Epi Notes

North Carolina Department of Health and Human Services ◆ Division of Public Health

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CDC Investigation of Traveler with Extensively Drug Resistant Tuberculosis (XDR TB): The North Carolina Connection

Prepared by Maureen O'Rourke, Public Health Advisor, Kitty Herrin, PhD, Epidemiologist, and Carol Dukes Hamilton, M.D., GCDC Branch, TB Control Program Medical Director, General Communicable Disease Control Branch

North Carolina recently became involved with the first documented investigation of a case of Extensively Drug-Resistant Tuberculosis (XDR TB) with risk of transmission during air travel. XDR TB is caused by a tuberculosis bacterial strain that has developed resistance to most of the drugs used to treat the disease. By definition, XDR-TB strains are resistant to the two best first-line drugs, isoniazid and rifampin, and to the best second-line medications, fluoroquinolones and at least one of the three injectable drugs (i.e., amakacin, kanamycin, or capreomycin).

The case concerns United States (U.S.) citizen with potentially contagious XDR TB who traveled to and from Europe on commercial flights between May 12 and May 24, and then re-entered the U.S. at the Canada – U.S. border via automobile. The patient subsequently returned to the U.S. where he has been placed in isolation per federal quarantine order and is receiving care at National Jewish Medical and Research Center in Denver, Colorado.

The North Carolina TB (NC TB) Control Program was alerted by the Centers for Disease Control and Prevention (CDC) that ten North Carolina (N.C.) residents were possibly exposed to this individual on a flight from Atlanta, Georgia to Paris, France. The highest risk contacts were located within two rows above, two rows below or on the same row as the potentially infectious patient. Only two of the ten N.C. contacts were in these high risk areas of the airplane. All individuals are currently being contacted by their respective local health departments and are being offered testing, evaluation and follow-up per contact investigation protocols indicated in the NC TB Policy Manual. These passengers will be evaluated for TB infection and asked to return 8-10 weeks later for re-evaluation.

The likelihood of acquiring TB from another person depends on how infectious that person is, how much time is spent with the infectious person, and how vulnerable the contact is. XDR TB is thought to

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(***Investigation of Traveler with XDR TB,*** *cont'd from page 1)*
spread similarly to other forms of TB. In the current situation, it is thought that the likelihood of spread during the airline flight is low because the individual is sputum smear-negative, meaning that he is probably not terribly contagious, and the time and positioning during an airline flight is not thought to be a high-risk situation. However, because there has never been an airline contact investigation for XDR TB, all passengers and crew onboard these flights are being asked to be evaluated for evidence of exposure or development of TB disease over time.

The current investigation is evidence of the continuing need for strong public health programs, including TB Control programs, throughout the state. While U.S.-born cases of TB are declining, we expect an increase in other categories including direct importation of infectious individuals traveling to the U.S. from high-incidence countries; development of active TB among foreign-born individuals residing in the U.S., or development of active TB among US-born individuals who have worked or lived in high-incidence countries, which is the situation of the current XDR TB-airline exposure.

Tracking MDR and XDR in North Carolina

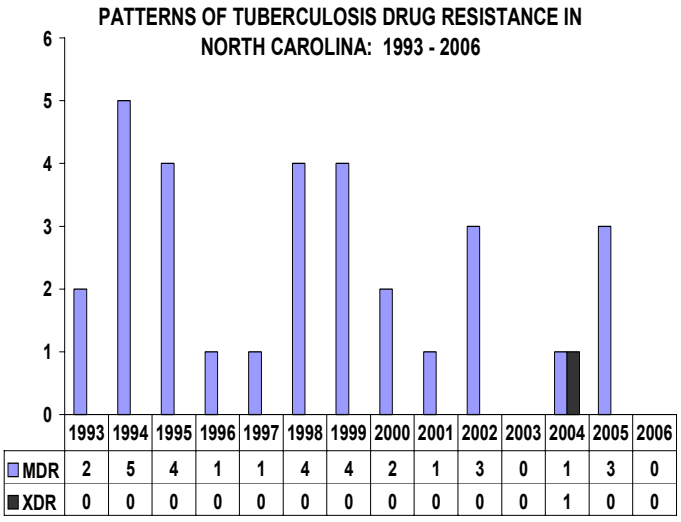
Whenever an individual has a positive TB culture from sputum or other body tissues, additional tests are performed on that culture to determine drug sensitivities for the TB strain isolated. The results are used to adapt treatment for that individual's TB disease, and allow the patient's doctors and TB nurses to be aware early on of the drugs to which that particular strain of TB might be resistant. If it is resistant to two or more of the most important medicines - isoniazid (INH) and rifampin (RIF) – this is called multidrug-resistant TB, or MDR TB. This is a **very serious problem** since it is more difficult to treat these persons, requiring 18-24 months of treatment instead of the usual six months. The second-line drugs are not as good as the usual medicines for TB and they may cause more side effects.

Although MDR is very serious, we now know that it can be even worse. A drug-resistance pattern called extensively drug resistant TB, or XDR TB, has emerged. The bacteria in these cases are resistant to almost all drugs used to treat TB, including not only resistance to INH and RIF but also resistance to the best second-line medications: fluoroquinolones (i.e., ciprofloxacin and ofloxacin) and at least one of three injectable drugs (i.e., amikacin, kanamycin, or capreomycin).

