



Infectious Diseases in New Mexico 2013 Annual Report

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Contents

Contributors.....	iv
Introduction.....	1
Chapter 1: Norovirus Outbreaks in New Mexico, 2012.....	2
Highlights	2
Background	2
Norovirus in New Mexico.....	4
Conclusions	8
References	8
Chapter 2: Restaurant-Associated Foodborne Illness associated with Food Handlers.....	10
Highlights	10
Background	10
Restaurant-associated Foodborne Illness Investigation in New Mexico.....	10
Conclusions	13
References	13
Chapter 3: Investigation of <i>Pseudomonas aeruginosa</i> Infection associated with Ear Piercing ...	14
Highlights	14
Background	14
Investigation Methodology and Results	15
Conclusions	18
References	20
Appendix.....	22
Appendix A: Summary of Select Notifiable Diseases, New Mexico, 2012.....	23
Appendix B: Glossary.....	25
Appendix C: Acronyms.....	27
Appendix D: Methods	28
Appendix E: New Mexico Notifiable Diseases.....	29

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Chapter 1

Norovirus Outbreaks in New Mexico, 2012
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Chapter 2

Restaurant-Associated Foodborne Illness associated with Food Handlers
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Chapter 3

Investigation of *Pseudomonas aeruginosa* Infection Associated with Ear Piercing
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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 sentinel events occurring in NM during 2012. These chapters cover a range of topics including investigating norovirus outbreaks in New Mexico, a foodborne illness outbreak associated with a restaurant, and a bacterial infection associated with an ear piercing studio. Appendix A provides a summary of notifiable disease rates in NM during 2012. Appendices B-E provide additional information, including a glossary, acronym definitions, methods, and notifiable diseases in NM for 2012.

This report has been prepared by NMDOH infectious disease epidemiology staff. Significant contributions from others within NMDOH were provided by Scientific Laboratory Division (SLD) personnel, public health nurses (PHNs), and regional epidemiologists whose efforts 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: Norovirus Outbreaks in New Mexico, 2012

Meg Adams-Cameron MPH and Fred Gentry BS

Highlights

- Noroviruses cause the vast majority of acute gastrointestinal illness in the United States (US)
- In 2012, there were 24 norovirus outbreaks reported and investigated in New Mexico
- The Scientific Laboratory Division's genotype testing identified five different types of *Norovirus* in New Mexico during 2012
- Immediate widespread cleaning with US Environmental Protection Agency (EPA) approved cleaning products is necessary to stop the transmission of norovirus

Background

Norovirus (previously referred to as Norwalk-like viruses (NLVs)) is a single-stranded ribonucleic acid (RNA) virus within the family Caliciviridae. It is highly infectious requiring as few as 18 viral particles to cause illness. Humans are the only known reservoir and transmission routes are person-to-person (direct and indirect), foodborne, and waterborne. Direct transmission may occur through ingestion of aerosolized vomitus or indirectly when the virus remains on surfaces contaminated by either vomitus or stool from an infected person. After exposure, signs and symptoms typically begin within 12-48 hours, often suddenly with acute vomiting or diarrhea. Other symptoms may include nausea, abdominal cramps, body aches, and low grade fever. Most people recover within 1-3 days but virus can be found in their stool for an average of four weeks¹.

The Centers for Disease Control and Prevention (CDC) notes that norovirus is the most common cause of acute gastrointestinal illness and foodborne related illness in the US. According to CDC, as many as 21 million illnesses are caused by noroviruses each year. The importance of norovirus in causing acute gastrointestinal illnesses has become increasingly recognized partly due to advances in reporting and laboratory testing. These developments have expanded the understanding of the epidemiology of norovirus infection.

Even without laboratory confirmation, epidemiological investigations have been successful in linking environmental surface contamination with norovirus as the source of infection. In 1999, investigation of a large London outbreak (involving 300 people with gastrointestinal illness) found the only link among outbreak cases was attendance at an event held in a large multi-tiered concert hall over a five day period. The initial case had

vomited in one section and bathroom of one of tiers. Subsequent cases, occurring after the initial case became ill, were all linked to sitting in that same section².

Prior to widespread laboratory testing, public health professionals relied on an array of signs and symptoms to identify norovirus as the most likely cause of acute gastrointestinal illness outbreaks. A set of descriptive clinical indicators, known as the “Kaplan criteria” was developed in 1982³. The ability of these criteria to correctly identify norovirus as the cause of acute gastroenteritis outbreaks was validated by a group of CDC researchers who retrospectively applied it to over 4,000 outbreaks⁴. They found that when all five of the measurement criteria were met, there was 99% sensitivity that the outbreak was caused by norovirus. However the criteria are not as good for identifying true negatives (68% specificity). The five factors used in the original Kaplan criteria are:

- Duration of illness
- Incubation period
- Percent of cases with vomiting
- Ratio of cases with fever compared to number with vomiting
- Ratio of cases with diarrhea compared to number with vomiting

Although laboratory confirmation of *Norovirus* in stool or vomitus specimens from cases of acute gastroenteritis remains the gold standard, the Kaplan criteria are useful when either specimens were not collected or laboratory testing was not available. CDC now uses a modified Kaplan Criteria based only on four factors.

More advanced laboratory testing for the *Norovirus* genotype has expanded the capacity to determine how the virus is transmitted person to person after the initial case. An investigation of an outbreak in 2009 among airplane passengers and crew originally hypothesized the exposure occurred during travel on a single flight. Subsequent genotyping of stool specimens from the ill crew and passengers revealed that all illnesses were traced to a single airplane with different flight attendants working different flights. This illustrates how genotyping may provide valuable information during norovirus investigations⁵.

Persistence of transmissible *Norovirus* virions on environmental surfaces has been demonstrated by genotyping of the virus in two recent outbreaks. In Oregon, an investigation traced exposure to a staff luncheon in which 12 of 16 ill staff attending the luncheon were found to have the same *Norovirus* genotype. Subsequently, genotyping revealed this same norovirus genotype on surfaces of a diaper changing table in the woman’s bathroom four days (and several cleanings) later⁶. Based on staff interviews, investigators concluded that transmission occurred when two staffs who used the bathroom after it was cleaned subsequently handled a tray of sandwiches served at the staff luncheon⁶. Another outbreak investigation found a more indirect and delayed transmission among participants in a soccer tournament. All cases were Oregon residents who had traveled to Washington State for a soccer tournament. No other

competing teams reported illness. Those ill were not exposed to the initial case after their onset of illness. But two days later subsequent cases handled packaged food from a reusable grocery bag stored in the initial case's bathroom. Two positive norovirus samples were taken from the reusable grocery bag two weeks after the implicated food items had been handled and consumed and were found to be the same genotype as the soccer tournament participant cases⁷.

