Legionellosis Outbreak at the Aria Hotel, 2009-2011 --Las Vegas, Nevada

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Public Health Investigation Final Report

Southern Nevada Health District
Office of Epidemiology
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BACKGROUND:

On June 15, 2011, the Centers for Disease Control and Prevention (CDC) Respiratory Diseases Branch, as part of the national surveillance system to detect cases of Legionnaire's disease among travelers, informed the Southern Nevada Health District (SNHD) Office of Epidemiology (OOE) of two case reports of laboratory-confirmed Legionnaires' disease (LD) in persons who had stayed at the Aria Hotel in Clark County during their incubation period. One of the cases had illness onset in February 2011 and the other in April 2011. At the time of the CDC report, both cases had recovered.

On June 15, 2011 the SNHD OOE notified Environmental Health (EH) staff and the Nevada State Health Division, Office of Epidemiology, of the new case reports. There was only one room number provided on the original notification and no case names. OOE requested that CDC consult with the reporting states and request case names to enable cross matching with hotel guest lists to determine dates of stay and the rooms occupied.

The Aria was previously associated with Legionnaire's disease cases in late 2009 and in 2010. The first case had illness onset in December of 2009 and stayed at the hotel shortly after the grand opening. In 2010 two confirmed cases stayed at the facility, one in April and one in June during the incubation period. In June of 2010, SNHD Environmental Health staff conducted an environmental assessment of the building in response to the two cases being reported from the CDC. The environmental assessment was forwarded to CDC for their review and did not reveal any issues that would lead to an increase risk of contracting LD. At this time, the hotel's water management plan had not been fully implemented as there was no routine quarterly water testing at the hotel for the presence of *Legionella*. A case of LD was reported to the OOE in April 2011, but the time of symptom onset was slightly outside the normal incubation period for legionellosis. This case stayed at the Aria in January 2011 and had onset of illness February 8, 2011.

Based on the facility's previous history and the report from CDC on June 15, 2011 of two new cases associated with the facility, an epidemiologic and environmental investigation was initiated on June 16, 2011.

METHODS:

Call Centers

The health district's help line (702) 759-INFO, is routinely forwarded to Rocky Mountain Poison and Drug Center (RMPDC). Because high call volume was anticipated as a result of the Aria guest notification, on July 12, 2011, the SNHD provided updated information to the RMPDC regarding Legionnaires' disease and developed frequently asked questions specific to this event. The RMPDC incorporated the materials and was ready to take calls relating to this event on July 13, 2011. (Attachments A). Any calls from physicians regarding potential legionellosis cases as well as calls from persons with respiratory symptoms and a history of

staying at the Aria were forwarded to the SNHD OOE. The Aria Hotel set up its own call center on July 11, 2011 to respond to guest inquiries.

Environmental Investigation

SNHD staff visited the hotel on June 16, 2011 and collected samples from the bathtub, bar sink and shower head in a room that had been occupied by one of the cases. Six environmental samples were taken. The sampling was done using CDC recommended procedures. Aerators were removed from each of the bar sink and shower head and a swab was taken of the aerator and inside the pipe supplying the aerator. At the bathtub, only the surface of the spout was swabbed since the aerator could not be removed. Once the swab was taken it was placed into a sterile centrifuge tube and approximately 5 ml of water was added. After the swabs were taken, a 50 ml sample of the first draw of the hot water was taken at each of the three fixtures. All six samples were sent to NALCO, Naperville, IL for isolation and serotyping of any *Legionella* species present. NALCO is a participant in the CDC ELITE program. Once the sampling was complete the hot water temperature was taken and free chlorine residual was measured. The SNHD also requested that facility managers provide a copy of their current water management plan and any sampling results that occurred during the past year.

A second visit was made on June 21, 2011. On this date SNHD staff cross checked a list of case names provided by CDC with hotel guest lists to obtain room numbers. The history of room occupancy of the six case rooms for a 2-week period prior to the cases' stay at the Aria was recorded. Environmental sampling was done in the same manner as on June 16, for the fixtures in five rooms along with the hot water return for the hot water system that served the rooms where the two most recent cases stayed. After the sampling of each fixture, a hot water temperature and free chlorine residual was measured. None of the rooms sampled on June 21 had a bar sink or separate bathtub. Each room had a sample taken from the shower of the bath shower combo and one sample from one of the two bathroom sinks. All nineteen of the SNHD samples were submitted to NALCO, Naperville, IL.

Third Party Testing

On July 6, 2011, additional sampling was completed by a third party, Phigenics, Naperville, IL, a laboratory selected by the Aria facility management. Samples were taken from the room sampled by SNHD on June 16 along with samples from a room on the same floor, and a room on the floor above and floor below the room sampled by SNHD on June 16. Samples were taken of first draw after the water was hot and after flushing the water for 1 minute. The fixtures sampled included the wet bar sink, bathtub and shower. The samples were taken and analyzed using three tests. One test used molecular marking to determine the presence or absence of *Legionella sp.* DNA in the water, the second was a proprietary method using a dipslide to capture viable *Legionella sp.* and determine their concentration in the water and the third used ISO 11731 to determine the concentration of *Legionella sp.* in 50 ml of sample water.

