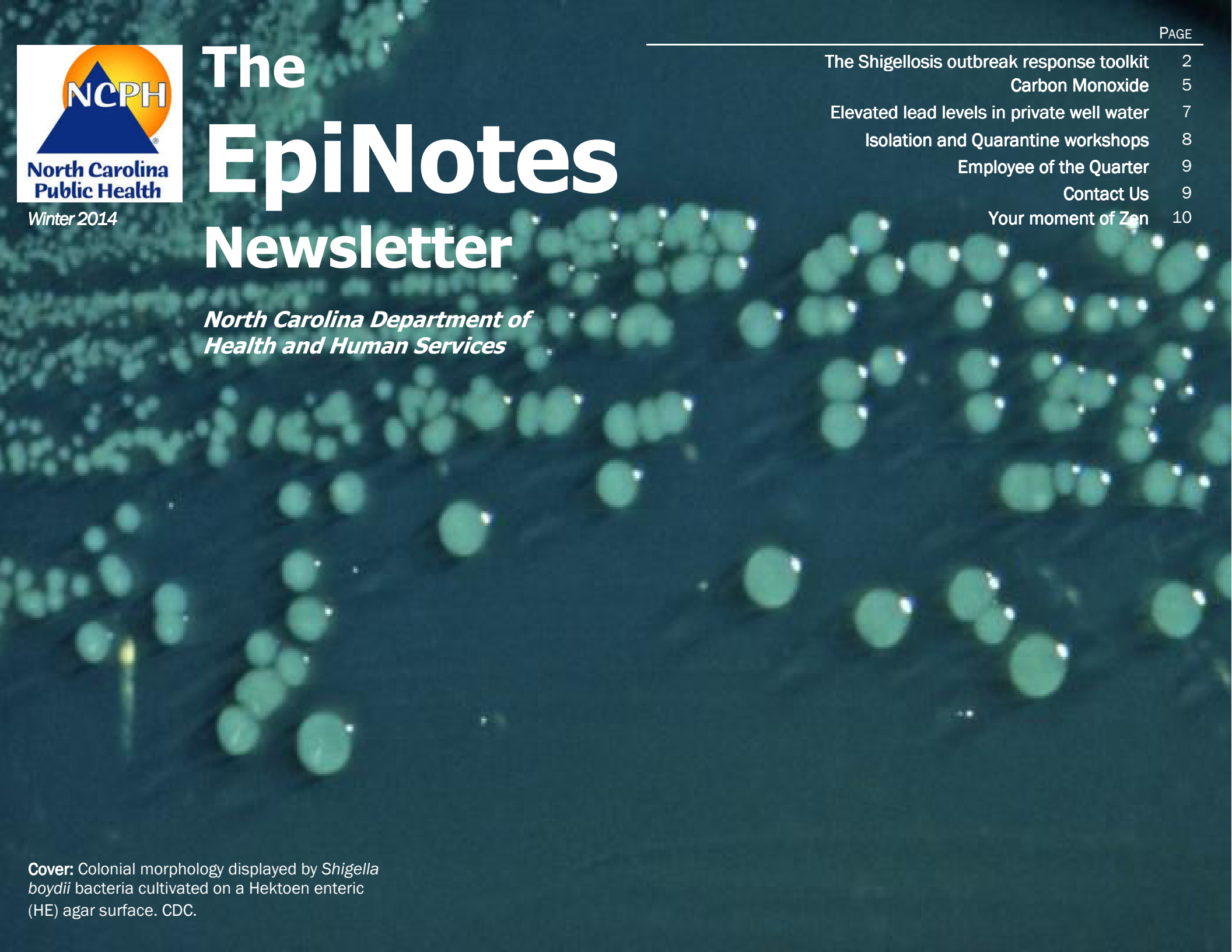
# The EpiNotes Newsletter

*Winter 2014*

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





**Cover:** Colonial morphology displayed by *Shigella boydii* bacteria cultivated on a Hektoen enteric (HE) agar surface. CDC.

# The Shigellosis Outbreak Response Toolkit

By Nicole Lee, MPH and Carl Williams, DVM

Shigellosis is an acute gastrointestinal illness caused by a species of bacteria in the genus Shigella. There are four species of Shigella, including S. dysenteriae, S. flexneri, S. boydii, and S. sonnei. Almost all cases reported in North Carolina are caused by S. sonnei. According to the CDC, there are approximately 450,000 cases of shigellosis (72% due to S. sonnei) that occur in the United States each year, but only 14,000 of these are laboratory confirmed. Because of the low infectious dose and significant outbreak potential, single or multiple cases of Shigella infection necessitate a prompt and aggressive response and strict application of control measures. Outbreaks are known to persist for weeks or months without appropriate control measures. This article provides relevant background information and NC Department of Public Health guidance for case identification, management and outbreak control.