Genotyping has been used to confirm the role of shedding in the transmission of norovirus. In Ireland, an investigation of an outbreak among attendees of a large family luncheon at a hotel concluded that asymptomatic food handlers preparing sandwiches transmitted norovirus to the food. Workers reported no symptoms and no contact with a symptomatic person. The only ill persons at the hotel or from other events held there were attendees at the family luncheon. Stool or vomitus specimens from all eight attendees and five of the ten staff tested positive for *Norovirus* RNA genogroup II⁸. Three of the five staff who tested positive were asymptomatic food handlers.

Many clinical and public health laboratories have the capability to test human specimens (stool and vomitus) for norovirus. Early methods identified the presence or absence of the virus by standard reverse transcription-polymerase chain reaction (RT-PCR) assays. This was used by the New Mexico Department of Health Scientific Laboratory Division (SLD) until 2009 when it began using an additional test (real-time reverse transcription polymerase chain reaction or RT-qPCR) allowing grouping of *Norovirus* at the genetic level (genotyping). This test method (RT-qPCR) is so sensitive that it detects low levels of virus in asymptomatic infected individuals⁹. By using RT-qPCR genotype testing, SLD qualifies to participate in the CDC CaliciNet Program.

CaliciNet is an electronic norovirus outbreak surveillance network allowing certified laboratories to upload their genotyping information to a national database. The CaliciNet database allows tracking of transmission sources and temporal spread of specific *Norovirus* genotypes. A CDC analysis of CaliciNet outbreaks from March 2009-May 2010 showed the GII 4 genotype of *Norovirus* was more often associated with person-to-person transmission than outbreaks transmitted by food¹⁰.

The norovirus genotypes vary from season to season because “these viruses evolve rapidly by genetic mutation coupled with selective pressure. The rapid evolution of GII 4 Norovirus resulting in the successive emergence of new variants has been observed since 2002¹¹.”

Norovirus in New Mexico

Individual cases of norovirus infection are not required to be reported to the New Mexico Department of Health (NMDOH). However, norovirus outbreaks do require reporting under the “suspected foodborne illness in two or more unrelated persons” (Figure 1).

Figure 1. Norovirus Outbreak Reporting Requirement in New Mexico



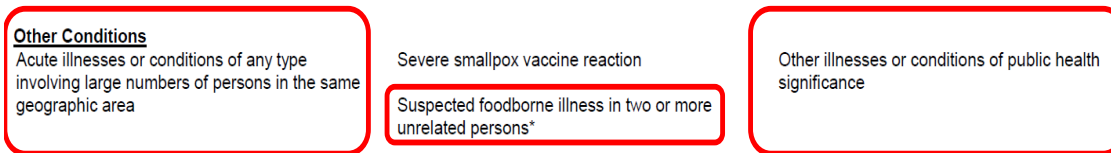
NOTIFIABLE DISEASES OR CONDITIONS IN NEW MEXICO
7.4.3.13 NEW MEXICO ADMINISTRATIVE CODE

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.



Since 2008, Norovirus outbreaks have increased, both in total number (Figure 2) and as a proportion of all reported gastrointestinal outbreaks in New Mexico (Figure 3). NMDOH investigated a yearly average of 11 laboratory-confirmed norovirus outbreaks, from 2008 through 2012, representing an average 52% of all gastrointestinal outbreaks of any cause.

Figure 2. Number of Norovirus Outbreaks Investigations, New Mexico, 2008-2012

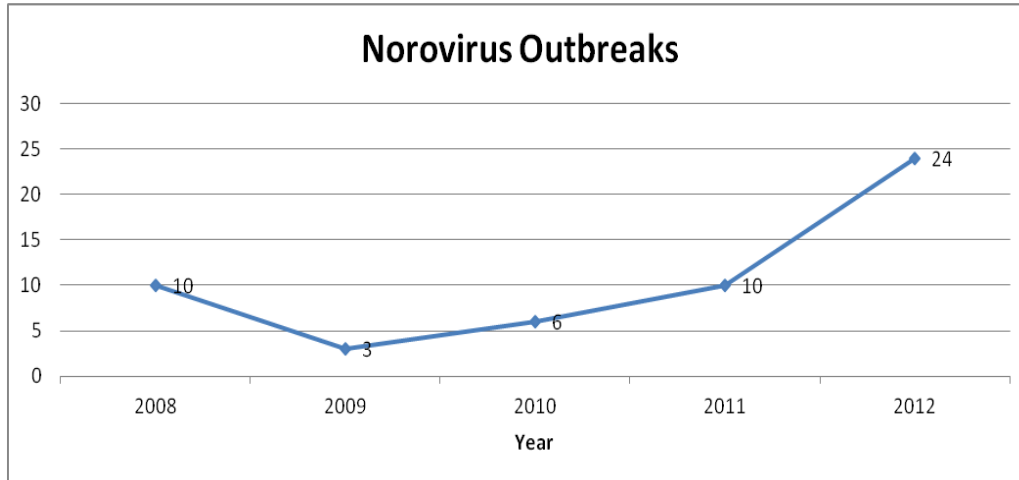
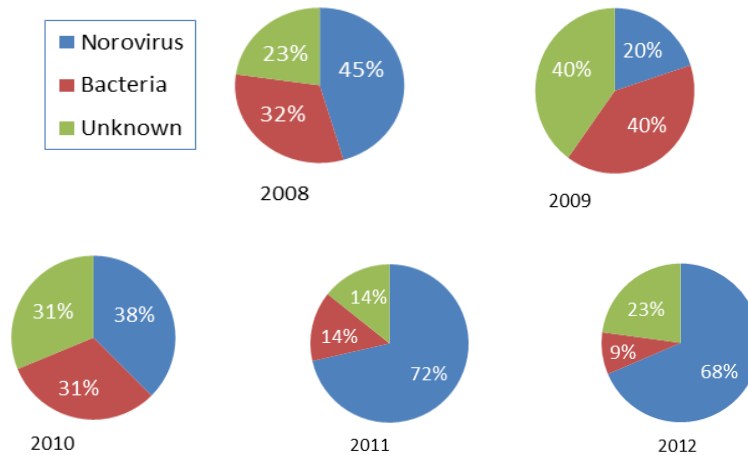


Figure 3. Number of Gastrointestinal Illness Outbreak Investigations by Pathogen, New Mexico, 2008-2012



Laboratory-confirmed norovirus outbreaks accounted for 69% of all gastrointestinal illness outbreaks in 2012. During that year, NMDOH investigated 24 laboratory-confirmed norovirus outbreaks, twice as many as reported in the previous year. Additionally, eight other gastrointestinal disease outbreaks were characteristic of norovirus etiology but were not counted as norovirus outbreaks. By CDC definition norovirus outbreaks must have laboratory confirmation of norovirus from at least two different cases' specimens. Three of the eight gastrointestinal illness outbreaks without laboratory confirmation had sufficient data to apply the Kaplan criteria. As shown in

Table 1, only two of the three outbreaks with sufficient information were determined by the Kaplan criteria to be caused by norovirus.