While a TB strain can be resistant to some drugs in the beginning of the treatment, it may also become resistant to more drugs during treatment. This is usually caused by factors such as not taking TB medicine regularly or not taking all of TB medicines as prescribed by a doctor or nurse. It can also happen if the doctors do not order the correct combination or doses of medications, so the NC TB Control Policy Manual clearly spells out exactly how TB drugs are to be prescribed, and the NC TB Nurse Consultants try to monitor active cases being treated in the counties. The best way to assure that persons are remembering to take medicines is to directly observe them taking their treatment, a method called directly observed therapy (DOT). A health care worker sees TB patients on DOT every day or several times a week and the patients take medicines while the health care worker watches. In 2006, North Carolina mandated that all TB patients be on DOT the entire time they were required to take medicines.

The North Carolina Tuberculosis (NC TB) Control Program, based in the General Communicable Disease Control Branch of the Epidemiology Section, is responsible for collecting information and monitoring trends for TB disease and infection in the state. On June 6th, 2007, the CDC was asked to testify before both Houses of Congress on the disposition on currently existing extensively drug resistant tuberculosis cases in the United States. North Carolina, as well as all other states reviewed TB cases from 1993 to 2006 for any tuberculosis cases meeting the XDR case description as defined in the first paragraph. The TB Program also reviewed cases that meet the definition of multidrug- resistant tuberculosis (MDR), which is tuberculosis that is resistant to at least isoniazid and rifampin.

Since 1993, when the United States expanded the case reports for TB to include drug-susceptibility results, the proportion of patients with primary MDR TB (no previous TB treatment and evidence of INH and RIF resistance on the first culture) has decreased from 2.5% to 1.0%.1 North Carolina has also experienced a decrease in the number of MDR cases, going from a high of five cases in 1994 to no cases found in 2003 and 2006 although there were three cases in 2005. Only one verified case of XDR TB has occurred in North Carolina. However, between 1993 and 2006, there were four cases which were not only resistant to INH and RIF but also resistant to at least one of the injectable drugs. These three cases, therefore, were only one drug away from being classified as XDR.



	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
MDR	2	5	4	1	1	4	4	2	1	3	0	1	3	0
XDR	0	0	0	0	0	0	0	0	0	0	0	1	0	0

Figure 1 shows the number of MDR and XDR cases in North Carolina between 1993 and 2006. ◆

Mycobacteriology Laboratory Update

Shadia S. Barghothi, Mycobacteriology Laboratory Supervisor, N.C. State Laboratory of Public Health

The NC State Laboratory of Public Health (NCSLPH) Mycobacteriology Laboratory tests 12,000 specimens a year for the bacterium known as *Mycobacterium tuberculosis,* commonly shortened to TB. About 12 percent of these samples are positive.

The Mycobacteriology Laboratory receives specimens from several different types of facilities, including local health departments, hospitals, commercial laboratories, physician offices, and detention centers, as well as the occasional elephant trunk washing from the NC Zoological Park. Specimens consist of clinical specimens, or primary specimens taken directly from the patient, and reference specimens. Reference specimens have been partially characterized by the submitting facility and then referred to the NCSLPH for further testing.

Mycobacteria are referred to as Acid Fast Bacilli (AFB); "bacilli" for their rod-like shape and "acid fast" for the unique ability of the organism's cell wall to retain certain types of stains or dyes. Clinical specimens are decontaminated and digested using a standard protocol and then inoculated onto three different types of media. In addition, a sputum smear is stained and viewed microscopically, looking for AFB. The submitting agency is notified of all first- time smear-positive patient specimens by a telephone call by close of business each work day. Results are also available on line at the secure clinical results website (https://slph.state.nc.us/lims/).

Some mycobacteria are very slow growing and identification often takes three to six weeks. Several different methods are available for the detection of TB in patient specimens. The NCSLPH uses nucleic acid probes as the primary method for identification. Since these probes are only available for a few of the more common *Mycobacterium* species, High Pressure Liquid Chromatography (HPLC) is also used. The HPLC method detects the mycolic acids found in the cell wall of mycobacteria. Each mycobacterium has a unique pattern that is used to identify the organism. Both of these methods are used in conjunction with traditional culture methods and biochemicals to confirm the identification. Drug susceptibility testing is then performed on positive TB specimens. As soon as the laboratory results are approved, they are available on-line so that the submitting agency can obtain the report as quickly as possible. The NCSLPH Mycobacteriology Laboratory is committed to providing accurate results as quickly as possible. To further improve turn-around-time, nucleic acid amplification will be added to the testing algorithm in the near future.

Partners

The Mycobacteriology Laboratory works very closely with the physicians and nurses of NC TB Control Program to ensure that testing algorithms positively contribute to the control of the spread of TB in NC communities and to limit the development of drug-resistant strains. NCSLPH also consults with experts at CDC and other public health laboratories through the Association of Public Health Laboratories (APHL) to ensure that the Mycobacteriology laboratory meets national goals and objectives for elimination of TB. Without such a strong network of partners committed to this goal, TB will continue to be a public health threat in the United States and abroad.◆

1. Extensively Drug-Resistant Tuberculosis—United States, 1993-2006, *MMWR,* March 23, 2007, 56(11); 250-253. (http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5611a3.htm)

Table 1:
N.C. and U.S. Case Rate and N.C. Ranking in U.S. by Case Rate 2002-2006

Year	Rate		NC Rank
	US	NC	
2002	5.2	5.2	14
2003	5.1	4.4	21
2004	4.9	4.5	19
2005	4.8	3.8	25
2006	4.6	4.2	18

DATA SOURCE: Annual surveillance reports published by CDC.

