shiga-toxin producing (STEC) infections*	Lyme disease	*Vibrio* infections*
Encephalitis, other	Malaria	West Nile Virus infections
Giardiasis	Mumps	Western equine encephalitis infections
Group A streptococcal invasive infections*	Necrotizing fasciitis*	*Yersinia* infections*

Group B streptococcal invasive infections*	Psittacosis
Hantavirus pulmonary syndrome	Q fever

Infectious Diseases in Animals (Report case within 24 hours to Epidemiology and Response Division at 505-827-0006; or contact the local health office).

Arboviral, other	Psittacosis
Brucellosis	West Nile Virus infections

Tuberculosis* or Other Nontuberculous Mycobacterial Infections (including *Mycobacterium avium* complex or leprosy)
Report suspect or confirmed cases within 24 hours to Tuberculosis Program, NM Department of Health, P.O. Box 26110, Santa Fe, NM 87502-6110; or call 505-827-2473.

Sexually Transmitted Diseases
Report to Infectious Disease Bureau - STD Program, NM Department of Health, P.O. Box 26110, Santa Fe, NM 87502-6110, Fax 505-476- 3638; or call 505-476-3636.

Chancroid	Gonorrhea	Syphilis
Chlamydia trachomatis infections		

HIV (Human Immunodeficiency Virus) and AIDS (Acquired Immunodeficiency Syndrome)
Report to HIV and Hepatitis Epidemiology Program, 1190 St. Francis Dr., N1350, Santa Fe, NM 87502, fax 505-476-3544 or call 505-476-3515.

All CD4 lymphocyte tests (count and percent)	All HIV genotype tests	Opportunistic infections, cancers and any other test or condition indicative of HIV or AIDS
All confirmed positive HIV antibody tests	All positive HIV cultures	
(screening test plus confirmatory test)	All tests for HIV RNA or HIV cDNA (viral load tests)	
	All tests to detect HIV proteins	

Occupational Illness and Injury
Report to Epidemiology and Response Division, NM Department of Health, P.O. Box 26110, Santa Fe, NM 87502-6110; or call 505-827-0006.

Asbestosis	Occupational asthma	Silicosis
Coal worker's pneumoconiosis	Occupational burn hospitalization	
Hypersensitivity pneumonitis	Occupational injury death	Other illnesses or injuries related to occupational exposure
Mesothelioma	Occupational pesticide poisoning	
Noise induced hearing loss	Occupational traumatic amputation	

Health Conditions Related to Environmental Exposures and Certain Injuries
Report to Epidemiology and Response Division, NM Department of Health, P.O. Box 26110, Santa Fe, NM 87502-6110; or call 505-827-0006

Environmental Exposures

All pesticide poisoning	Lead (all blood levels)	Uranium in urine greater than 0.2 mcg/liter
Arsenic in urine greater than 50 micrograms/liter	Mercury in urine greater than 3 micrograms/liter	or 0.2 mcg/gram creatinine
Carbon monoxide poisoning	or Mercury in blood greater	Other suspected environmentally-induced
Infant methemoglobinemia	than 5 micrograms/liter	health conditions
Injuries		
Drug overdose	Firearm injuries	Traumatic brain injuries

Adverse Vaccine Reactions
Report to Vaccine Adverse Events Reporting System, http://www.vaers.hhs.org. Send copy of report to Immunization Program Vaccine Manager, NM Department of Health,
P.0. Box 26110, Santa Fe, NM 87502-6110; fax 505-827-1741.

Healthcare-associated infections

Central line-associated bloodstream infections (CLABSI) events
Clostridium difficile infections

Cancer

Report to NM DOH designee: New Mexico Tumor Registry, University of New Mexico School of Medicine, Albuquerque, NM 87131. Report all malignant and in situ neoplasms and all intracranial neoplasms, regardless of the tissue of origin.

Human Papillomavirus (HPV)

Report to NM DOH designee: Laboratories report the following tests to the New Mexico HPV Pap Registry, 1816 Sigma Chi Rd NE, Albuquerque, NM 87106, phone 505-272-5785 or 505-277-0266.

Papanicolaou test results (all results)	Cervical, vulvar and vaginal pathology results (all results)	HPV test results (all results)

Birth Defects Report to Epidemiology and Response Division, NM Department of Health, P.O. Box 26110, Santa Fe, NM 87502-6110; or call 505-827-0006.
All birth defects diagnosed by age 4 years, including:

Defects diagnosed during pregnancy	Defects found in chromosome testing on amniotic fluid, chorionic villus sampling and products of conception for Trisomy 13, Trisomy 18 and Trisomy 21
Defects diagnosed on fetal deaths	

Genetic and Congenital Hearing Screening

Report to Children's Medical Services, 2040 S. Pacheco, Santa Fe, NM 87505; or call 505-476-8868.

Neonatal screening for congenital hearing loss (all results)	Suspected or confirmed congenital hearing loss in one or both ears	All conditions identified through statewide newborn genetic Screening program

For details online of 7.4.3 NMAC see:
http://www.nmcpr.state.nm.us/nmac/parts/title07/07.004.0003.htm