Epidemiological Investigation

Case-finding

To enhance case-finding, on July 8, 2011 the SNHD posted on CDC's EPI-X a request to other state and local health departments to report to the SNHD cases of legionellosis with a travel history to Las Vegas since December 2009.

On Tuesday, July 12, 2011, the Aria Hotel sent a letter to more than 18,000 guests who stayed at the Aria between June 21 and July 4, 2011 notifying them of their potential exposure to Legionnaire's disease. (Attachment B). SNHD requested by email on July 18, 2011 that the Aria staff report the name and contact information to SNHD OOE of any individual directly reporting symptoms of Legionnaires' disease to the Aria. A subsequent similar request was submitted by letter on August 12, 2011. Additional correspondence regarding this matter was submitted to the Aria by letter on August 22, 2011.

SNHD staff reviewed 2011 Clark County legionellosis cases to determine if any had a history of staying at the Aria hotel.

Aria guests who self-reported illness to SNHD were interviewed and documentation supporting legionellosis diagnoses was gathered. OOE staff contacted one couple who had been clinically diagnosed with Pontiac Fever and had informed the Las Vegas Review Journal (LVRJ), and cross-checked a list of plaintiffs suing Aria that was published in the LVRJ with the outbreak case files. Clinical specimens were requested for verification of the diagnosis.

The following case definition was initially utilized to determine if any of the persons reporting illness should be classified as outbreak-related cases:

Confirmed Legionnaires' Disease Case:

A person who stayed overnight at the Aria and became ill between two days after arriving and fourteen days after leaving, had positive laboratory testing for *Legionella pneumophila* serogroup 1, including isolation (by culture) of any *Legionella* organism (from respiratory secretions, lung tissue, pleural fluid, or other normally sterile fluid), by detection of *L. pneumophila* serogroup 1 antigen in urine using validated reagents, or by seroconversion (fourfold or greater rise in specific serum antibody), and met one of the following clinical criteria:

- Received care (as an inpatient or outpatient) for one or more symptoms consistent with pneumonia (fever equal or greater than 101◦ F, chills, cough, fatigue or weakness) OR
- Received antimicrobial treatment that is effective against *Legionella* and another pneumonia causing organism was not isolated such as *S. pneumoniae* OR
- Had radiographically-confirmed pneumonia.

If any criteria for the definition are unknown (e.g., receipt of antibiotics) and the case otherwise meets the definition, assume that the missing criteria exists for investigation purposes.

Suspect Legionnaires' Disease Case:

A person who stayed overnight at Aria and became ill between two days after arriving and fourteen days after leaving, had no laboratory testing for *L. pneumophila* serogroup 1, AND met the following clinical criteria:

- Received care (as an inpatient or outpatient) for one or more symptoms consistent with pneumonia (fever equal or greater than 101 F, chills, cough, fatigue or weakness) and received antimicrobial treatment that is effective against *Legionella* and another pneumonia causing organism was not isolated s/a *S. pneumoniae* OR
- Had radiographically-confirmed pneumonia.

On September 12, 2011, the above case definition was modified due to reports of Pontiac Fever, which is a milder form of legionellosis than Legionnaires' disease. The previous case definition had not included Pontiac Fever. The new case definition was as follows:

Confirmed Legionnaires' Disease Case:

A person who stayed overnight at the Aria and became ill between two days after arriving and fifteen days after leaving, had positive laboratory testing for *Legionella pneumophila* serogroup 1, including isolation (by culture) of any *Legionella* organism (from respiratory secretions, lung tissue, pleural fluid, or other normally sterile fluid), by detection of *L. pneumophila* serogroup 1 antigen in urine using validated reagents, or by seroconversion (fourfold or greater rise in specific serum antibody), and met one of the following clinical criteria:

- Received care (as an inpatient or outpatient) for one or more symptoms consistent with pneumonia (fever equal or greater than 101° F, chills, cough, fatigue or weakness) OR
- Received antimicrobial treatment that is effective against *Legionella* and another pneumonia causing organism was not isolated such as *S. pneumoniae* OR
- Had radiographically-confirmed pneumonia.

If any criteria for the definition are unknown (e.g., receipt of antibiotics) and the case otherwise meets the definition, assume that the missing criteria exists for investigation purposes.

Suspect Legionnaires' Disease Case:

A person who stayed overnight at Aria and became ill between two days after arriving and fifteen days after leaving, had no laboratory testing for *L. pneumophila* serogroup 1 AND met the following clinical criteria:

- Received care (as an inpatient or outpatient) for one or more symptoms consistent with pneumonia (fever equal or greater than 101° F, chills, cough, fatigue or weakness) and

received antimicrobial treatment that is effective against *Legionella* and another pneumonia causing organism was not isolated s/a *S. pneumoniae,* and did not have a radiological test for pneumonia OR
- Had radiographically-confirmed pneumonia.