Rabies in Livestock and Horses

Prepared by Carl Williams DHHS/OEE, Tom Ray NCDA&CS/ Veterinary Division, Rick Langley DHHS/OEE, Sherry Rigouard DHHS/OEE

One hundred and ninety-six animals have tested positive for rabies at the State Laboratory of Public Health from January 1st through May 25th 2007. Through the same time period in 2006 a total of 149 animals were identified as positive. The animal which tested positive most commonly was the raccoon (104) which is not unusual because it is the terrestrial reservoir for rabies. However, this year more rabies cases in livestock and horses have been noted. In 2006 only two cattle submitted for rabies diagnostic testing were identified as positive. So far this year, five cattle have tested positive for rabies. In 2006 no rabid goats or horses were identified in North Carolina. Through May 25th of this year two goats and one horse were identified as positive. Of note, both goats came from the same farm and were exposed to the same rabid skunk. Also two of the cattle came from the same farm and were likely exposed to the same rabid animal. All livestock were infected with the raccoon strain of rabies virus.

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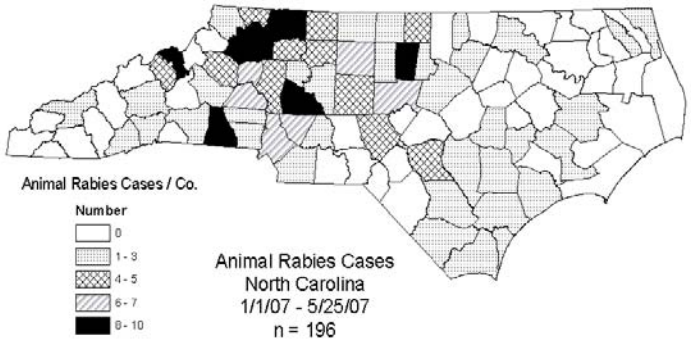
(***Rabies in Livestock and Horses,*** *continued from page 3)*



The geographic distribution of animal rabies cases this year has been predominantly in the western part of the state.
In the United States, human rabies cases occur predominantly through exposure to rabid bats. Human rabies due to exposure to rabid livestock or horses is unlikely though possible. These animals do shed rabies virus in their saliva though they typically do not bite, which is generally required for effective transmission of rabies virus. Human contact with rabid livestock or horses should be carefully evaluated to determine if a non-bite exposure to rabies may have occurred. A non-bite exposure could result from contamination of a freshly open wound or mucous membrane with infectious saliva from the animal. In the event such an exposure occurred, or is likely to have occurred, rabies post exposure prophylaxis may be warranted.

In the event of rabid livestock, food borne transmission of rabies may be a concern. Rabies virus is widely distributed in the tissues of rabid animals, therefore tissues and products from rabid animals should not be used for human or animal consumption. Historically, federal guidelines for meat inspectors required that any animal known to have been exposed to rabies within 8 months be rejected for slaughter.[1] However, because rabies virus is inactivated by temperatures below those used for cooking and pasteurization, eating thoroughly cooked meat or drinking pasteurized milk from a rabid animal is not an indication for rabies Post Exposure Prophylaxis (PEP).[2]

In North Carolina only dogs and cats are required by law to be vaccinated against rabies. United States Department of Agriculture (USDA) licensed rabies vaccines are available for ferrets, horses, cattle and sheep, in addition to dogs and cats. Given the burden of wildlife rabies present in North Carolina, it may be of value to inform livestock producers that a vaccine is available and will help protect their animals and themselves. There is no USDA licensed rabies vaccine for use in goats. Vaccination of livestock against rabies should only be performed in the context of a valid veterinarian client patient relationship. Because antibiotics are sometimes used as a preservative in vaccines there may be a withdrawal time required prior to livestock being sent to slaughter if they are vaccinated against rabies.

In the event livestock or horses are exposed to rabid animals the N.C. Department of Agriculture and Consumer Services, Veterinary Division, must be notified in addition to the N.C. Division of Public Health. The Veterinary Division will ensure that an evaluation of the animal and farm is conducted to search for other livestock potentially exposed to rabies and impose any quarantine or confinement of animals. The following North Carolina guidelines are utilized when investigating livestock exposed to rabies and may vary slightly from the NASPHV Compendium:

Three options exist for livestock that are currently vaccinated against rabies and exposed to a rabid animal:
1. The animal should be re-vaccinated against rabies within 72 hours of exposure and quarantined for 45 days.
2. If the animal is not re-vaccinated, it should be quarantined for eight months from the date of exposure.
3. Euthanize the animal.

Two options exist for livestock that are not currently vaccinated against rabies and exposed to a rabid animal:
1. The animal should be quarantined for eight months from the date of exposure.
2. Euthanize the animal.

The animal may be sent to slaughter if both of the following criteria are met, regardless of rabies vaccination status:
1. At least eight months have elapsed since the exposure incident
2. The animal is not displaying clinical signs or symptoms suggestive of rabies

The conditions of any quarantine will be determined by the attending NCDA&CS field veterinarian. If at any time during either quarantine period the animal shows signs suggestive of rabies, the owner must notify the attending field veterinarian. The animal will be euthanized and submitted for rabies diagnostic testing. ◆

1. 2007 National Association of State Public Health Veterinarians Compendium of Animal Rabies Prevention and Control. http://www.nasphv.org/Documents/RabiesCompendium.pdf
2. Mass Treatment of Humans Who Drank Unpasteurized Milk from Rabid Cows — Massachusetts, 1996-1998. MMWR. March 26, 1999 / 48(11);228-229. http://www.cdc.gov/mmwr/preview/mmwrhtml/00056759.htm

Accidental Toxicity Deaths of Child Residents of North Carolina, 1999-2005

Prepared by Krista Ragan, MA, Researcher & Investigator and Deborah Radisch, MD, MPH Child Fatality Prevention Team, Office of the Chief Medical Examiner

The North Carolina Child Fatality Prevention Team (CFPT) staff is charged with reviewing the deaths of children investigated by the Office of the Chief Medical Examiner. The CFPT defines a child as any individual from the age of birth through 17 years. These deaths include all homicides, suicides, accidents, undetermined, and some natural deaths. Additional information including law enforcement records and medical records is gathered through review of these cases.