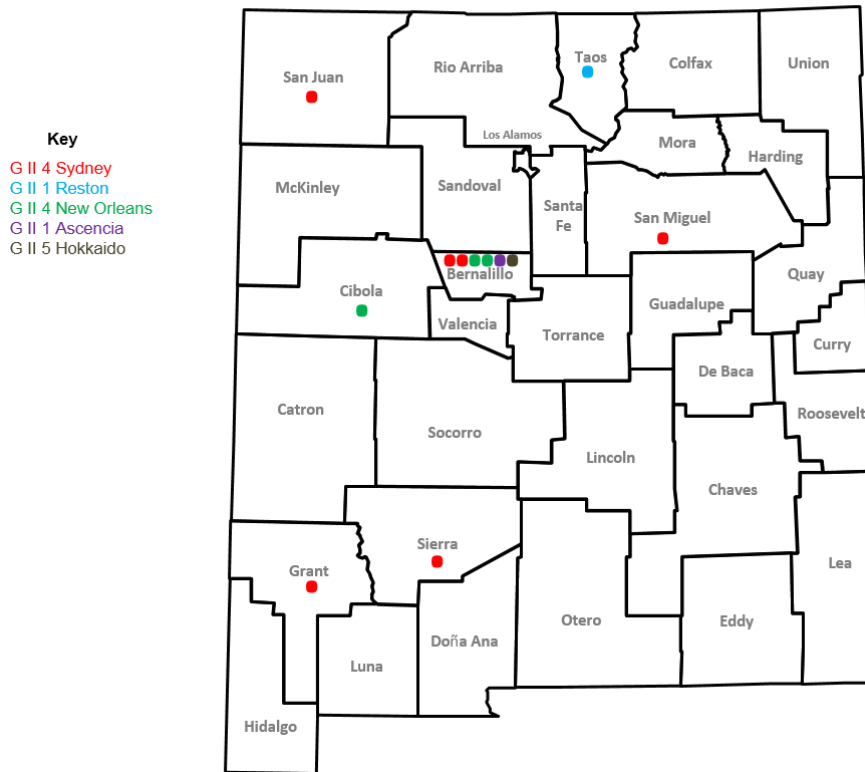
Table 1. Gastrointestinal Outbreaks associated with Norovirus based on Kaplan criteria, New Mexico 2012

Kaplan Criteria	Cases not meeting criteria (2012-017 Outbreak)	Cases meeting criteria (2012-053 outbreak)	Cases meeting criteria (2012-022 outbreak)
Median duration of illness is 12-60 hours	Median duration unknown	Median duration 24 hours	Median duration 60 hours
Incubation period of 24-48 hours	Median incubation unknown	Median incubation unknown	Median incubation unknown
≥50% of cases report vomiting	15% vomiting	54% vomiting	87% vomiting
Fever to vomiting ratio ≤1.0	No fever data collected	0.37 Ratio	0.17 Ratio
Diarrhea/vomiting ratio <2.5	Diarrhea/vomiting ratio 1.5	Diarrhea/vomiting ratio 1.3	Diarrhea/vomiting ratio 1.7

As in other years, in NM the majority (92%) of norovirus outbreaks in 2012 occurred in institutional settings such as long-term care facilities. Outbreaks in these facilities typically have a high number of cases due to common areas for living and eating, and the frailty of residents. In 2012, the number of cases for individual institutional settings ranged from 11-155, varying by the attack rate and the population size of the facility. The outbreak with the highest number of cases was a multi-facility system with a single long-term care setting. When the outbreak ended after five weeks, 224 cases (among a total census of almost 400) were documented by the facility’s infection control department. The vast majority of cases were employees of the three facilities who provide “cross-coverage” at all sites which may have led to transmission between individual facilities. Immediate and continued widespread cleaning with US EPA-approved cleaning products is essential to stop the transmission of norovirus within these facilities.

Figure 4 shows a map of norovirus outbreaks, by genotype, occurring in New Mexico during 2012. This illustrates that some genotypes (e.g., G II 4 Sydney) are found throughout multiple counties in NM. This genotype was first identified in 2012 by CDC and accounted for most of the norovirus outbreaks throughout the United States during that same year. Other genotypes have only been identified in a single New Mexico county during 2012.

Figure 4. Geographical Distribution of Norovirus Outbreaks by Genotype, New Mexico, 2012



Conclusions

New Mexico’s experience with norovirus mirrors the national picture. Norovirus causes the vast majority of acute gastrointestinal outbreaks in NM and the US. Most outbreaks occur in long-term care facilities, with rapid spread resulting in high numbers of cases. Norovirus outbreaks remain a challenge to public health professionals and staff in long-term care facilities due to the ability of this virus to remain viable on environmental surfaces for several weeks and due to noroviruses’ ability to cause infection with exposure to relatively few virions. Genotyping of the virus and SLD’s participation in the CaliciNet Program has provided focused recommendations to control the spread of norovirus in outbreaks in NM and the US.

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Chapter 2: Restaurant-Associated Foodborne Illness associated with Food Handlers

Meg Adams-Cameron, MPH, Carol Conroy, MPH, PhD, Chad Smelser MD

Highlights

- Outbreak investigations at restaurants require assessing the role of food handlers in transmission of disease
- Food handler testing is important to determine the source of exposure and to help ensure no further transmission occurs
- Communication with restaurant management is critical to working with food handlers

Background

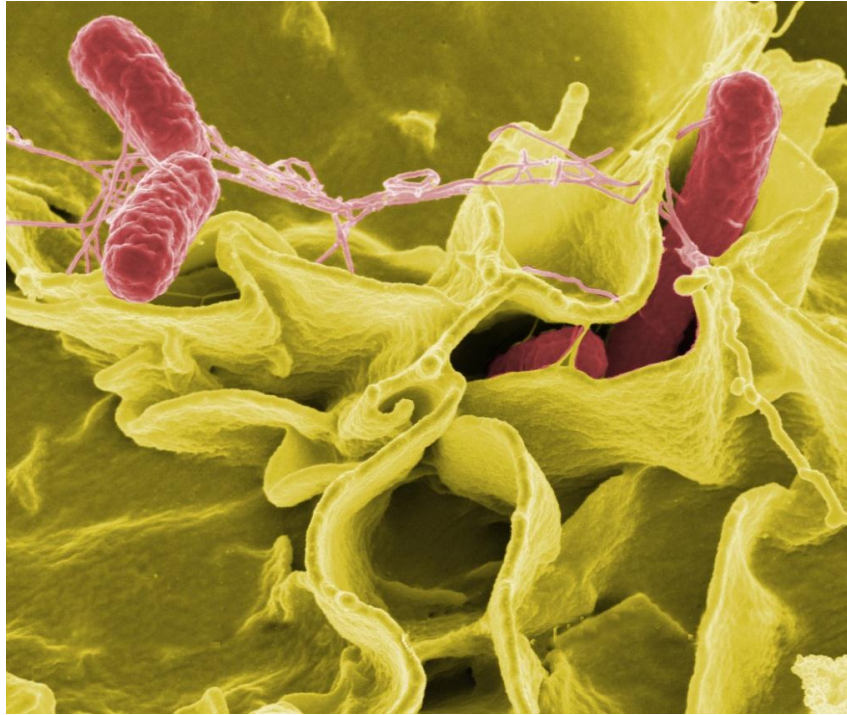
During foodborne illness investigations, it is important to determine the source of infection to stop transmission and prevent further illness. During 2009 through 2010, there were 1,527 foodborne disease outbreaks documented by the Centers for Disease Control and Prevention (CDC) National Outbreak Reporting System (NORS). This system documented that food eaten at a restaurant or delicatessen was the likely exposure source for 48% of outbreaks (with a single, known exposure source¹).