Confirmed Pontiac Fever (PF) Case:

A person who stayed overnight at the Aria and became ill between 5 hours after arriving and 3 days after leaving, had positive laboratory testing for *Legionella pneumophila* serogroup 1, by detection of *L. pneumophila* serogroup 1 antigen in urine using validated reagents, or by seroconversion (fourfold or greater rise in specific serum antibody), and met the following clinical criteria:

- Received care (as an inpatient or outpatient) for fever equal to or greater than 101° F and one or more of the following symptoms; chills, cough, myalgia, fatigue, abdominal pain, diarrhea.

Remediation

According to Aria staff, remediation of the hotel began on July 5, 2011 when the bar sinks were taken out of service. This action was taken due to the possibility that the bar sinks were a source of contamination. Also, according to Aria staff, thermal treatment of the hot water system began on July 6, 2011 and repeated over a number of nights. SNHD staff did not observe these two steps but during various visits to the Aria SNHD staff did note that the bar sinks were taken out of service.

From July 11, 2011 until July 21, 2011, staff from the facility conducted a comprehensive remediation program to remove *Legionella sp.* from the hot water system. The rooms of each hot water zone were removed from service and not rented for the night that the remediation occurred. Once the zone was vacated, remediation was implemented by injecting a chlorine solution of 12.5% sodium hypochlorite into the hot water loop at a point before the hot water was delivered to the first room on the riser. Next, the most distal faucet was then flushed until a chlorine residual was detected in the water. Then each fixture served by the loop with the chlorinated hot water was individually flushed until a chlorine residual between 10 to 200 ppm was detected using chlorine test strips. After all of the faucets on the riser had been opened and flushed, a two hour soak time was started. During this time, each shower head served by the riser was soaked in a 2% chlorine bleach solution for ten seconds. After either the two hour soak period expired or after treatment of all of the showerheads occurred, whichever was longer, a hot water flush of each fixture occurred to remove the chlorine from the system.

The hot water system was turned up to 170^{o}F and the loop was drained at the distal end to remove the high level of chlorine from the loop. Once the chlorine was flushed from the the loop, each faucet was then flushed with the hot water. The temperature and chlorine residuals were measured at each fixture by Aria staff to ensure that the water temperature

supplying the fixture exceeded 150°F and no elevated chlorine residuals were detected by using chlorine test paper.

Once the entire system was flushed with the hot water, system was returned to its normal operating temperatures. The next day, two third-party contractors, Phigenics and Bureau Veritas, Downers Grove, IL., tested 4% of randomly selected rooms along with both the proximal and distal ends of the hot water loop. Any rooms not selected for testing were permitted to be rented. Samples taken by Phigenics were analyzed using three tests. One used molecular marking to determine the presence or absence of *Legionella sp.* DNA in the water, the second used a dipslide to capture viable *Legionella sp.* and determine their concentration in the water and the third used ISO 11731 to determine the concentration of *Legionella sp.* in the sample water. Rooms sampled by Bureau Veritas were only tested for the presence of Legionella sp. using ISO 11731 and 1 liter of water from the fixture.

RESULTS:

Call Center Results:

Initial call volume on the SNHD 759-INFO line totaled 95 calls between July 14 and July 17, immediately following distribution of guest letters and media coverage. Of the 95 calls, RMPDC initiated more in-depth questions based on caller questions for 21 callers. Caller contact information was forwarded to OOE for follow up.

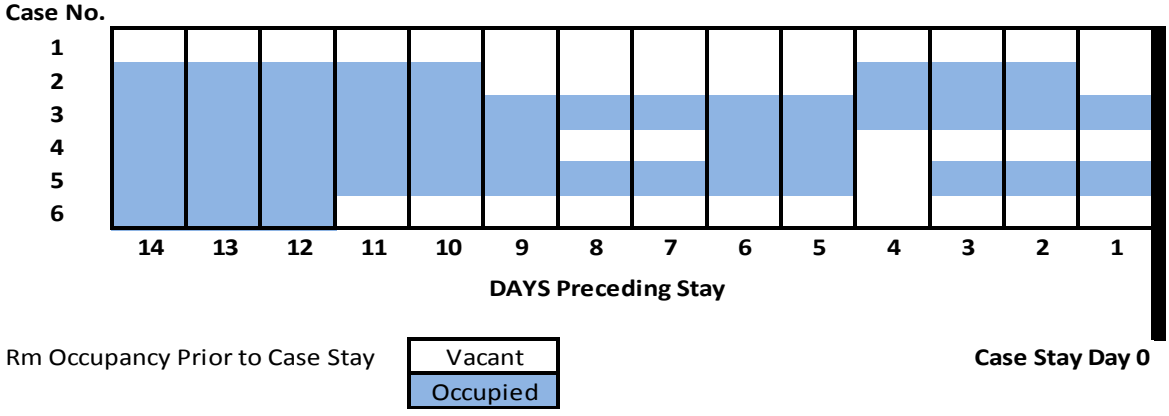
The RMPDC call center for this outbreak was discontinued on December 1, 2011. The total number of calls handled in the entire time period was 222. In-depth surveys were administered to 38 callers. Thirty-five callers were referred to OOE for follow up.