The CFPT database captures information from 1999 through the present. Case entry is complete through December of 2005. During the time period from 1999 through 2005, 4240 cases were reviewed and 4053 were determined to be child residents of North Carolina. Of the child resident deaths, 59 cases of fatal accidental toxicity were identified (1.4% of all child deaths). Accidental deaths from toxins include accidental drug toxicity, unintentional ingestion of chemicals, or exposure to lethal chemicals. While numbers are relatively low, deaths from accidental toxicity reached a peak of 16 in 2005.

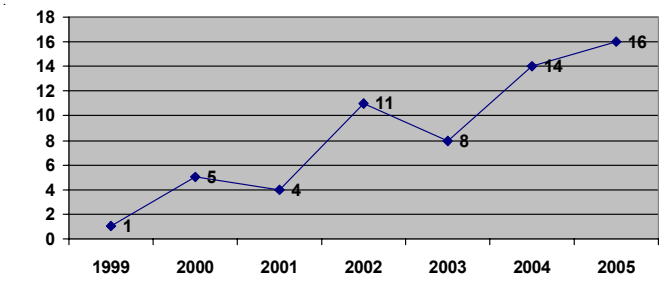


Figure 1. Accidental Toxicity Deaths of Child Residents of North Carolina, 1999-2005.

Demographics

The majority of children who died from accidental toxicity were between the ages of 15 and 17 years (80%, 47). There were 6 children between the ages of 10 and 14 years, 2 children between the ages of 5 and 9 years, and 4 children between the ages of 1 and 4 years. There were no infant deaths due to accidental toxicity. While deaths in all other age groups stayed relatively stable (between 0 and 2 each year), the 15 to 17 years age group showed a steady increase from 2003, doubling from 6 in 2003 to 12 in 2004.

White children accounted for 54 (92%) of the deaths, followed by 5 (8%) of the children who were Black. Male decedents accounted for 44 (75%) of the deaths and females for 15 deaths (25%).

Circumstances

In 45 (76%) of the accidental toxicity deaths of children, the decedent was using a drug(s) recreationally when s/he took a lethal amount. The majority of these deaths occurred in 17-year-olds, with 29 (64%) of the recreation drug use deaths, followed by 8 deaths of 16-year-olds, 5 deaths of 15-year-olds, and 3 deaths of 14-year-olds. In 4 (8%) of the deaths the circumstances were unclear and the CFPT could not determine the circumstances around the drug use. In 5 (8%) of the deaths the child was taking a prescribed drug as treatment when he or she was given or accidentally took too much of that drug. In 4 (8%) of the deaths the child ingested or came in contact with a toxin that the child was not old enough to know was a potential hazard.

Toxins

Only drugs/chemicals found to be lethal, either alone or in combination with other drugs, were included in this evaluation. There were 20 different drugs found to be lethal in the 59 deaths. Because the decedents in some cases took more than 1 drug that resulted in the fatality, toxicological testing came back positive for 78 drugs/chemicals in lethal-alone or lethal-combination amounts. By classification, the majority of deaths involved the use of narcotics, accounting for 69% (54) of the lethal drug levels.

Toxin	Number
Narcotics	54
CNS Depressants	4
Stimulants	8
Anti-Depressants	3
Other Prescribed drugs	3
Over-the-Counter	2
Other illicit drugs	1
Other	3
Total	78

Table 1. Lethal Levels of Toxins Found Through Postmortem Toxicological Analysis in Accidental Toxicity Deaths of NC Children, 1999-2005.

Closer examination of fatal narcotic deaths found that methadone comprised 30 (56%) of the lethal narcotic levels. This was followed by oxycodone in 11 (20%) deaths, hydrocodone in 4 deaths, morphine in 4 deaths, fentanyl in 2 deaths, and generic opiates in 1 death. There were 2 deaths due to heroin, the only non-prescription narcotic found in lethal amounts.

Of the 78 lethal levels, 62 (80%) were medications usually available by prescription only. Of the non-prescription drug deaths, 2 were caused by over-the-counter medications, two

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First Annual Preparedness Coordinators Meeting

Prepared by Various Staff of Office of Public Health Preparedness and Response

On June 11-14th, 2007, the first annual Preparedness Coordinators meeting was held at the Grandover Resort in Greensboro. Over 100 participants from 75 local health departments, 7 Public Health Regional Surveillance Teams (PHRST's) and Public Health Preparedness and Response (PHP&R) attended.

As a first meeting of its kind, the agenda consisted of the overview of relationships between local, regional and state public health agencies, the Preparedness Agreement Addendum and reporting requirements. Break out sessions included group discussions of promising practices and continued challenges in the Strategic National Stockpile Plans (SNS), forming partnerships with other agencies, continued Incident Command Systems (ICS) training, integrating preparedness programs into the every day practice of public health with competing priorities, and Local Health Information Teams. A preliminary report was delivered on the Local Assessment process that all local health departments have undertaken. North Carolina is only the third state to complete 100% of its county plans utilizing this tool implemented August 2006.