**Transmission:** Shigella bacteria are spread by fecal-oral transmission. While contamination of a vehicle (e.g., food or water) by an infected food handler or bather can happen, the majority of cases are caused by person-to-person transmission. Humans are the only reservoir for Shigella bacteria. The infectious dose for shigellosis is very small; less than 200 organisms (Figure 2). As a result, even seemingly minor breaches in hygiene can result in outbreaks.

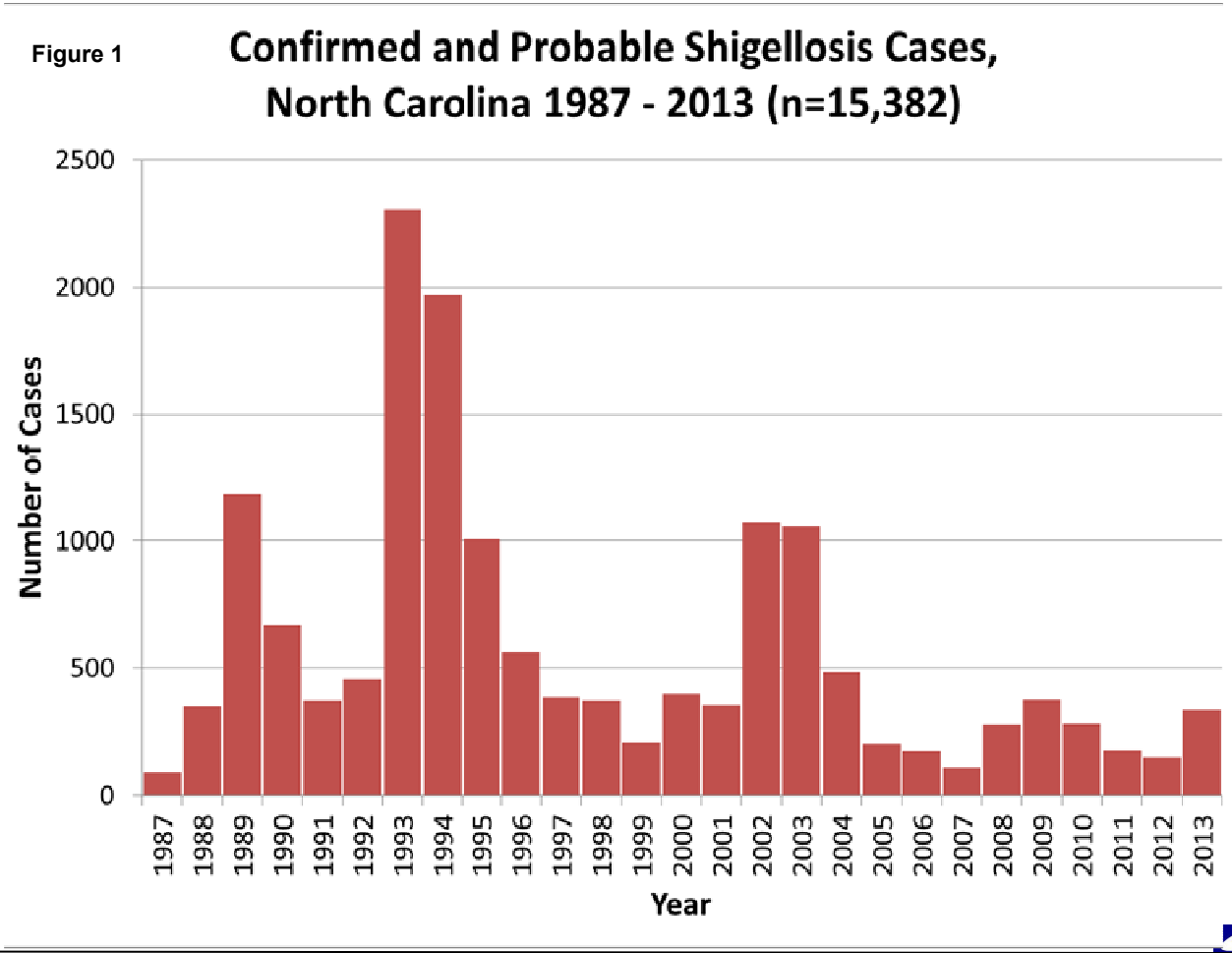
**Clinical signs and symptoms** : Infection with S. sonnei and S. boydii usually cause relatively mild illness in which diarrhea may be watery or bloody. Signs and symptoms of shigellosis range from asymptomatic or mild symptoms to abdominal cramping, fever and mild or severe diarrhea.

**Diagnosis and Case Classification:** Isolation of Shigella from feces or rectal swabs using bacterial culture methods is **confirmatory**. Non-culture based methods such as PCR, fluorescent antibody, and enzyme-linked microassay testing are becoming more common. Non-culture based diagnostics provide laboratory evidence of infection, but from a surveillance standpoint, these cases are classified as **suspect** cases.