Statistics for the Aria call center were not reported to SNHD.

Environmental and Epidemiology Investigation:

The results of the case-room occupancy study are illustrated in Table 1.

Table 1. Room Occupancy Prior to Case-Stay



Environmental Results:

On June 16 and June 21, 2011, SNHD staff measured both the hot water temperature and free chlorine residual. The free chlorine residual for each room ranged from a low of 0.02ppm to a high of 1.01ppm. The mean was 0.18ppm. The hot water temperature for the rooms ranged from a low of 113°F to a high of 132°F. The mean was 124°F. Both the water sampling results and water management plan were provided to SNHD.

Laboratory Results:

The sample results from 25 samples taken by the SNHD on June 16 and June 21, 2011 indicated that 7 samples from 4 rooms had some *Legionella* growth. Eleven samples had no detectable growth of *Legionella* and seven samples were not tested because their contents leaked during transport. The one sample taken directly from the terminal end of the hot water return had no detectable growth. Six of the seven samples containing *Legionella* had *Legionella pneumophila* serotype 1. Two of the seven samples had fluorescent *Legionella* growth that was not serotype 1. One of the seven samples had both *Legionella pneumophila* serotype 1 and fluorescent *Legionella*.

Third Party Laboratory Testing Results:

On July 6, 2011 samples were taken from four rooms by the Aria's consultant. One room was the room that SNHD tested on June 16; the other three rooms were located nearby the room sampled by SNHD. Using the three tests, the third party laboratory detected the molecular marker for *Legionella sp.* in 11 of the 24 samples using their proprietary molecular marker test. Using Phigenics proprietary dipslide method for collection specimens, one sample taken after a 1 minute flush from the bar sink hot water supply from the same room that SNHD tested indicated *Legionella pneumophila serogroup* 1. The concentration was 10cfu/ml and the molecular marker for *Legionella sp.* was not detected. This sample was also tested using the ISO culture method and found no *Legionella pneumophila* present. Three of the remaining 23 samples, found *Legionella sp.* present using the ISO culture method. One these samples had a concentration of 59 cfu/ml of *Legionella sp* not *L. pneumophila* Serogroup 1-14. The molecular marker test for this sample also did not detect that the molecular marker for *Legionella sp.* This sample was from the pre flush of the same bar sink that had *legionella pneumophila* serogroup 1 after a one minute flush. The other two results were from a the pre and post 1 minute flush of a bar sink in a room on the same floor as the one that was tested by SNHD. The samples contained 1cfu/ml for the first draw and 2cfu/ml after the one minute flush. The molecular marker test detected *Legionella sp.* but the proprietary dipslide did not detect any *Legionella sp.* 10cfu/ml or more.

Remediation Results:

During the room by room remediation that took place over four nights from July 11 to July 21, 2011, the chlorine residual detected ranged from 100 to 200 ppm at each fixture during the

chlorine flush. The chlorine residual in the loop ranged from 3.0 to 50 ppm chlorine just before the temperature of the water was raised and flushing of the system commenced. The rinse temperature of the flush ranged from a low of 150°F to a high of 170°F.

None of the 179 samples taken by Phigenics had a test result that indicated *Legionella pneumophila* sergroup 1 was present and none of the 90 Bureau Veritas samples revealed any *Legionella spp.* greater than 1cfu/ml.

One hundred forty nine samples of the 179 samples analyzed by Phigenics did detect *Legionella spp.* DNA in the water using the proprietary molecular marker screen. There were some samples that did find *Legionella spp.* present. One sample taken from Zone 3 had a result of 1 cfu/ml Legionella spp., another sample from Zone 2 had a result of 2 cfu/ml using the ISO standard method and a third sample in zone 2 had a result of 50 cfu/ml using the proprietary dipslide method. In all three of these cases, there was no *Legionella pneumophilla* detected by either the proprietary dipslide test or the ISO standard method. In Zone 1, there were eight samples reveled various levels of *Legionella spp.* present. Six samples revealed, using the ISO standard method, *Legionella spp.* in the range of 1 to 3cfu/ml. The proprietary dipslide method did not reveal any *Legionella spp.* for the same samples. One of the remaining two samples revealed, using the ISO standard method, 57 cfu/ml and the other sample revealed 1 cfu/ml *Legionella pneumophila* serogroup 2-14. Zone 5 had five samples that revealed *Legionella spp.* One sample revealed 1cfu/ml using the ISO standard method and 10cfu/ml using the proprietary method. Three of the five revealed 10cfu/ml Legionella pneumophila serogroup 2-14 using the proprietary method and 3 to 17cfu/ml using the ISO standard method. One of these three samples revealed 1cfu/ml *Legionella spp.* Finally, the sixth sample had 70cfu/ml using the proprietary method, and 9cfu/ml using the ISO standard method. All five of the fixtures that had positive test results in Zone 5 saw little use prior to sampling. For remediation, all five of the fixtures were flushed with hot water for 12 hours. The fixtures also had the aerators replaced and under counter piping replaced then tested again. During the second round, three of the five had detected *Legionella pneumophila* serogroup 2-14 using the ISO Standard Method. Two samples were below 10cfu/ml and using the proprietary dipslide test, did not detect any *Legionella spp.* The third sample revealed 10cfu/ml using the proprietary dipslide method and 13cfu/ml using the ISO standard method. The fixture was completely replaced and follow-up testing using the ISO standard method revealed 6cfu/ml. Shortly after the follow-up testing the facility became permitted as a public water system and began treating their municipal supply with chlorine.