Other research has shown the role food handlers at restaurants may play in transmission of disease. CDC studied 369 restaurants, (22 with foodborne illness outbreaks and 347 without outbreaks) to identify factors associated with restaurant-associated foodborne illness outbreaks². The most common factors identified were food handling by an infected worker and workers not wearing gloves during food contact³. The Minnesota Department of Health also studied characteristics of 23 restaurant-associated foodborne illness outbreaks involving *Salmonella*. They found 83% of outbreaks involved food handlers infected with *Salmonella* and specific food items were not implicated as the exposure source. The authors noted that restaurant outbreak cases experienced longer than expected illness incubation times, which they attributed to low infectious doses that would occur with contamination from food handler shedding of *Salmonella*. Also, the relatively low number of outbreak cases supported a low dose of an infectious agent as opposed to a single exposure source, such as a food item⁴.

Restaurant-associated Foodborne Illness Investigation in New Mexico

In 2012, the New Mexico Department of Health (NMDOH) conducted an investigation of a foodborne illness outbreak associated with a local restaurant. The outbreak was first identified during routine review of a cluster identified by a NMDOH Scientific Laboratory

Division (SLD) laboratorian. The cluster consisted of five pulsed field gel electrophoresis (PFGE) matched cases with *Salmonella typhimurium* infection. PFGE is the laboratory procedure producing a “DNA fingerprint” when DNA from bacteria are “pulled” across a gel by an electric current, creating a unique banding pattern. When PFGE patterns match, this suggests a common source of exposure to the same bacteria.



Scanning Electron Micrograph showing *S. typhimurium* invading cultured human cells, Rocky Mountain Laboratories, NIAID, NIH

Interviews of the initial five cases by regional public health investigators showed that the five cases lived in four different counties in New Mexico. One of the two cases who lived in the same county was a food handler. NMDOH also learned that the second case in that county reported eating at the restaurant where the food handler worked.

In collaboration with NMDOH, a city restaurant inspector performed an on-site review of food safety practices and procedures at the restaurant. The inspector sampled numerous cooking and food preparation surfaces and obtained food items to test for pathogens at NMDOH SLD. During this same visit, the regional NMDOH investigators interviewed all employees present that day to determine if there were additional cases among the food handling staff. In addition to on-site interviews, telephone interviews of 55 other employees were conducted using a master list of all employees provided by restaurant management. None of the employees interviewed by telephone reported illness or symptoms indicating a *Salmonella* infection.

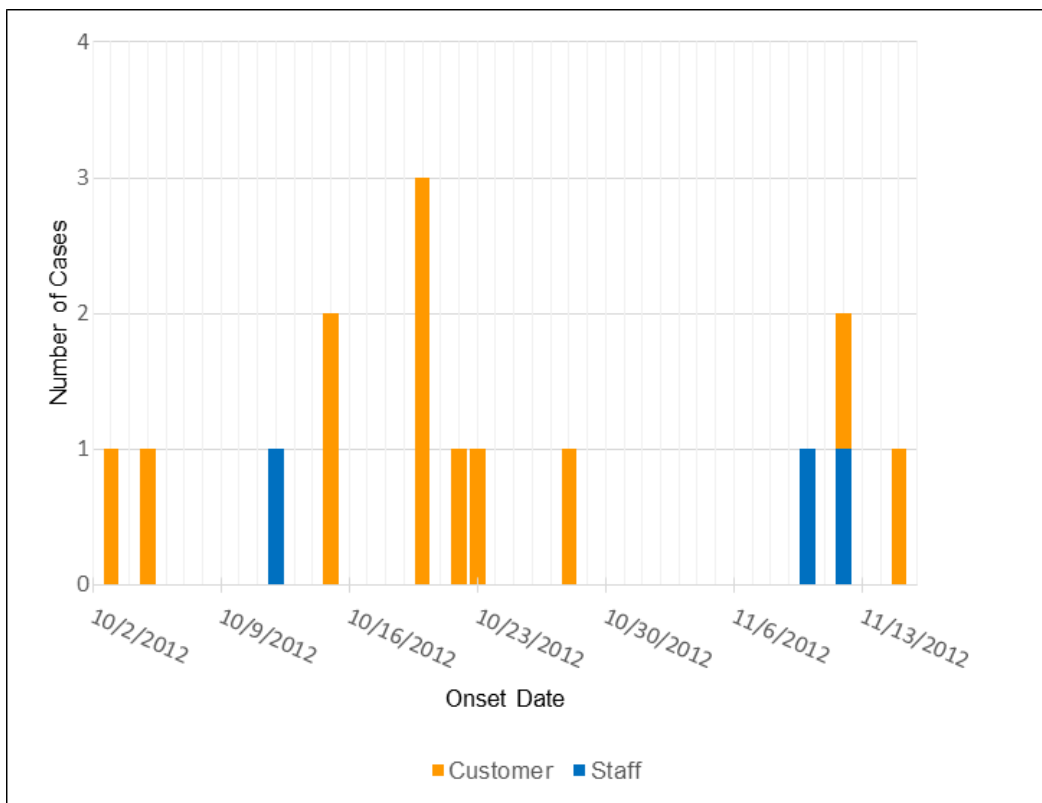
In addition to interviewing restaurant employees, NMDOH collected stool specimens from employees for testing at SLD to determine if they carried the *Salmonella* outbreak strain. Testing was limited to employees most likely to have had food contact, resulting

in possible contamination of food, during the time the ill customers ate at the restaurant. Twelve employees (identified using payroll records) who worked at least four of six days when ill customers had eaten at the restaurant were asked to provide a stool specimen for testing. To encourage cooperation, restaurant managers arranged an off-site location and paid time off for these staff to meet with NMDOH investigators. Restaurant employees were provided stool collection kits and information on bacterial illness. As a result of stool testing, two additional employees were identified as infected with the *Salmonella* outbreak strain. These employees denied any signs or symptoms of gastrointestinal illness but were excluded from food handling duties until subsequent stool testing was negative for *Salmonella*.