A person with a clinically compatible illness with direct contact with a confirmed case or a member of a risk group during an outbreak meets case definition criteria as a **probable** case.

**Incubation period:** The symptoms of shigellosis usually appear within one to three days of infection, but may range from 1 to 7 days between exposure and illness onset.

Figure 1



**Risk Factors:** Anyone can get shigellosis, but it is recognized more often in young children and frequently associated with children in group settings, including individuals who work at or attend child care centers. A lack of appropriate hand washing and diapering practice is associated with an increased risk of transmission of shigellosis in childcare centers. [1]

**Period of infectivity:** Shigella can be spread for as long as the organism can be isolated from a person's stool, which is up to four weeks. Certain antibiotics may shorten the shedding phase; however, Shigellae are frequently resistant to one or more antibiotics.

**Preventive measures**: Good personal hygiene is the single most important preventive measure. Frequent and thorough hand washing is essential before handling food, before eating and after toilet use, especially in young children who may not be completely toilet trained.

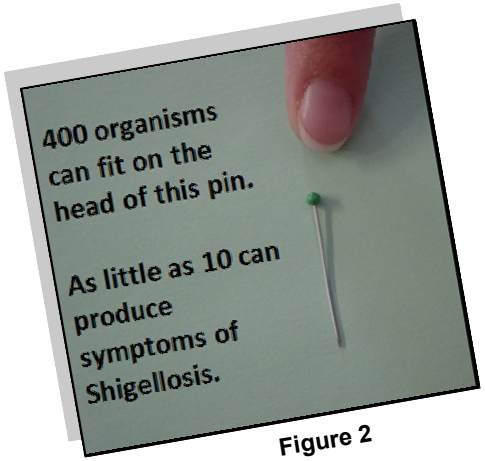


Figure 2

**Control of cases**: Exclusion until appropriate for re-admission. Treatment if indicated by clinician; best supported by antibiotic susceptibility testing. Re-admission based on applicable regulations, negative testing, or resolution of symptoms depending on the type of facility attended. Historically, culture has been required in certain circumstances, but PCR testing is becoming more widely used and is adequate in some situations. Education on the importance of personal hygiene, particularly after using the toilet, and before and after food handling.

**Control of contacts**: Identification and testing of symptomatic contacts to identify additional cases and apply control measures. In situations with 2 or more cases, test all direct contacts of cases regardless of illness status.

**Control of environment**: Strict attention should be paid to maintaining environmental cleanliness and sanitation in childcare centers, institutions and food premises.

Intervention to control or prevent a shigellosis outbreak is dependent on community collaboration. If an outbreak is beginning or expanding, it is recommended that local health departments develop a **task force** to identify the necessary control measures and ensure their application throughout the community. This has been demonstrated to be an effective means of addressing and controlling outbreaks. [2] The task force should include, at a minimum:

- Communicable disease nursing staff
- Environmental health staff
- NC Division of Child Development and Early Education staff
- Clinicians

**Shigella Outbreak in Cabarrus and Neighboring Counties**
**September - December 2013**

| Table 1 | All Cases (n=185) | | Lab Confirmed (n=101) | | Probable (n=84) | |
|---|---|---|---|---|---|---|
| *Exposure* | # | % | # | % | # | % |
| *Gender* | | | | | | |
| Male | 79 | 43% | 41 | 41% | 38 | 45% |
| Female | 106 | 57% | 60 | 59% | 46 | 55% |
| *Age (years)* | | | | | | |
| N | 171 | - | 96 | - | 75 | - |
| Min | 0 | - | 0 | - | 0 | - |
| Max | 71 | - | 66 | - | 71 | - |
| Median | 8 | - | 6 | - | 9 | - |
| *Symptomology* | | | | | | |
| Vomiting | 49 / 166 | 30% | 28 / 95 | 31% | 21 / 71 | 30% |
| Diarrhea | 173 / 178 | 97% | 91 / 96 | 95% | 82 / 82 | 100% |
| Bloody Diarrhea | 56 / 161 | 35% | 43 / 91 | 47% | 13 / 69 | 19% |
| Fever | 96 / 159 | 60% | 62 / 92 | 67% | 34 / 67 | 51% |
| Abdominal cramps | 142 / 168 | 84% | 79 / 95 | 83% | 63 / 73 | 86% |
| Tenesmus | 16 / 88 | 18% | 9 / 46 | 20% | 7 / 42 | 17% |
| Asymptomatic | 4 / 110 | 4% | 4 / 48 | 8% | 0 / 62 | - |
| *Severity of Illness* | | | | | | |
| Provider visit | 87 / 145 | 60% | 53 / 82 | 65% | 34 / 63 | 54% |
| ED visit | 38 / 141 | 27% | 31 / 82 | 38% | 7 / 59 | 12% |
| Hospitalized | 5 / 173 | 3% | 5 / 99 | 5% | 0 / 74 | - |
| *Duration of Illness (days)* | | | | | | |
| N | 73 | - | 41 | - | 32 | - |
| Min | 1 | - | 2 | - | 1 | - |
| Max | 35 | - | 35 | - | 16 | - |
| Median | 5 | - | 6 | - | 3 | - |
| *County of Residence* | | | | | | |
| Cabarrus | 99 | 54% | 38 | 38% | 61 | 73% |
| Mecklenburg | 27 | 15% | 27 | 27% | - | - |
| Rowan | 43 | 23% | 27 | 27% | 16 | 19% |
| Stanly | 5 | 3% | 2 | 2% | 3 | 4% |
| Union | 9 | 5% | 6 | 6% | 3 | 4% |