Case Finding Results:

The Epi-X posting did not result in any immediate identification of additional legionellosis cases. However, on August 11, 2011, OOE received a report from CDC on a Pontiac Fever case. The case had stayed at the Aria in late June.

The Aria guest letter and the ensuing media coverage generated several self-reports of illness to both Aria and SNHD. Callers to SNHD were referred to their physician for diagnosis and testing.

The Las Vegas Review Journal (LVRJ) published a story July 24, 2011 on two Arizona college students clinically diagnosed with Pontiac Fever after staying at the Aria July 5 and 6. SNHD staff was able to interview the individuals, as well as the diagnosing physician and arrange urinary antigen and serological testing. All results were negative for *Legionella pneumophila*.

A second story was published by LVRJ on August 23 about a lawsuit against Aria and the builder. Six plaintiffs were claiming that they acquired Legionnaire's disease at the Aria. The plaintiffs were named in the article, which allowed SNHD staff cross-check the names with our files. None of the names were among the known laboratory-confirmed cases associated with this outbreak. SNHD successfully arranged urinary antigen testing for one individual which was negative for *Legionella pneumophila* serogroup 1. More than three months had elapsed between illness and testing, so results must be interpreted with caution. Although *Legionella* antigen can persist for months in an individual who has been infected, it is ideal to test during the illness period or as soon as possible thereafter. Therefore, a negative result this far after illness does not rule out *Legionella* infection.

Over the course of the investigation, SNHD OOE received several different lists of patrons who had reported illness directly to Aria. The first list was received on September 15, 2011. None of the entries had names or contact information, and the test type was not included. None of the symptoms listed included pneumonia. Therefore in absence of specific laboratory information, none of the 14 individuals could be classified as a Legionnaires' disease case.

The second list was received on October 25, 2011. This list had 21 entries, none with names or contact information. There was only one entry with a positive test. The test type was not given. Based on the room number and dates of stay, this entry appeared to be a duplicate from the first list provided. The two lists did not have any other entries in common.

A third list was received on October 26, 2011. This was an exact duplicate of both the first and second lists, but with the names and contact information added.

The fourth list contained some test type information, i.e., serology, urology. There were 12 entries with "positive serology" and two with "positive urology". A single positive serological test is not diagnostic for recent *Legionella* infection, and therefore did not meet the case definition as a confirmed LD case. SNHD did not receive actual copies of the laboratory tests.

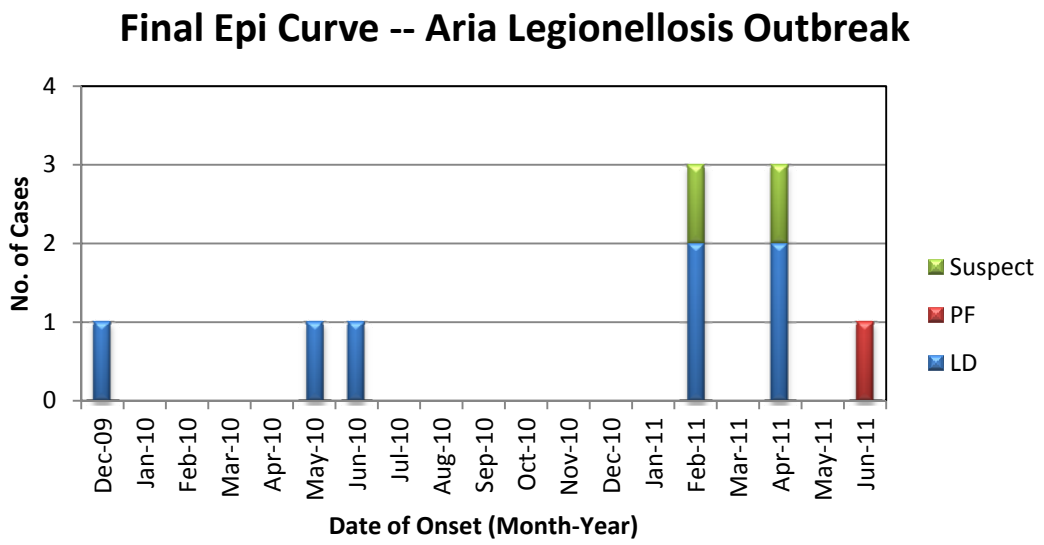
Of the information on potential cases collected by Aria, only one was a confirmed LD case. This case was noted on Aria's fourth list as having positive serology. However, the case had been previously identified through routine reporting methods as having a positive urinary antigen test and no serology. No other legionellosis case reports were received by SNHD from the respective states of the residents recorded in any of the lists provided by Aria.