Overall the meeting was considered very successful by its participants. All benefited from the information delivered and ability to ask questions of PHP&R. PHP&R received several suggestions for improving the program, one of which has already been implemented: publishing the inventory of apportionment for an SNS Push-package in terms of pallets and boxes to be received. This will allow improved detailed planning for receiving sites. Newly assigned preparedness coordinators benefited not only from the information exchanged but from the networking and being able to learn from the more experienced. While the preparedness coordinators continue to meet within their regions directed by the PHRST's, this was a meeting well worth attending and PHP&R is committed to a Second Annual Meeting in 2008.◆

(***Toxicity Deaths of Child Residents of NC,*** *cont'd from page 5)*

deaths were from alcohol poisoning and 2 deaths were from chemical exposure and abuse. In 10 deaths, an illicit drug (i.e. cocaine, heroin, or ecstasy) was found to have contributed or caused a death.

While there were dozens of positive toxicological findings that contributed to the deaths of the 59 children, in 36 (61%) only 1 drug was found to be fatal, with 21 of those deaths being from methadone. Therefore, 36% of the total accidental toxicity deaths of children in North Carolina from 1999-2005 were due to a lethal concentration of methadone.

Access to Toxic Substances

In addition to age and drug use, the CFPT also examined access to drugs in recreational drug use deaths. Of the 45 deaths:

- In 23 deaths (51%) information was not available or it could not determined where the decedent accessed the drugs
- In 11 deaths (24%) the decedent had access to the drug in his or her home, either by a prescription for self or someone else
- In 7 deaths (16%) the decedent obtained the drug from a friend or acquaintance
- In 2 deaths the drug/toxin was provided by a caregiver of a friend
- In 1 death the decedent purchased the toxin at the store

Discussion

A seven-year analysis of death records of child residents of North Carolina shows an increasing trend in accidental drug/chemical intoxication fatalities, with toxicity deaths showing an increase for the last 3 years. The majority of children are White (92%) and 80% are between the ages of 15 and 17 years. In 76% of the deaths, the child/teen was using at least 1 toxin for recreational purposes, and 80% of the lethal drugs were prescription medications. In 21 of the 59 deaths, the sole lethal drug was methadone. Examining where the child obtained the drug showed that in 47% of the deaths, the toxin was available in the home of the child or through a friend/acquaintance of the child. The examination also demonstrated a need for more thorough investigations regarding the source of the drug when drug/toxin overdose is suspected since 51% of the deaths did not have information on drug availability.◆

Hepatitis C Screening Program Gaston County Health Department

By Pete Moore, CDC Public Health Advisor, HIV/STD Prevention and Care Branch

Hepatitis C virus (HCV) infection is the most common blood-borne viral infection in the United States. Studies done through the Centers for Disease Control and Prevention (CDC) show that 1.8% of Americans (about 4-5 million) are infected with HCV, and about 75% of these are chronically infected (3.4 million). There are an estimated 150,000 North Carolinians living with Hepatitis C, many of whom do not know they are infected.

The consequences of chronic liver disease from HCV infection are serious, but may not become apparent until 10-20 years after infection. Roughly one in five patients develops cirrhosis, which can lead to liver failure. As a result, the need for liver transplants is rising and is expected to increase by over 500% by the year 2010. By the end of the decade, the annual death toll from HCV is projected to reach over 30,000—twice the toll that AIDS takes in America each year.

In an effort to address this problem by conducting more HCV screening in North Carolina, the HIV/STD Prevention and Care Branch funded the Gaston County Health Department to conduct HCV screening in its STD, maternity and family planning clinics. All patients seen in these clinics were offered the HCV test beginning in November of 2006. Demographic and risk factor data was collected on all clients, including those who decline HCV testing, was compiled by the Branch and will be analyzed at the end of the project. Data on those declining HCV testing was used by Health Department staff to improve the testing acceptance rate.

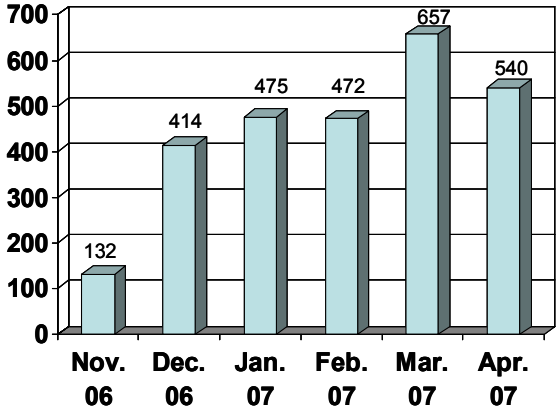
All HCV clients testing positive for HCV received post test counseling from a registered nurse, were offered Hepatitis A and B vaccination through the health department and were referred to the Gaston Family Health Services clinic for primary HCV care. This facility is in the same building as the Gaston Health Department, which greatly reduced the loss to follow up of HCV positive clients.

Gaston County Health Department staff were trained to offer the HCV test and overcame challenges such as creating a consent form, managing workload issues in busy clinics and laboratories supporting them, managing the logistics of submitting specimens to a reference lab, arranging clerical support and identifying post-test counselors to provide follow up on clients testing HCV antibody positive.

Forty-five people out of 2,690 people (1.7%) tested HCV antibody positive.. Two people were co-infected with HCV & HIV and the youngest HCV-positive person is 19 years old. Testing increased almost every month of the project as health department staff got more proficient at offering the test as indicated in the chart below.