- Childcare operators
- School district administrators & nurses
- Public Information Officer

**Historical Incidence of Shigellosis Outbreaks in North Carolina**
In North Carolina, there have been various outbreaks of Shigella. It has been established that outbreaks usually cycle every 7 – 9 years. However, a decreasing trend in disease incidence has been observed during the past 10 years in North Carolina (Figure 1). The large outbreak of 1993-1994 primarily affected children and staff at childcare centers and their household contacts statewide. During that period, 43% of 4271 reported cases were aged less than 5, and 68% less than 9 years. Similarly, an outbreak in 2002 also began in childcare centers and persisted for approximately 18 months, though it was mostly limited to Mecklenburg County. These outbreaks led to the development of a toolkit to assist local health departments with Shigella outbreak response. Childcare centers were the primary type of facility associated with illness and became the focus of controlling transmission. The toolkit concentrated on exclusion of the ill, environmental cleaning, and cohorting.

**2013 Shigellosis Outbreak**
The most recent outbreak of shigellosis began in September 2013. Initial cases were reported in an elementary school in Cabarrus County and quickly spread into the community. By the end of the outbreak, 185 confirmed and probable cases were identified, affecting multiple schools and childcare facilities in five counties (Figure 3). An additional 116 symptomatic contacts were investigated. Most of the 185 cases were children and the majority were female. Approximately 5% of cases were hospitalized; the median duration of illness was 5 days (Table 1).

**The shigellosis outbreak toolkit** was updated in 2013 based on activities stemming from the 2013 outbreak, collaboration with CDC, and updated scientific studies regarding exclusion criteria [3]. The updated guidance includes the following new recommendations (see Toolkit for complete list of updates at epi.publichealth.nc.gov):

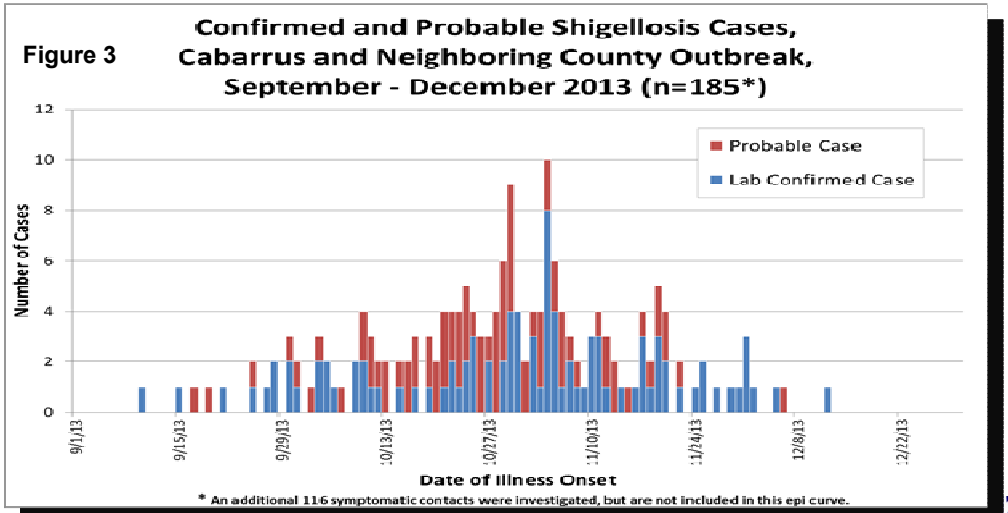
- Response should be adapted based on whether a community-wide outbreak is occurring or not.
- Ill childcare attendees who become asymptomatic require one negative stool instead of two before they can be allowed to return to childcare.
- A childcare center should be temporarily closed to new admissions after the report of one positive case. Surveillance for additional cases should occur for one week, after which normal activities may resume if no additional cases are identified.
- Ill staff epi-linked to a lab-identified case cannot return to a childcare facility where one case has been identified until he/she tests negative according to the testing protocol in the toolkit, per APHA manual. [4]
- Children who are not yet of kindergarten age should be excluded until one negative stool is obtained.
- A task force should convene before an outbreak to ensure all necessary partners are on the same page regarding response.