The two individuals being reported as having "positive urology" were contacted in an effort to confirm the results of laboratory testing. One individual did not have a urinary antigen test done, and did not have any diagnosis of pneumonia, and thus did not meet any case definition. The second individual did not return voice messages, so it was not possible to confirm any of the information provided by Aria.

Callers referred by RMPCD and callers who called OOE directly were interviewed by the OOE staff. Interviews resulted in identification of two suspect cases of Legionnaires' disease (by the second case definition). A local resident who had been formerly diagnosed with laboratory-confirmed Legionnaires' disease informed OOE of a stay at Aria during the incubation period. This was confirmed through hotel receipts.

The final case count was as follows: Seven Legionnaires' disease cases; one Pontiac Fever case and two suspect Legionnaires' disease cases. The epidemiological curve for this outbreak is illustrated in the figure below:

Figure 1. Epidemiological Curve Legionellosis, Aria Hotel and Casino, 2009-2011



DISCUSSION:

On July 1, 2011 some of the final and preliminary results of the environmental samples taken by the SNHD on June 16, 2011 and June 21, 2011 were received from NALCO. These results documented the presence of *Legionella* sp. in the water system with high levels present in the wet bar from one room. The EH program staff developed recommendations for remediation and appropriate guest notification and sent them to the Hotel on July 5, 2011. The hotel responded by proposing further environmental sampling and an interim immediate remediation effort.

On July 6, 2011, the SNHD arranged a teleconference with the Centers for Disease Control and Prevention and the hotel management and representatives. During the discussion, the following key points were specifically addressed and confirmed.

- All six patients reported to CDC who had stayed at the Aria during the incubation period of Legionnaire's disease were laboratory confirmed through urine testing and had the same serogroup, LP1, the same serogroup found in the water at the Aria hotel.
- The identification of 6 associated cases is very unusual and indicative of an outbreak of Legionnaire's disease at the Aria.
- The most likely source of exposure was showering by the guests.
- The identification of these cases and the water sample results indicate a systemic contamination problem throughout the hotel water system, and a comprehensive water management and remediation program will be needed to disinfect the system and maintain disinfection on an ongoing basis.

On July 8, 2011 SNHD leadership met with the CEOs from the hotel, City Center, and MGM to finalize a remediation plan and guest notification. At that meeting, the hotel representatives shared information of their remediation efforts to date. According to the Aria management, the hotel initiated the following measures beginning on July 5, 2011 -- they had taken all wet bars out of service, super heated the water to 165 degrees, cleaned all shower heads and begun to remove the plastic water restriction devices from all shower heads. Following these measures, they had taken additional environmental samples and expected results by noon on July 9, 2011.

The SNHD and hotel management agreed that a comprehensive, aggressive water system disinfection program would be implemented beginning July 11 through July 21. The hotel management also agreed to notify all guests who had been exposed during the incubation period prior to the initiation of the remediation plan on July 5. Letters were sent out notifying guests beginning Tuesday, July 12, 2011. (Attachment B) Because the immediate initial remediation program of thermal heating, chlorination, and cleaning plus taking the wet bars out of service was completed, new incoming guests would not be at increased risk of exposure. Therefore, notification of incoming guests was not required.

The results of the post remediation testing indicate that there was *Legionella spp.* present prior to remediation as evidenced by the large number of positive molecular marker tests. Although none of the tests indicated that *Legionella pneumophila* serogroup 1, the organism that caused the illness, was present, there was some contamination of *Legionella spp.* in the hot water system. Additional remediation of these areas removed the contamination. Once the remediation was conducted, the facility continued enhanced monitoring for *Legionella spp.* using their third party testing agency. The facility also installed a chlorination system to treat the municipal water supply and became a permitted public water system. The facility will continue to conduct testing over the next year after the event to ensure that *Legionella spp.*

does not colonize the system. This monitoring will continue for by taking samples of 1% of the rooms along with the terminal rooms every other week over a six week period and analyzing them for *Legionella spp.* If the testing indicates that the systems have not been re-colonized, then 1% of the rooms along with the terminal rooms will be tested monthly for three months, and finally, after the three monthly tests indicate that *Legionella spp.* has not re-colonized the system then testing will occur quarterly for three quarters. Any single test that finds *Legionella spp.* other then *Legionella pneumophilla* sergroup 1 will be considered to be isolated and the specific room will be remediated by sanitizing the fixtures and flushing with hot water. If *Legionella pneumophilla* serogroup 1 is identified, or a number of tests are found to have *Legionella spp.* then the system will be considered to be re-colonized and the system will be required to be remediated.

Discussions between the hotel management and the SNHD have continued, focused on developing a long term water system management and monitoring plan.