As part of the investigation, food items consumed and not consumed by all cases were compared to identify any common food exposure.

A total of 17 cases with PFGE patterns matching the outbreak strain who worked or ate at the restaurant were identified in this outbreak. Incubation times were calculated using a case's illness onset date and their self-reported food consumption date at the restaurant as the exposure date. The 17 outbreak cases had an average of a three day incubation period, with a range of 1-21 days. An epidemic curve ("epi curve") (Figure 1) shows the distribution of illness onset in both restaurant staff and community cases.

Figure 1. Epidemic Curve for Restaurant-associated *Salmonella typhimurium* Outbreak, New Mexico, 2012



Conclusions

NMDOH investigators concluded at least one of the three employees infected with *Salmonella* handled and/or prepared “macaroni and cheese” thus transmitting the bacteria to people eating at the restaurant. Many ill customers who ate at one of the restaurant locations, on five different dates, reported eating “macaroni and cheese”. No other cases who had eaten “macaroni and cheese” at other restaurant locations were ill with the outbreak strain of *Salmonella*. This suggests it was unlikely this food item was contaminated prior to cooking or during centralized preparation. (Many food items served at all the restaurant locations were prepared at the same central kitchen, with ingredients originating from the same commercial sources.)

Further evidence supporting the role of the food handlers in transmitting the bacteria to customers dining at the restaurant was based on incubation periods. *Salmonella* infections typically have an incubation period ranging from 12 hours to 3 days. Even longer incubation periods up to 16 days have been documented with low dose exposure⁵. These longer incubation periods suggest an infected food handler being the exposure source instead of a food item.

This restaurant-associated outbreak investigation highlights the importance of determining the role of food handlers to identify the source and stop the spread of restaurant-associated illness. NMDOH wishes to thank the restaurant management and its employees for their strong commitment and collaboration during this investigation. Their collaboration allowed the investigation to proceed smoothly and in a timely fashion, which benefitted all parties.

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Chapter 3: Investigation of *Pseudomonas aeruginosa* Infection associated with Ear Piercing

Megin Nichols DVM, MPH, Angela Tang MPH, Samantha Nagy BA, Joan Baumbach, MD, MPH, MS

Highlights

- A person was hospitalized with a *Pseudomonas aeruginosa* infection after receiving an ear piercing at a New Mexico (NM) piercing studio
- Outbreaks of *Pseudomonas aeruginosa* have been associated with ear and body piercings
- Environmental contamination is a common finding in piercing studios implicated in outbreaks
- Proper piercing technique, environmental sanitation, and regulatory requirements may aid in the prevention of infections and outbreaks associated with piercing procedures

Background

On November 23, 2012, the on-call epidemiologist for the Epidemiology and Response Division of the New Mexico Department of Health (NMDOH) received a call from a physician regarding a patient diagnosed with an infection caused by the bacterium *Pseudomonas aeruginosa*. The physician indicated that the patient's onset of signs and symptoms, including pain, redness, and swelling, started on the evening of November 17, 2012 — hours after having an ear pierced in the cartilage near the fossa triangularis of the left ear. The patient had received the piercing at a piercing studio in New Mexico and had returned to the location after the piercing due to concern about signs and symptoms suggesting a potential problem. The physician reported to NMDOH that, according to the patient, the piercing technician stated that the piercing should not be removed even after the patient reported her signs and symptoms to the technician. The patient stated that her condition subsequently worsened and she was admitted to the hospital on November 21, 2012. The patient required antibiotics and incision and drainage of infected material from the ear. A public health investigation was initiated immediately upon notification by the reporting physician. On November 26, 2012, NMDOH personnel spoke with one inspector and one compliance officer from the New Mexico Regulation and Licensing Department which enforces regulations at piercing studios. A collaborative investigative approach between NMDOH and the Regulation and Licensing Department was agreed upon.

P. aeruginosa is a ubiquitous organism present in many settings. It can survive in a variety of environments and tolerate a variety of physical conditions. This ability allows it to exist in both community and healthcare settings¹. *P. aeruginosa* is not usually a part of the normal microbial flora in humans^{2,3}. If left untreated, this infection can become severe and require treatment in a hospital⁴. Upper ear cartilage piercings can result in infections more often than soft tissue piercings because of the avascular nature of the cartilage¹⁻³. These piercings have been reported to result in infections requiring surgical intervention, which in some cases resulted in permanent disfigurement of the ear⁴. The scientific literature suggests that poor antiseptic technique, high burden of organisms contaminating the environment, and the use of benzalkonium chloride can increase risk of infection^{1,5,6}.

Investigation Methodology and Results

The investigation included three components: epidemiologic, environmental, and laboratory. The on-site environmental investigation was initiated on November 26, 2012. A team from NMDOH interviewed the licensed piercing technician at the studio regarding piercing practices, equipment storage, and sterilization techniques. The team also swabbed surfaces in the piercing studio and sanitation/sterilization room (“clean room”) and collected samples of ink, mouthwash, disinfectant, and water from a hand rinse of the piercing technician. The specimens were submitted to the NMDOH Scientific Laboratory Division that day for testing. A list of all those who had received piercings at the piercing studio from October 1 to November 25, 2012 was obtained for investigating whether other clients may have had or currently had infection.

On November 27, 2012, NMDOH epidemiologists began to call clients from the line list using a standardized questionnaire that included questions regarding observed piercing practices, client knowledge and perceived piercing risk, and whether the clients had any signs or symptoms of infection that were either ongoing or had occurred after the piercing. These clients also were questioned about previous piercings and whether they had any problems (i.e., possible infections) associated with previous piercings irrespective of the piercing studio where the procedure occurred. Parents were interviewed when the client was under 18 years old.

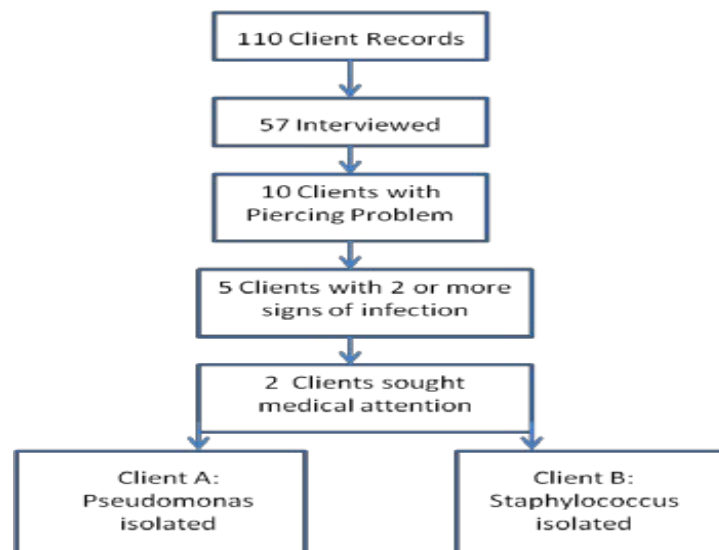
The laboratory investigation consisted of conducting pulsed-field gel electrophoresis (PFGE) on the *P. aeruginosa* isolate collected from the ear of the patient and comparing the PFGE pattern to bacterial isolates of *P. aeruginosa* grown from environmental swabs collected at the piercing studio.