**Impact of Shigellosis:** Shigellosis cases and outbreaks can last for months and have a big impact on business operations for childcare centers, schools and parents. It is essential to communicate a clear and succinct plan to all community members to foster cooperation and understanding. Outbreaks of shigellosis are difficult to control and may persist for months, and community members must be prepared for their impact.

## References


1. Shane A, Crump J, Tucker N, Painter J, Mintz E. Sharing *Shigella*: risk factors and costs of a multi-community outbreak of shigellosis. Archives Pediatrics and Adolescent Med 2003; 157 601-603.
2. Heymann, D (2008). *Control of Communicable Disease Manual.* Washington: American Public Health Association.
3. Shane A, Crump J, Tucker N, Painter J, Mintz E. Sharing *Shigella*: risk factors and costs of a multi-community outbreak of shigellosis. Archives Pediatrics and Adolescent Med 2003; 157 601-603.
4. Heymann, D (2008). *Control of Communicable Disease Manual.* Washington: American Public Health Association.


**Figure 3**



# Carbon Monoxide: From the Basics to Syndromic Surveillance

By David Lipton, MSPH CIH and Ricky Langley, MD MPH

The Occupational and Environmental Epidemiology Branch (OEEB) provides routine consultation on exposure investigations as well as methods to prevent carbon monoxide (CO) poisonings. Recently, however, OEEB implemented a statewide CO-related surveillance system using near real-time emergency department and poison center call data. Specifically, ED visits suggestive of CO poisoning are monitored using chief complaints as well as clinical and exposure information from calls made to the Carolinas Poison Center. These data are aggregated and compiled monthly. Reports are being posted to the OEEB website (Figure 1).

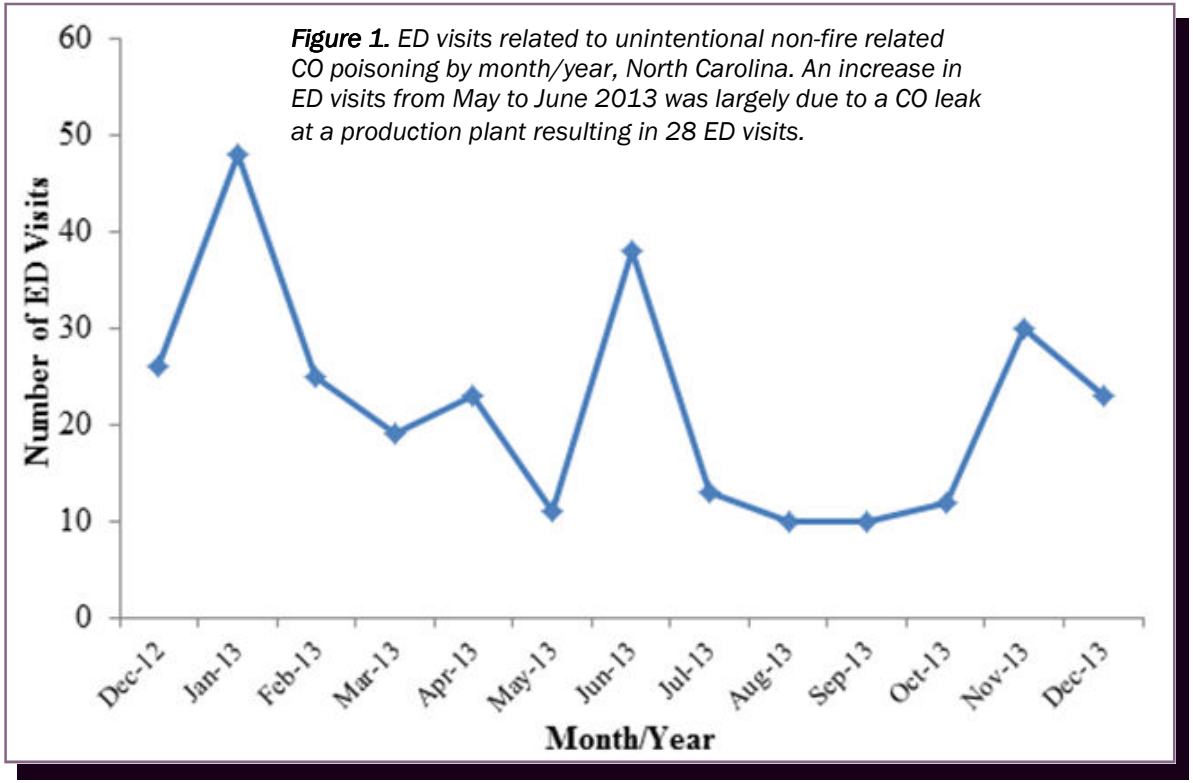



***Figure 1.*** *ED visits related to unintentional non-fire related CO poisoning by month/year, North Carolina. An increase in ED visits from May to June 2013 was largely due to a CO leak at a production plant resulting in 28 ED visits.*

During 1999-2010, the CDC reported that 5,149 deaths from unintentional CO poisonings occurred in the U.S. (an average of 430 deaths per year). In addition, each year approximately 21,000 persons are evaluated in EDs, and between 2,500 and 4,000 patients are hospitalized.