This program has generated useful data for future HCV testing initiatives across North Carolina and will allow the Branch and Local Health Departments to develop screening criteria supporting more efficient HCV testing across North Carolina. The Branch is attempting to find resources to allow the Gaston County Health Department to continue screening for HCV and is actively searching for funds to support local health departments and Branch partners to extend hepatitis C screening across the state. ◆

Gaston County HCV Testing. 2006-07



Rare Eye Infections Associated with Contact Lens Use

Prepared by Linda Wall, Mycologist and Dr. Leslie Wolf, Director, N.C. State Laboratory of Public Health

In 2006, the Centers for Disease Control and Prevention received reports from ophthalmologists in New Jersey and Illinois regarding an apparent increase in two different rare eye infections. Retrospective studies were initiated to determine the incidence and potential causes of these two eye infections, in order to reduce the risk of more infections. Both diseases have similar symptoms of an eye infection: eye pain or redness, blurred vision, sensitivity to light, feeling of a foreign object in the eye and excessive tearing. Based on these outbreaks and the identification of risk factors for these infections, CDC provided detailed recommendations for reducing risk of infection. These recommendations include, but are not limited to, the following:

- wearing and replacing contact lenses following instructions from the eye care provider
- removing contact lenses prior to showering, using a hot tub or swimming

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(***Rare Eye Infections,*** *continued from page* 7)

- washing hands with soap and water, and drying hands well prior to handling contact lenses
- using fresh cleaning and/or disinfecting solution each time contact lenses are cleaned or stored; never reusing or topping off old solutions
- using proper disinfecting solutions (not saline or re-wetting drops)
- storing re-usable lenses in the correct storage case; rinsing cases with sterile contact lens solution (not tap water), leaving open to dry after each use
- replacing storage cases at least once every three months

Fusarium **Keratitis Outbreak**

Fungal keratitis is a severe infection of the cornea, most often associated with eye trauma, and occurs more frequently in the warmer, southern areas of the United States. On March 8, 2006, CDC received a report from a New Jersey ophthalmologist regarding three patients with contact lens associated *Fusarium* keratitis during the preceding three months, which was very unusual. Contact with several other corneal disease specialty centers in the US revealed that they had also seen increases in *Fusarium* keratitis. Subsequent to these reports, a request was initiated through Clinmicronet asking labs to report all suspected cases of non-trauma related fungal keratitis to the Mycotic Diseases Branch at CDC. As of May 18, 2006 there were 130 cases of the usually rare *Fusarium* keratitis confirmed by the CDC in 26 states and one territory. Thirty seven of these patients (31%) required a cornea transplant.

Although patients with confirmed *Fusarium* keratitis reported using a variety of contact lens cleaning solutions, a majority of them (64%) used Bausch & Lomb's ReNu with MoistureLoc® solution which was manufactured at a plant in Greenville, SC. Investigation of the plant and its products yielded no evidence of direct contamination of the contact lens solutions, and *Fusarium* has not been isolated from any unopened bottles. Testing at CDC showed that a number of different strains of *Fusarium* species were causing infection, so it is unlikely that there was a common source of contamination during production of the solutions at the plant.

CDC states that their findings, together with the results of the environmental testing, suggest that exposure to *Fusarium* was most likely due to contamination of contact lens solution bottles or lens cases that occurred post-manufacturing, such as in the patients' homes. The observed genetic diversity of U.S. *Fusarium* isolates probably reflects the ecological diversity of *Fusarium* in water systems in case-patients' homes or communities. Though it seems the contamination most likely occurred in patient homes, inadequate lens care hygiene was not the only reason for the outbreak, nor was any single hygiene deficiency responsible. One practice that was often associated with infection was the reuse of old lens solution in contact lens cases.

CDC and FDA researchers do believe, however, that the ReNu with MoistureLoc® solution was the most overwhelming factor leading to infections in a complex and, as yet, undetermined interaction between MoistureLoc, *Fusarium* and possibly the lens case or contact lenses. While the solution's formula met biocidal standards against *Fusarium*, it contains two unique chemicals that may have led to increased susceptibility to *Fusarium*—Alexidine, a disinfectant, and polyquarterium 10, a polysaccharide that holds water close to the contact lens surface. Bausch & Lomb voluntarily and permanently withdrew all ReNu with MoistureLoc® products from the US market on April 13, 2006. Prior to the US action, on February 18, 2006, sales were halted in the Far East in Singapore, Hong Kong and Malaysia after multiple cases of *Fusarium* keratitis among contact lens users were reported. CDC and the FDA, along with Bausch & Lomb scientists are continuing to investigate the outbreak. Dr. Benjamin J. Park, senior CDC researcher in the investigation, has said that a number of studies are in progress to evaluate the formula and what it is about it that promotes fungal growth. In addition, surveillance continues and the FDA has been prompted to re-evaluate current testing methods that govern the safety of contact lens solutions.

In North Carolina there were two cases of *Fusarium* keratitis associated with this outbreak. One from Craven County, in which the NCSLPH Mycology Laboratory was actively involved in the identification of the organism, and another from Mecklenburg County which was handled by a private laboratory. The Craven County patient required a cornea transplant. Laboratory methods to detect Fusarium in clinical samples include direct microscopic examination following special staining of the corneal scrapings or mounting in 10% KOH. A variety of media used for mold isolation can also be used, including Sabouraud glucose agar, inhibitory mold agar or brain heart infusion agar with 10% sheep blood.