Epidemiologic: A total of 110 persons received body piercings at the piercing studio from October 1 to November 25, 2012. Eighty (73%) of those pierced were female. The median age of pierced clients with a known date of birth was 21 years (range: 14–53 years). Of the 110 people who received piercings from the piercing technician at the studio, 57 (52%) people were contacted and interviewed. Of those interviewed, 11 indicated they received an ear piercing. Four of these 11 had their upper ear cartilage

pierced. Only 21% of those interviewed said that this was their first piercing. All of those interviewed reported that the piercing technician wore gloves, and 95% indicated that the body site was cleaned prior to piercing. However, very few could remember what was used to clean the site. Eighty-nine percent of those interviewed stated that they received instructions on how to care for their piercing; the majority of instructions were provided verbally. Seventy-seven percent of interviewees felt they were able to follow the aftercare instructions very closely. Two people (4%) indicated they had consumed alcohol or drugs in the hours prior to receiving the piercing. When asked if the piercing room was clean, all respondents answered affirmatively.

Ten (18%) of those interviewed said that they had a problem with their most recent piercing (Figure 1). Five of those interviewed indicated they had two or more signs or symptoms of infection including redness, swelling, pain, drainage/pus, or bleeding. Two of these sought medical attention and had bacteria cultured from the site of their piercing. *Pseudomonas* was isolated from the piercing site of the case patient. *Staphylococcus* was isolated from another client's piercing site.

Figure 1. Case Finding Process



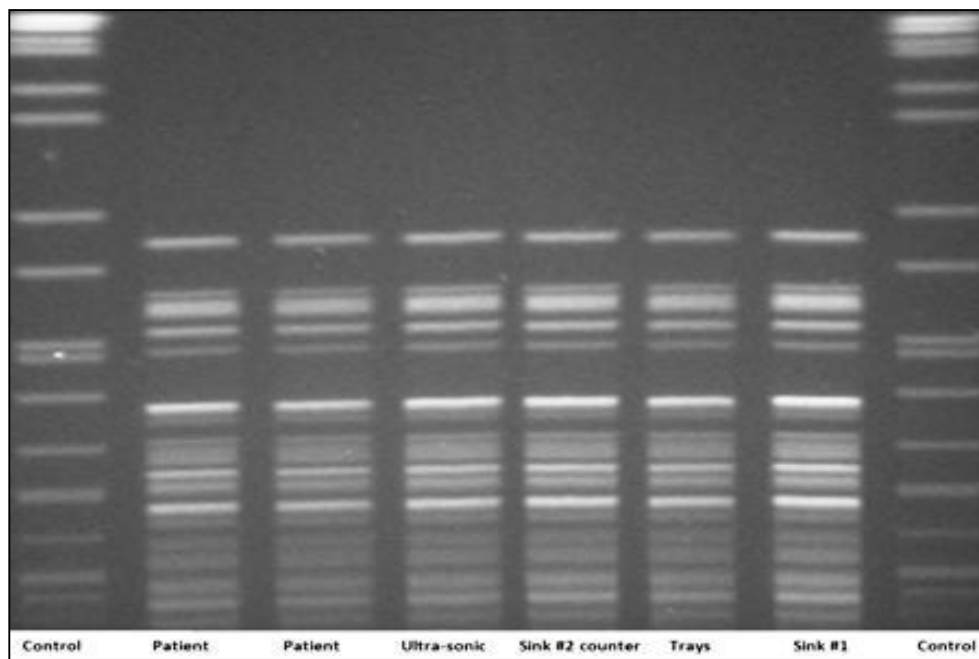
Environmental: The environmental investigation noted the piercing room contained items unnecessary to the piercing procedure. The countertop where piercing materials were present included mouthwash, dye, plastic toys, and disinfectant, and the surface was cluttered. A white curtain that hung between the cabinets and the piercing bench was stained and visibly soiled. Items in the piercing room, including a body piercing wheel gauge and mirror, were hung on the wall with push pins. The crease of the piercing bench contained a film of dirt and debris, the area under the upper portion of the bench was covered in a layer of dirt, and there was dirt and debris underneath the bench. The mayo instrument stand used for piercing instruments had a non-sterile paper towel draped over it to separate the metal surface from the autoclaved/sterilized

instruments. Several additional lighting devices were also present in the room, but did not appear to be in use.

The “clean room” contained two sinks and an autoclave; they were separated from each other by a partition but located on the same contiguous countertop. The countertop also contained a tray with instruments, two reusable toothbrushes, a reusable sponge used to clean the instruments, Comet® cleaner, an ultrasonic cleaner, and at the far side, an autoclave. Beneath the sinks were materials (e.g., old autoclave) in storage along with debris (e.g., plastic wrappers) and dirt. Biohazard containers were also stored in the same room. The tattoo artist at the studio also used the “clean room” to sterilize tattoo equipment.

Laboratory: Six of the 36 environmental specimens collected at the studio grew *P. aeruginosa*. Samples were collected from the ultrasonic machine, water bath, sponge used to clean instruments, two sink counters, and an instrument tray. All six isolates were genetically identical to the two isolates of *P. aeruginosa* from the ear of the patient (Figure 2).

Figure 2. *P. aeruginosa* Patient and Four Environmental Isolate Pulsed-Field Gel Electrophoresis Results



Conclusions

The laboratory, epidemiologic, and environmental investigation results indicated that the most likely source of the patient's infection with *P. aeruginosa* was the piercing. The genetically indistinguishable bacteria from the environmental samples and the patient's ear indicated contamination at some point during the piercing process. The use of the paper towel (an absorbent material) to separate sterile instruments from the mayo stand was not an appropriate barrier to prevent contamination of equipment. The sink drain, sink basin, ultrasonic machine, sponge, and instrument tray were all items found within the "clean room" of the piercing studio. This suggests that there was potential for post-sterilization contamination of piercing equipment from the environment. Sources of bacteria most likely included the pipes of the sink and the water. *P. aeruginosa* has previously been isolated from plumbing and tap water/water baths during outbreaks in piercing parlors and healthcare facilities in New Mexico and other states^{1-3,7}. The source of the staphylococcal infection in another piercing client at this studio was not identified during this investigation.