While only 10 cases of legionellosis were identified during this outbreak, it is likely that additional cases occurred that remained unconfirmed and therefore unreported. SNHD staff noted that several persons from out of state were reported as possible cases after a single positive serological test. Though frequently ordered, a single positive serological test is not confirmatory for recent *Legionella* infections. Without a convalescent test done in the appropriate time frame after an acute test, it is not possible to use this test methodology for confirming a recent infection. Of the "serology" positive individuals reported by the Aria, it is unknown if the convalescent testing took place. Therefore none of these could be confirmed as being associated with the Aria outbreak. SNHD was able to work with health departments in the state of residency of potential cases to arrange follow up testing if we were notified in the appropriate time frame. However, of those persons with an initial positive serological test where convalescent testing was done, follow-up testing was negative.

The preferred test methodology if a quick result is needed, is urinary antigen, while the gold standard is sputum culture. Urinary antigen testing is also ideal for confirming a diagnosis of Pontiac fever, since the patient is unlikely to be able to produce positive sputum unless a diagnosis of pneumonia has been made.

CONCLUSIONS:

Confirming a diagnosis of legionellosis is a critical component of case finding in an outbreak investigation. Sputum specimens for culture (in a patient with pneumonia) should be collected prior to initiation of treatment. Urinary antigen testing should ideally be done within 14 days of onset of illness. However, *Legionella* antigen excretion can persist for 60 days or more, even after treatment, so still may serve to diagnose cases in the weeks after illness has resolved.[i,ii] Urinary antigen testing can be used to diagnose Pontiac fever as well. Serology can also be a useful diagnositic tool, but only when both acute and convalescent specimens are collected. A four-fold rise in titer is indicative of a recent acute infection. Since both LD and Pontiac fever

have symptoms in common with many other illnesses, appropriate and timely testing can assist both the investigator and the affected facility in determining if patron illness is truly associated with the outbreak. Thus, case finding functions to both rule in and rule out potential cases and assists in describing the scope of the outbreak and common exposures. All patrons complaining of legionellosis symptoms should be immediately referred to the investigating health department by facility staff. The delay in sharing information with SNHD in this investigation resulted in an inability of SNHD staff to rule in and/or rule out several potential cases and also may have resulted in inappropriate or absence of diagnostic testing.

Enhanced national travel-associated legionellosis surveillance conducted by CDC, in combination with improved availability of clinical testing, has resulted in more frequent detection of facility-related legionellosis outbreaks nationwide. There have been several facility-related outbreaks detected on the Las Vegas Strip since 2001. In most instances, there was a single LD case reported weeks or months before a second or third case was reported. Waiting until there are multiple associated cases resulted in missed opportunities for preventing LD or Pontiac fever cases in visitors to Las Vegas. Had there been immediate and appropriate remediation and monitoring of the facility water systems after a single case, it is likely that subsequent cases could have been prevented. To this end, SNHD has identified a need for a standard operating procedure (SOP) to respond more aggressively to LD reports. This SOP is currently under development and will be shared with local resort hotels upon completion.

ARIA Q&A/July 13, 2011

Following is some Q&A developed regarding the ARIA Resort & Casino.

Are the six cases/patients part of the at-risk group or do any of them have underlying medical conditions?

- The patients were between the ages of 40 and 71. (*We have provided this type of generic info in the past)*

How come you're not notifying people who were at the hotel before the June 21 date, or people who stayed there last year?

- Because of the health district's 2011 water sampling, we know that the water system had *Legionella* bacteria during the two week notification period. At the time of testing in 2010, we found nothing to indicate an increased risk for *Legionella*. If former guests become symptomatic it is important that they advise their health care provider about travel history.
- The health district recommends that if anyone has been diagnosed with Legionnaires' disease or any other pneumonia-type illness and have a history of travel to the hotel, they should contact their health care provider.
- The health district has also set up a monitoring plan with the property and our recommendations will be re-evaluated based on ongoing test results.

Is it possible there could have been people infected in 2010 or at any other time than the two weeks from June 21-July 4?

- Because of the health district's 2011 water sampling, we know that the water system had *Legionella* bacteria during the two week notification period. At the time of testing in 2010, we found nothing to indicate an increased risk for *Legionella*. If former guests become symptomatic it is important that they have this information so they can provide it to their health care provider.

But, isn't it really possible that on June 19 the water was contaminated?

- The dates of stay were identified due to the incubation period of the illness. If anyone who stayed at the hotel prior to June 21 has developed symptoms, they should contact their health care provider and discuss their risk factors and travel history. If they are diagnosed with Legionnaires' disease, the information would be included as part of any updated reporting to the CDC and later to the health district.

Is Aria providing information to guests as they check in?

- Currently, the hotel is not. The notification is for guests who were at the property during the period when the positive water samples were taken. This time period represents the incubation period for the illness. The property immediately began

remediation as well as additional precautionary measures and its most recent samples found no detectable levels of the bacterium. The health district will continue to monitor the sampling and testing program. Based on our review, our recommendations, including recommendations about guest notifications, could change.

Are there more cases?

- Legionnaires' disease is a form of pneumonia and unless specific testing is completed, it is difficult to determine for certain if a patient has it. Because of this, it is possible there are more cases but we cannot be certain about that.

Are other properties at CityCenter affected by this?

- At this time, the health district has not received any reports of illness at other CityCenter properties.