Acanthamoeba Keratitis Outbreak

In May 2006, the Illinois Department of Health notified CDC that an ophthalmology center in Illinois had noticed a possible increase in the incidence of *Acanthamoeba* kertatitis (AK). This is a relatively rare corneal infection, but can lead to blindness if undetected and untreated. *Acanthamoeba* is a free-living ameba, found in many environments, including tap and recreational waters, soil, sewage systems, cooling towers and heating, ventilation, and air conditioning systems. As of May 24, 2007, CDC reports that a total of 138 patients with AK symptoms occurring on or after January 1, 2005. These cases occurred in 35 states and one territory. Preliminary results from a case controlled study of 46 culture-confirmed patients indicated that the risks of AK were higher in patients wearing soft contact lenses using Advanced Medical Optics Complete® MoisturePlus™ multipurpose cleaning solution.

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(***Rare Eye Infections,*** *continued from page* 8)

To date, while no requests have been made to test clinical samples NCSLPH has received a request to test contact lens solution and a contact lens case for *Acanthamoeba*. No *Acanthamoeba* grew from these samples, however. The CDC Division of Parasitic Diseases continues to offer testing for AK to aid in the continuing investigation of this outbreak. Two laboratory methods are available to detect AK. One includes microscopic analysis, and the other is molecular diagnosis using a real-time polymerase chain reaction (PCR) assay developed by the CDC Division of Parasitic Diseases.◆

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Medicolegal Seminar, 2007

Prepared by Patricia Barnes, Office of the Chief Medical Examiner

The Office of the Chief Medical Examiner in conjunction with UNC-CH School of Medicine Continuing Medical Education held the annual Medicolegal Seminar at the William and Ida Friday Center for Continuing Education in Chapel Hill on Saturday, June 2, 2007. This year's seminar focused on current topics from the SBI Crime Laboratory and the role forensic sciences play in medicolegal death investigations. The popularity of CSI and similar programs on television has blurred the boundaries between the various disciplines of forensic science. Medical examiners and pathologists benefited from hearing presentations about the work done by crime and accident scene investigators and laboratorians.

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Occupational & Environmental Epidemiology Branch Expands Capacity for Evaluating Site-Specific Environmental Hazards

Prepared by Peter Costa, MPH, CHES Public Health Educator, Occupational and Environmental Epidemiology Branch

In April 2006 the Health Assessment, Consultation and Education (HACE) Program was established in the Occupational & Environmental Epidemiology Branch (OEEB) under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). North Carolina is one of 31 states under the cooperative agreement. This program was developed to study possible public health problems caused by chemicals at hazardous waste sites. The mission of the new program is to prevent or reduce exposure to and disease from hazardous substances and toxic chemicals by using the best science, responsive public health actions and reliable health information for the citizens of North Carolina. Currently staffed by a health assessor, health educator and program coordinator, HACE program activities include, but are not limited to, public health assessments, consultations, technical assistance and education.

Public health assessments and consultations gather information about hazardous substances at hazardous waste sites and evaluate whether exposure to those substances might cause harm to people. Assessments and consultations are conducted by collecting environmental data, exposure data and toxicity data, health outcome data and community health concerns. These activities answer questions such as: Where is the site located? What activities have taken place at the site? What chemicals have been released into the environment? What are the levels of chemicals found in the environment? How might people come in contact with the chemicals? How might those chemicals affect the public's health? Does living or working near the site mean people may get sick? What actions need to be taken to protect the public's health? Based on the findings, recommendations may then be made to advise federal, state, and local agencies on actions to prevent or reduce the public's exposure to any hazardous chemicals released at those sites. Additional activities that may follow the conclusion of a public health assessment or consultation include cleanup, community involvement, risk communication and education, health studies and/or research.

A current focus of the HACE program is on naturally occurring asbestos at the Sapphire Valley Gem Mine where recreational gem-mining activities take place. The

(*continued on page* 11)

Reported Communicable Diseases, North Carolina, January-June 2007 (by date of report)*

Disease	Year-to-Date (Second Quarter)			2ndQuarter 2007	Comments / Note
	2007	2006	Mean (2002-2006)		
Brucellosis	3	2	1	3	
Campylobacter	266	404	294	143	
Chlamydia, laboratory reports	14624	17823	14844	6968	
Creutzfeldt-Jakob Disease	3	0	-	3	Notes 1 and 2
Cryptosporidiosis	39	36	27	31	
Cyclosporasis	1	1	0	1	
Dengue	2	1	2	1	
E. coli Shiga Toxin-producing	37	33	17	21	Note 3
Ehrlichiosis, Monocytic	16	19	7	13	
Encephalitis, California Group	1	1	1	1	
Foodborne, C. Perfringens	2	7	2	2	
Foodborne, Other	45	98	124	1	
Foodborne, Staphylococcal	1	0	13	0	
Gonorrhea	7044	8556	7892	3234	
Haemophilus Influenzae	38	23	29	25	
Hemolytic Uremic Syndrome	5	1	1	1	
Hepatitis A	20	45	56	14	
Hepatitis B	70	85	98	22	
Hepatitis B Carrier	448	505	469	364	
Hepatitis B Perinatal	1	2	1	1	
Hepatitis C, Acute	8	0	7	2	
HIV/AIDS	773	1205	962	312	Note 4
Legionellosis	21	19	14	12	
Listeriosis	7	13	9	4	
Lyme Disease	19	11	30	14	
Malaria	12	13	11	8	
Measles	3	1	0	3	
Meningococcal Invasive	11	19	19	7	
Meninigitis, Pneumococcal	31	28	23	13	
Mumps	24	2	3	24	
Q Fever	4	2	1	3	
Rabies	251	199	303	149	
RMSF	182	327	147	150	
Salmonellosis	563	560	501	226	
Shigellosis	33	92	182	19	
Strep A, Invasive	95	93	82	55	
Syphilis, Total	298	302	260	139	Note 5
Toxic Shock Synd.,Strep	6	7	0	3	
TSS	2	1	2	2	
Tuberculosis	156	144	137	82	
Typhoid, Acute	2	2	2	1	
Typhus Epidemic	1	1	0	1	
Vibrio, Other	2	4	4	1	
Whooping Cough	170	101	56	111	