On December 7, 2012, an NMDOH representative visited the piercing facility to discuss the findings of the investigation and make recommendations. The facility owner and management were contacted and the piercing component of the facility voluntarily closed on December 7 and 8 for cleaning. On December 8 at 3 pm (24 hours after the December 7 visit), two NMDOH representatives visited the facility to ensure that public health recommendations had been implemented. The facility had done an exemplary job of cleaning, replacing pipes and plumbing, and disposing of potential sources of contamination (Figures 3–6).

Figure 3. Before and After Cleaning, Piercing Room Countertop



Figure 4. Before and after Cleaning, Piercing Bench

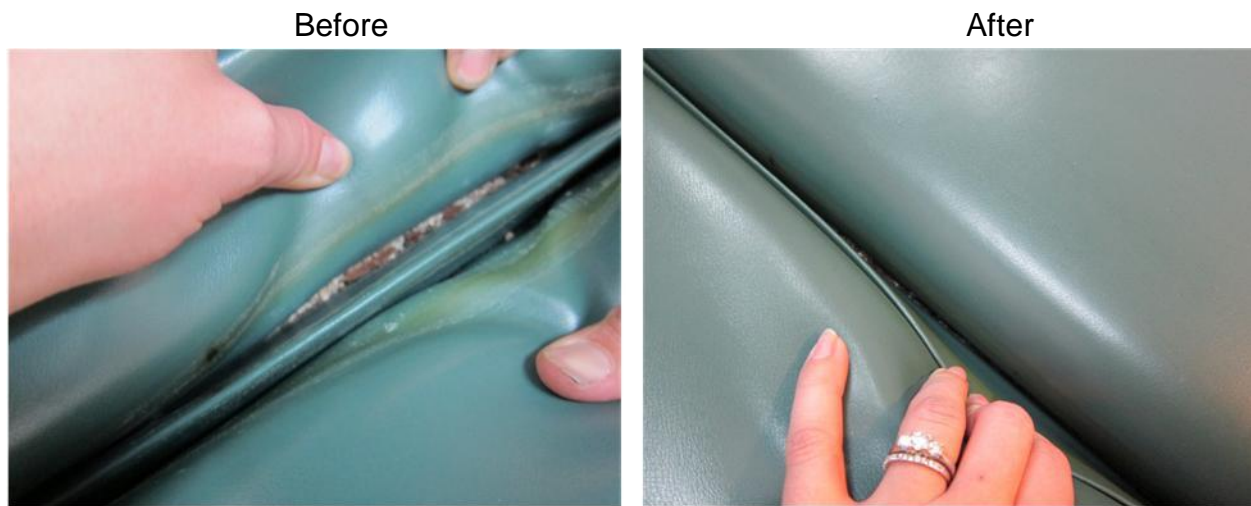
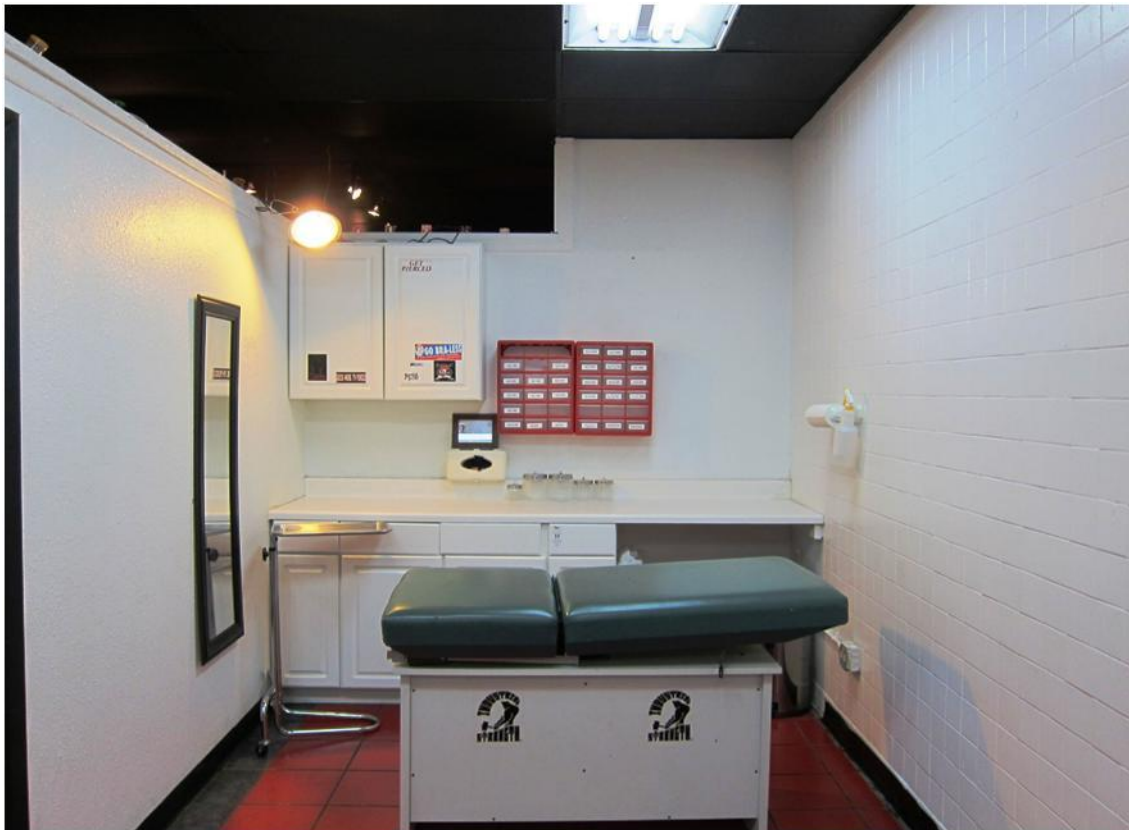


Figure 5. Before and after Cleaning, Clean Room Sink



Figure 6. Piercing Studio after Cleaning



Thorough cleaning and disinfection measures are needed now and in the future to prevent bacteria found in the environment from contaminating the piercing instruments, materials and piercing rooms, and clients. These measures will help prevent infections among clients. In addition, increased regulatory authority was needed to enforce closures of piercing facilities in the event that the environment posed a threat to clients. In April 2013, Governor Susana Martinez signed legislation giving the state licensing board for tattoo and body piercing studios, barber shops, and hair salons the power to issue cease and desist orders to those facilities for violations, including violations of sanitation and safety requirements that could pose a risk to the public's health (Appendix).

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Appendix

NM expands enforcement power over tattoo parlors

The Associated Press

Posted: 04/04/2013 05:01:45 PM MDT

SANTA FE, N.M. — A newly enacted law gives New Mexico state government more power to crack down on tattoo parlors for licensing and health violations.