CO is produced from the incomplete combustion of fuels such as gasoline, diesel fuel, liquefied natural gas, kerosene, propane, wood, and charcoal. Equipment that uses these fuels include, but are not limited to, forklifts, power washers, concrete saws, gas-powered floor buffers, small gasoline engines, grills, cook stoves, water heaters and dryers, portable generators, and unvented heaters, all of which generate CO. Prior use of the equipment without any problems may provide a false sense of safety. It is important to follow basic safety precautions when working with or around these types of equipment, especially in enclosed spaces. More detailed prevention guidance can be found on both the OEEB and CDC websites (see resource section at the end of this article).

Exposure to CO may cause the following symptoms: headache, dizziness, weakness, nausea, vomiting, chest pain, and confusion. Exposure to high levels of CO can quickly cause unconsciousness and can result in death.

Carbon monoxide alarms are life safety devices, intended to provide additional warning beyond smoke detectors about potentially hazardous conditions. Carbon monoxide alarms should be installed and maintained in every residential dwelling following manufacturer's instructions. North Carolina General Statute Chapter 42 Article 42 requires that owners install a carbon monoxide alarm in every residential rental dwelling containing fuel burning appliances or equipment. The North Carolina Building Code requires carbon monoxide alarms in all residences built after 2009. Effective October 1, 2013, the General Assembly amended North Carolina General Statute 143-138 to require carbon monoxide alarms if combustion sources are present in lodging establishments. Industrial grade CO monitors should be installed where combustion powered equipment or power tools are used indoors or in confined spaces.

### To prevent overexposure to CO

- Keep combustion equipment properly maintained.
- Combustion products from fixed equipment should be properly vented to the outside and away from buildings, especially doors, windows, or air intakes.
- Do not use fuel-burning mobile or portable equipment in enclosed spaces without adequate ventilation.
- Substitute electric-powered or alternative (using non-combustible fuel) equipment if possible.
- Limit the amount of time combustion equipment is operated indoors.
- Industrial grade CO monitors should be installed where combustion powered equipment or power tools are used indoors or in confined spaces.
- Every residential dwelling should have a carbon monoxide alarm meeting current UL™ standards.

### Steps for people responding to an emergency

- If a person has symptoms or is unconscious, be aware that hazardous gases such as CO may be present. Do NOT make yourself a victim!
- Use appropriate personal protective equipment (see CDC website).
- Use ventilation to remove possible toxic gases.
- Remove victim to a safe area with fresh air.
- Transport victim to an emergency facility for further medical evaluation.

### Resources:

- Occupational and Environmental Epidemiology Branch, CO Poisoning webpage: http://epi.publichealth.nc.gov/OEE/A_Z/CO.HTML
- CDC, Carbon Monoxide webpage: http://www.cdc.gov/CO/FAQS.HTM
- Consumer Products Safety Division, Guidelines for Responding to Carbon Monoxide Incidents. Available at: http://www.cpsc.gov/PAGEFILES/117067/COGUIDE.PDF & Questions and Answers available at: http://www.cpsc.gov/en/Safety-Education/Safety-Education-Centers/Carbon-Monoxide-Information-Center/Carbon-Monoxide-Questions-and-Answers-/.

# CARBON MONOXIDE POISONINGS

## MONTHLY REPORT
## January 2014

nc department of health and human services

North Carolina Public Health

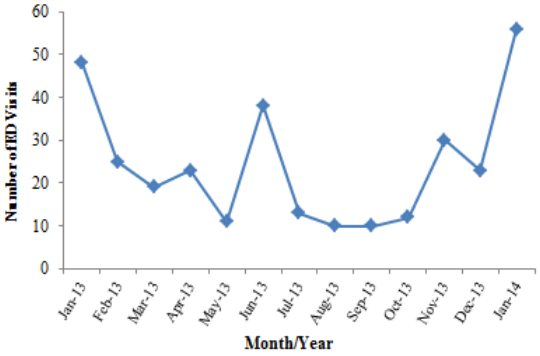

**Emergency Department (ED) Visits:** 56 visits related to unintentional non-fire related carbon monoxide (CO) poisoning were identified.