Are you going to check the water systems at the other CityCenter properties?

- The health district conducts an investigation and testing if it has received reports of illness, and at this time, fortunately, we have not received any additional illness reports. However, we would encourage all properties to review their water monitoring systems and make appropriate changes if necessary.
- The environmental health division provided information to area properties about steps they should take when they reactivate water systems that were shut down for a period of time due to room closures, etc. Staff from the special projects program would be happy to meet with any resort or hotel to discuss the steps that should be taken.

How come SNHD doesn't inspect water systems regularly?

- Public accommodations are required to provide potable water to customers by a public water system. The Nevada Department of Environmental Protection has been given the responsibility to regulate public water systems to ensure that these systems meet the requirements of the U.S. Safe Drinking Water Act. Although the act does not specifically mention *Legionella*, it does have requirements on the bacteriological quality of the water and they should, for the most part, prevent *Legionella*.

Can you get Legionnaires' disease at home? How could you prevent it?

- Many people who develop the disease are exposed at large venues or facilities, like a hotel. However, it is possible to be exposed at home if you have tubs, showers, misters, or sinks that are not used very often. It is recommended that you run those regularly to keep *Legionella* from growing in your own water systems.

Is there *Legionella* in the Valley's water system?

- For specific information, you would need to contact the water district.
- *Legionella* is found in surface water and the Southern Nevada Water Authority uses filtration, a state-of-the-art disinfection system called ozonation and disinfection contact

- The Las Vegas Water District, upon learning of the outbreak has increased its monitoring and sampling program to assure visitors and residents that the local water system remains bacteria and disease free.
- The Southern Nevada Water Authority monitors the raw and finished water at its treatment plants as well as the Las Vegas Wash and has not detected any *Legionella*.

Can you get Legionnaires' disease by drinking the water?

- You cannot get sick from brushing your teeth or drinking the water. Most people who are exposed to *Legionella* do not get sick; the illness itself is a respiratory disease. For those who are at a higher risk, exposure occurs from inhaling vapors or droplets. The most common exposure among those who do get sick is from showering.

How many cases of Legionnaires' disease do we get each year?

- We received reports of Legionnaires' disease in Southern Nevada residents throughout the year. In 2010, we had 16 reported cases in local residents.

How many other hotels have had Legionnaires' disease issues?

- *Legionella* bacteria are found in the environment and it is not uncommon in facilities or venues here or other places across the countries. The CDC has a nationwide tracking system and what the Aria is experiencing is not uncommon.
- The environmental health division provided information to area properties about steps they should take when they reactivate water systems that were shut down for a period of time due to room closures, etc. Staff from the special projects program would be happy to meet with any resort or hotel to discuss the steps that should be taken.

Aria
RESORT & CASINO

Dear Valued Guest:

In cooperation with the Southern Nevada Health District, ARIA Resort is contacting recent guests who may have stayed with us from June 21 to July 4 at a time when water tests detected elevated levels of Legionella bacteria in several of our guest rooms.

Health officials have recently notified us of a few reported instances of guests who visited Aria, were diagnosed with, treated for, and recovered from Legionnaires' disease (a form of pneumonia caused by Legionella bacteria). In an abundance of caution, we are attempting to notify guests who may have been exposed to these bacteria during this short period. Legionella is a common naturally occurring bacteria that exists in most water supplies and in some circumstances can cause illness. People often receive low-level exposure in the environment without getting sick. Illness usually occurs when someone who is susceptible receives direct concentrated exposure to the bacteria when breathed in as a mist or vapor.

The illness is not contagious; you cannot catch it from other people. Most cases are successfully treated with antibiotics. Symptoms of illness caused by Legionella bacteria include high fever, chills, cough, fatigue, muscle aches and headaches. These symptoms usually begin 2 to 14 days after being exposed. If you have developed any combination of these symptoms, we encourage you to see your doctor, especially if you are at higher risk of infection due to a chronic illness, respiratory disease, or compromised immune system or if you are a smoker or elderly.

Legionella is a concern for all large buildings and ARIA has a comprehensive water management program in place, which includes regular testing. Following the recent elevated test result, our facilities team immediately implemented additional precautionary measures, and our most recent test results indicate that no detectible level of active Legionella bacteria was present in any of the locations tested. We will continue to monitor our water quality on an ongoing basis to ensure the safety of the water system and our guests.

If you have questions regarding this notice, please call 1-877-326-ARIA (2742) to speak directly with our staff about this issue. Also, please share this letter with others who stayed in your room during your visit to the ARIA Resort.

Additional information on Legionella is available on the Southern Nevada Health District website, www.SNHD.info, or by calling the Health District's information line, (702) 759-INFO (4636) or toll free (866) 767-5038.

Sincerely,

Paul Berry
Vice President Hotel Operations

3730 Las Vegas Blvd South Las Vegas, NV 89158

REFERENCES

[i] Kohler, R B, Winn, W C, Jr, and Wheat, L J, *Onset and duration of urinary antigen excretion in Legionnaires' disease,* J Clin Microbiol. 1984 October; 20(4): 605–607.
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