Gov. Susana Martinez signed legislation into law on Thursday allowing a state licensing board to issue orders immediately closing tattoo and body piercing studios as well as barber shops and hair salons for violations, including having unsanitary conditions that endanger customers.

The state board also can impose greater fines on unlicensed tattoo parlors.

The governor said a business currently is able to remain open for 30 days while making changes to comply with state standards.

Appendix A: Summary of Select Notifiable Diseases, New Mexico, 2012

	Number	Rate (per 100,000 population)
Foodborne Diseases		
Botulism, foodborne	0	0.0
Botulism, infant	2	0.10
Campylobacteriosis	329	15.8
Cholera	0	0.0
Cryptosporidiosis	93	4.5
Cyclosporiasis	0	0.0
Giardiasis	95	4.6
Hepatitis A, acute	10	0.48
Hemolytic uremic syndrome	0	0.0
Listeriosis	5	0.24
Salmonellosis	334	16.0
Shiga toxin-producing <i>Escherichia coli</i> (STEC)	56	2.7
Shigellosis	108	5.2
Typhoid fever (<i>Salmonella typhi</i>)	0	0.0
Yersiniosis	2	0.1
<i>Vibrio parahaemolyticus</i>	1	0.05
Vaccine Preventable Diseases		
Measles (Rubeola)	2	0.1
Mumps	0	0.0
Pertussis	890	42.7
Tetanus	1	0.05
Varicella (Chickenpox)	99	4.8
Bacterial Invasive Diseases		
Group A <i>Streptococcus</i> , invasive	128	6.2
Group B <i>Streptococcus</i> , invasive	228	10.9
<i>Haemophilus influenzae</i> , invasive	46	2.2
<i>Neisseria meningitidis</i> (Meningococcal disease)	5	0.2
<i>Streptococcal pneumoniae</i> , invasive	273	13.1
Zoonotic Diseases		
Brucellosis	0	0.0
Dengue Fever	0	0.0
Lyme disease	1	0.05

Hantavirus pulmonary syndrome	1	0.05
Malaria	2	0.1
Plague	1	0.05
Tularemia, human	1	0.05
Rabies, animal	47	2.3
West Nile virus neuroinvasive disease	23	1.1
West Nile virus non-neuroinvasive disease	24	1.1
Bloodborne Diseases		
Hepatitis B virus infection, chronic	129	6.2
Hepatitis B virus infection, acute	3	0.14
Hepatitis C virus infection, chronic or resolved*	3546	170.2
Hepatitis C virus infection, acute	21	1.0
Respiratory Diseases		
Coccidioidomycosis	38	1.8
Legionellosis	9	0.43

*Undercount due to incomplete reporting at the time of publication.

Appendix B: Glossary

Acute	Rapid onset of illness.
Asymptomatic	Person who is infected but not ill.
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).
CaliciNet	Network of public health and food regulatory laboratories submitting Norovirus outbreak data into national database.
Caliciviridae	Family of RNA viruses.
Case	Person or animal identified as having a particular disease, infection, or condition under investigation.
Chronic	Long-term or ongoing disease.
Contagious	Disease that is easily transmitted.
Epidemiological	Methodology focusing on cause, patterns, and prevention of disease or injury within a population.
Foodborne	Type of illness associated with eating contaminated food.
Genotyping	Process of determining differences in genetic make-up by the DNA sequence.
Gram-positive	Bacteria staining dark blue/purple by a Gram stain due to a peptidoglycan cell wall layer.
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.
Infection preventionist	Infection prevention professional often working in health care facility.
Infectious	Organism (e.g., bacterium, virus) capable of producing infection or disease.
Invasive	Disease that spreads to surrounding body tissues.

Laboratorian	Laboratory professional.
Long-term acute care facility	A hospital for patients requiring extended hospitalization.
Pathogen	Biological agent causing disease.
Pulse Field Gel Electrophoresis	Laboratory test to identify microorganisms based on DNA patterns.
Reservoir	Long term host or source of pathogen.
Reverse transcription polymerase chain reaction	Molecular biology technique used to detect RNA expression.
Risk factor	Anything that increases a person's chance of developing a disease.
Sensitivity	Proportion of true positive cases correctly identified as having the condition.
Septic/Septicemia	Bacteria in blood.
Serotype	Variation within a subspecies of bacteria or virus.
Specificity	The proportion of health people correctly identified as not have the condition.
Surveillance	On-going, systematic collection, analysis, and interpretation of health data.
Symptomatic	Showing symptoms of disease or injury.
Transmission	Spread of infectious diseases or pathogens.
Variant	New viral strains relating to an existing strain.
Viable	Capable of living.
Viron	Single virus particle.
Virus	Small infectious agent replicating only inside living cells.

Appendix C: Acronyms

CABQ	City of Albuquerque
CDC	Centers for Disease Control and Prevention
DNA	Deoxyribonucleic Acid
EHD	Environmental Health Department
IP	Infection Preventionist
NM	New Mexico
NM-EDSS	New Mexico Electronic Data Surveillance System
NMDOH	New Mexico Department of Health
NORS	National Outbreak Reporting System
PFGE	Pulse Field Gel Electrophoresis
PHN	Public Health Nurse
RNA	Ribonucleic Acid
RT-qPCR	Reverse transcription polymerase chain reaction
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, 2012 through December 31, 2012 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*	<i>Haemophilus influenzae</i> 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
<i>Campylobacter</i> infections*	Hepatitis A, acute	Rocky Mountain spotted fever
<i>Clostridium difficile</i> *	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	<i>Streptococcus pneumoniae</i> invasive infections*
Cysticercosis	Influenza, laboratory confirmed hospitalization only	Tetanus
Cyclosporiasis	Legionnaires' disease	Trichinellosis
Dengue	Leptospirosis	Toxic shock syndrome
<i>E. coli</i> O157:H7 infections*	Listeriosis*	Varicella
<i>E. coli</i> , shiga-toxin producing (STEC) infections*	Lyme disease	<i>Vibrio</i> infections*
Encephalitis, other	Malaria	West Nile Virus infections
Giardiasis	Mumps	Western equine encephalitis infections
Group A streptococcal invasive infections*	Necrotizing fasciitis*	<i>Yersinia</i> 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
<i>Chlamydia trachomatis</i> 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 or 0.2 mcg/gram creatinine
Arsenic in urine greater than 50 micrograms/liter	Mercury in urine greater than 3 micrograms/liter or Mercury in blood greater than 5 micrograms/liter	Other suspected environmentally-induced health conditions
Carbon monoxide poisoning	Firearm injuries	Traumatic brain injuries
Infant methemoglobinemia		
Injuries		
Drug overdose		

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.O. 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)
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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
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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
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For details online of 7.4.3 NMAC see:

<http://www.nmcpr.state.nm.us/nmac/parts/title07/07.004.0003.htm>