Table 1. ED visits related to unintentional non-fire-related CO poisoning, North Carolina

| | ED Visits (January 2014) |
|---|---|
| | N (%) |
| **Total** | 56 |
| Female | 37 (66.1) |
| Male | 19 (33.9) |
| **Age Group (years)** | |
| 0–9 | 5 (8.9) |
| 10–24 | 18 (32.1) |
| 25–44 | 16 (28.6) |
| 45–64 | 11 (19.6) |
| 65+ | 6 (10.7) |
| **Exposure Site** | |
| Home | 11 (19.6) |
| Public building | 3 (5.4) |
| Workplace | 21 (37.5) |
| Unspecified | 21 (37.5) |
| **Disposition** | |
| Admitted | 4 (7.1) |
| Discharged | 49 (87.5) |
| Transferred | 3 (5.4) |

NOTE: N.C. DETECT (Disease Event Tracking and Epidemiologic Tool) (https://www.ncdetect.org/) search criteria: ICD-9-CM nature of injury code 986 or external cause of injury ICD-9-CM codes E868.3, E868.8, E868.9, E982.1, E868.2 or E982.0. Poison Center calls were filtered by substance and calls were included when exposure to CO (whether or not additional substances were mentioned) was documented. ED visits and Poison Center calls related to self-inflicted or fire-related exposures (identified by keywords "fire" or "smoke") were excluded.

Figure 1. ED visits related to unintentional non-fire-related CO poisoning by month and year, North Carolina




In addition to ED visits, 33 calls related to CO exposure were captured through the **Carolinas Poison Center**:

- 51 exposed persons were mentioned in the 33 calls (limited information available to determine number of exposed persons in calls who visited ED)
  - 67% Female
  - 31% Male
  - 2% Unidentified
- Site of exposure
  - 82% Residence
  - 12% Workplace
  - 6% Unidentified

**January 2014 CO Exposure Descriptions**

- Occupational or residential heater malfunctions were described as cause of CO exposures in multiple incidents
- Kerosene heater use was mentioned in several CO exposure descriptions and resulted in multiple patients visiting ED
- Headaches and dizziness were common complaints

**For additional CO information and resources, please visit our website:**
http://epi.publichealth.nc.gov/oee/a_z/co.html

# Elevated Lead Levels in Private Wells, Western NC, 2013

**By** Nirmalla Barros, PhD MPH

In December 2012, the North Carolina Division of Public Health (NC DPH) received a report from a western North Carolina county health department of elevated lead levels (ELLs) in water samples from 55 (14%) of 398 private wells installed between 2008 and 2012. ELL is defined as a lead level greater than or equal to the U.S. Environmental Protection Agency's (EPA) Action Level (AL) for Treatment Technique of 15 parts per billion (ppb) for lead in drinking water. All 55 wells therefore had initial lead levels above EPA's Maximum Contaminant Level Goal (MCLG) of zero ppb (a non-enforceable health goal). New wells in NC are tested for microbial and inorganic contaminants within 30 days of being newly constructed pursuant to legislation adopted by the NC General Assembly in 2008. Of the 55 wells with ELLs, 41 (75%) were above the AL (range, 16 – 191 ppb), while the remaining wells had lead levels at or near the AL. NC DPH and the county health department began an investigation to 1) re-sample the wells with ELLs constructed since 2008, and 2) determine the source of potential lead contamination.

These ELLs were brought to our agency's attention by this county after a resident requested well water testing after elevated iron levels were noted soon after the well was constructed in 2010. The initial lead level was 191 ppb. The well water was re-sampled in June 2012 and the lead level (34 ppb) was found to be more than twice the AL. The water from the well was sampled again a month later and found to have an even higher lead level (55 ppb). The county then began an examination of lead levels in well water around this locale.

During April–May 2013, 41 (75%) of the 55 wells with initial ELLs were re-sampled. Twenty (49%) of 41 wells continued to demonstrate ELLs at the well head. However, only three of 20 wells had ELLs at the well head after flushing the system by allowing the water to run for five minutes. Thirteen (32%) of the 41 well water samples still had lead levels greater than the MCLG after the water had been allowed to run for one minute at the kitchen tap and 5 (38%) of these 13 samples had ELLs. However, when the water had been allowed to run for more than one minute at the kitchen tap, none of the 41 samples were above the AL and only two wells continued to have lead levels greater than the MCLG.

All households using wells with initial ELLs were advised to consult their health care providers for testing of blood lead levels in children. Households with ELLs at the well head or kitchen tap re-sampling were advised to let the water run in the morning for a specified period of time as determined by the level of lead detected in their water before drawing water for drinking. The two households with lead levels that continued to be greater than zero even after flushing at the kitchen tap were advised to drink bottled water and obtain information from their county health department about other measures to reduce lead in their drinking water (e.g., filters, piping replacement).

Potential sources of lead contamination in well water include plumbing at the well (e.g., the "drop pipe" that carries water from the submersible pump in a well up to the surface), well pumps, solder, wells casings, and indoor plumbing fixtures. Lead may enter the water as a result of corrosion of these plumbing systems. The water's acidity may influence the amount of lead in the water (US EPA, 2012) and cause piping corrosion; however, we did not observe any considerable trends of low pH among re-sampled wells. Five wells had lead levels greater than the MCLG at the kitchen tap, but no lead was found at the well head, indicating that lead may be leaching from the plumbing fixture dispensing the water from the tap.