* Preliminary data, as of 3/31/2007. Quarters defined as 13 weeks periods. Diseases reported in 2007 define those listed in this table. Notes: 1. "-"=Not reportable, or not reportable as such over this entire time period; 2. Became reportable 2/2003; 3. "E. coli O157::H7" was disease name until 2/15/2003; 4. Earliest report with HIV infection or AIDS diagnosis; 5. Includes primary, secondary and early latent syphilis.

Employee Recognition: Mina Shehee Employee of the Quarter

Prepared by Patsy West, Administrative Assistant, Epidemiology Section

Dr. Mina Shehee has received the Epidemiology Section's Employee Recognition Award for the second quarter of 2007. Dr. Shehee was nominated in the category of Service Excellence.

Dr. Shehee began employment with the Occupational and Environmental Epidemiology Branch within the Epidemiology Section in June of 2004 as an epidemiologist and coordinator of the Harmful Algal Blooms Program.

Dr. Shehee's optimism, high energy level and new ideas have made her a very effective public health leader with many accomplishments. Based on Dr. Shehee's innovative work in assessing the human health risk posed by harmful algal blooms in North Carolina, the CDC provided additional funding to continue harmful algal blooms (HAB) toxin monitoring and surveillance of health symptoms associated with exposure to HABs. Currently Dr. Shehee is conducting weekly samplings of drinking water from selected public water systems for algal toxins and is reviewing health surveillance data for people served by these systems. She is collaborating with the EPA health effects researchers to plan for biomonitoring for blood-borne HAB toxins for people served by these water systems.

Dr. Shehee is a very busy person. She is collaborating with the Shellfish Sanitation Section of the North Carolina Division of Environmental Health in conducting surveillance and in assessing the public health impact of algal blooms in marine and estuarine waters. Recently, Dr. Shehee conducted a study of environmental contaminants in Falls Lake and the health effects reported by people using the lake for recreational purposes. A report of this study is being written for publication. Currently Dr. Shehee is managing contracts with university researchers on the presence of HABs in estuarine and fresh water environments and on the presence of antibiotic resistant organisms in environmental media and humans located near confined animal feeding operations.

Through Dr. Shehee's hard work, diligence and passion for the work she loves to do, she has made many accomplishments in keeping North Carolinians safe and healthy.

In addition to receiving the Epidemiology Section's Employee Recognition Award, she was presented with a gift certificate to a local restaurant from the Epidemiology Section Management Team.◆

(***Site-Specific Environmental Hazards,*** *continued from page 9)*

Environmental Protection Agency (EPA) and ATSDR determined that a public health risk existed at this site. In conjunction with the N.C. Department of Environment and Natural Resources (NC DENR), the HACE program issued a precautionary public health recommendation to the property owner to restrict public access to the area and discontinue gem-mining activities. The property owner voluntarily complied by restricting access, eliminating advertising and posting caution signs. As a result of this mitigation effort, it is estimated that 500-2,000 visitors to the site each year will not be exposed to the naturally occurring asbestos fibers possibly created during recreational gem-mining activities. In March 2007 an initial activity-based sampling initiative was conducted by EPA contract personnel. The purpose of this sampling was to determine the concentrations of asbestos fibers. The data will be analyzed by the EPA and disseminated to the HACE program at which point a health consultation will be conducted for this site.

As the ability to measure chemicals in the human environment increases, so do environmental health concerns. Estimating the risk to human health from these chemicals has become critical. The Health Assessment, Consultation and Education program provides a formal approach to studying the effects of environmental pollutants on human health while engaging concerned community members. To learn more about the HACE program contact the Occupational & Environmental Epidemiology Branch at (919) 707-5900 or visit the HACE web site at http://www.epi.state.nc.us/epi/oee/hace.html◆

(***Medicolegal Seminary, 2007,*** *continued from page 9)*

Presenters included SBI Agents Paula Carson, Adam Tanner, John Dilday, David Freeman, and Jennifer Remy who discussed the approach to the crime scene, firearms evidence, documents and digital evidence, DNA evidence, and trace evidence. NC State Highway Patrol Officers Mark Davidson and Joseph Sadler discussed motor vehicle accident reconstruction.

Robert Farb, JD, of the UNC School of Government gave a more general presentation entitled The Legal Definition of Murder and Other Homicides. Dr. Butts concluded the day with a talk on exhumations, including why exhumations may be necessary and the law regarding exhumations.

One hundred ten people attended this year's seminar. The attendees included medical examiners, pathologists, law enforcement officers, forensic science students, OCME staff members, and others interested in forensic pathology and death investigation. The day-long seminar included lunch and refreshments provided by he Friday Center.

Next year's seminar is tentatively scheduled for Saturday, June 7, 2008. Information about next year's seminar will be available early in 2008.◆

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