While no existing wells were disassembled and tested, drop piping from a local drill yard was sampled to represent piping used for wells in this county. Four samples of imported galvanized steel pipes and one sample of U.S.-made galvanized steel pipes were tested. Two of the imported drop pipe samples had lead levels ranging from 8 to 7,800 mg/kg with more than 300 times the lead level of 20 mg/kg in the U.S.-manufactured drop pipe. Although the imported piping met the definition of "lead-free" for piping providing water for human consumption as required by the Safe Drinking Water Act, there were visible differences in integrity of the galvanic coating between the imported and domestic sources of piping, suggesting that lead could potentially be leaching from the drop piping.

Building code rules in NC do not cover plumbing at the well. For example, continuous plumbing from the well pump to within 5 feet of the house or other structure is not subject to any inspection or regulatory oversight. Therefore, in NC, inspections of construction quality and well piping integrity are not conducted. Local health departments in NC permit and inspect private drinking water wells based on state well construction rules. Discussions with state agencies have been ongoing to add well plumbing specifications to the state's building code rules.

**Reference**

US EPA (US Environmental Protection Agency). Basic information about lead in drinking water. Last updated on March 6, 2012. Available at http://water.epa.gov/drink/contaminants/basicinformation/lead.cfm. Accessed on October 8, 2013.

# Regional Isolation and Quarantine Workshops

By Aaron Fleischauer, PhD MSPH

During November and December 2013, the Public Health Preparedness and Response branch facilitated four regional isolation & quarantine (I&Q) workshops for local health departments. The goals for these workshops were to 1) describe the legal authorities and jurisdictional responsibilities for isolation and quarantine; 2) understand the state mass I&Q template and how to adapt it to local jurisdictions' needs and requirements; and 3) define the partners involved in supporting mass I&Q and draft a local plan to engage those partners.

**The difference between quarantine and isolation is:**

***Isolation*** applies to people who are known to be ill with a contagious disease.

***Quarantine*** applies to people who have been exposed to a contagious disease, but who may or may not become ill.

I&Q methods have been used throughout history to control disease spread. In the U.S., I&Q authority is derived from the police powers granted to states in Article 6 of the U.S. Constitution. In North Carolina, General Stature §130A-145 empowers both the state and local health directors to exercise their authorities to isolate and/or quarantine individuals ***"only when and so long as the public health is endangered, all other reasonable means for correcting the problem have been exhausted, and no less restrictive alternative exists."***

NC DPH and local health departments routinely exercise their isolation and, to a lesser extent, quarantine authority. Most commonly this occurs in TB case investigations and treatment management.

I&Q has also been employed during recent outbreaks to control disease transmission. During the 2013 measles outbreak, approximately 72 quarantine orders were issued to susceptible contacts. Developing county-level mass I&Q plans will further enhance our capacity to respond to future outbreaks and pandemics.

**Reference**

Moore J. THE NORTH CAROLINA PUBLIC HEALTH SYSTEM'S ISOLATION AND QUARANTINE AUTHORITY. Health Law Bulletin. 2006; No. 84. Available at: http://sogpubs.unc.edu//electronicversions/pdfs/hlb84.pdf?

Pictured from L-R: John Peebles, Pete Moore, Recipient Eric Davis, and Dr. Davies

# Employee of the Quarter: Eric Davis

Eric Davis coordinates the STD/TB drug shipment program for the Communicable Disease Branch and has worked tirelessly over the last eight months to improve this program and make it more efficient. During this time period, Mr. Davis 1) Surveyed all local health departments to get appropriate contact information to prepare them to register appropriately with HRSA; 2) Conducted research to answer many questions from LHDs about the availability of 340 B pricing on STD/TB drugs to enable them to use these drugs as allowed by HRSA; and 3) Worked with a contract pharmacy to ensure that all LHDs have the ability to order 340 B pricing to allow drugs to be purchased at a discount.

Mr. Davis' work with Cardinal Health enabled the CD Branch to save thousands of dollars in drug costs by ensuring that we can receive discount pricing on all STD and TB drugs ordered. His work with HRSA to appropriately register all local health departments in NC with HRSA will enable them to take control of their own STD/TB drug orders in the future.

## Epidemiology Section Offices

Communicable Disease Branch
(24/7 on-call)
919-733-3419
HIV/STD Program
919-733-7301
TB Program
919-733-7286

Occupational & Environmental
Epidemiology Branch
919-707-5900

Public Health Preparedness
and Response
919-715-0919
PHPR Emergency 24/7
919-820-0520

Rabies Emergency
(Nights, Weekends, Holidays)
919-733-3419

State Laboratory of Public Health
919-733-7834