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## **NIOSH HEALTH HAZARD EVALUATION REPORT**

**HETA # 2005-0329-2995**

**Swannanoa Valley Youth Development Center  
Swannanoa, North Carolina**

**March 2006**

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## PREFACE

The Respiratory Disease Hazard Evaluations and Technical Assistance Program (RDHETAP) of the National Institute for Occupational Safety and Health (NIOSH) conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health (OSH) Act of 1970, 29 U.S.C. 669(a)(6), or Section 501(a)(11) of the Federal Mine Safety and Health Act of 1977, 30 U.S.C. 951(a)(11), which authorizes the Secretary of Health and Human Services, following a written request from any employers or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

RDHETAP also provides, upon request, technical and consultative assistance to federal, state, and local agencies; labor; industry; and other groups or individuals to control occupational health hazards and to prevent related trauma and disease. Mention of company names or products does not constitute endorsement by NIOSH.

## ACKNOWLEDGMENTS AND AVAILABILITY OF REPORT

This report was prepared by Kristin J. Cummings, MD, MPH, Terri A. Pearce, PhD, Margaret Kitt, MD, MPH, and Stephen B. Martin, Jr., MS, PE, of the RDHETAP, Division of Respiratory Disease Studies (DRDS). Desktop publishing was performed by Amber Harton.

Copies of this report have been sent to employee and management representatives at the Swannanoa Valley Youth Development Center and the OSHA Regional Office. This report is not copyrighted and may be freely reproduced. The report may be viewed and printed from the following internet address: <http://www.cdc.gov/niosh/hhe>. Copies may be purchased from the National Technical Information Service (NTIS) at 5825 Port Royal Road, Springfield, Virginia 22161.

**For the purpose of informing affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.**

## HIGHLIGHTS OF THE NIOSH HEALTH HAZARD EVALUATION AT SWANNANOVA VALLEY YOUTH DEVELOPMENT CENTER

NIOSH received a confidential health hazard evaluation request to conduct an evaluation of tuberculosis (TB) control, indoor air quality (IAQ), and asbestos management at the Swannanoa Valley Youth Development Center (SVYDC) in Swannanoa, North Carolina. Employees reported a positive tuberculin skin test (TST) result, asthma, and respiratory symptoms.

### What NIOSH Did

- Conducted a visual inspection of the facility
- Reviewed TB screening protocol and results
- Reviewed state and facility TB trends
- Measured ventilation and IAQ parameters
- Reviewed asbestos management plan
- Provided feedback to improve TB control, IAQ, and asbestos management plans

### What NIOSH Found

- Five students had TST conversions in the past three years, with no reports of students with infectious TB
- Employees receive TST (one-step) at hire only and do not receive TB education
- No respiratory protection program for TB
- Mold growth in some student showers; evidence of past roof leaks in the cafeteria
- Elevated carbon dioxide levels in the clinic
- Student sleeping rooms and the clinic had slightly positive or neutral air pressure relative to hallways
- Some supply and return air vents were very dirty or partially blocked with dried paint
- Broken floor tiles that contain asbestos, according to the facility Asbestos Management Plan

### What Managers Can Do

- Designate a TB infection control officer
- Develop a TB infection control plan specific to SVYDC

- Use TB symptom screening for all students
- Use two-step TST for employees at hire
- Conduct an employee TST survey; interpret results with aid of state health department
- Conduct annual employee TB screening (TST)
- Include TB in periodic employee training
- Establish a respiratory protection program and provide N-95 respirators to employees
- Ventilate restrooms to prevent mold growth
- In buildings with heating, ventilation, and air-conditioning systems (HVAC), ensure HVAC is operating according to design specifications
- In buildings without HVAC systems, ensure sufficient entry of outdoor air
- Repair roof leaks as they occur
- Remove dust and paint from vents
- Update the Asbestos Management Plan
- Replace broken asbestos-containing tiles

### What Employees Can Do

- Participate in TST survey and screening
- Participate in TB education program
- Participate in respiratory protection program
- Report IAQ concerns and health symptoms to management
- Report broken materials (especially those suspected to contain asbestos) to management
- Avoid using mechanical cleaning devices that could disrupt the surface of asbestos-containing tiles



#### What To Do For More Information:

We encourage you to read the full report. If you would like a copy, either ask your health and safety representative to make you a copy or call 1-513-841-4252 and ask for HETA Report #2005-0329-2995



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#2005-0329-2995 Swannanoa Valley Youth Development Center**

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## **SUMMARY**

The National Institute for Occupational Safety and Health (NIOSH) received a confidential request from employees at the North Carolina Department of Juvenile Justice and Delinquency Prevention's (DJJDP) Swannanoa Valley Youth Development Center (SVYDC) in Swannanoa, North Carolina, to conduct an investigation of tuberculosis (TB) control, indoor air quality (IAQ), and asbestos management at that facility. Employees expressed concerns about possible TB exposure after hearing that at least one of the facility's students was being treated with TB medication and that one employee recently had a positive tuberculin skin test (TST) result when tested by a private physician. They questioned the change in policy that occurred in 2000, whereby annual skin testing for employees was replaced with testing at hire only. In addition, employees expressed concerns about indoor air quality, including exposure to mold. They reported asthma and other respiratory symptoms. Finally, employees expressed concerns about possible exposure to asbestos. They reported broken floor tiles that they believed contained asbestos as well as construction debris containing asbestos that had been buried on the campus grounds.

The NIOSH response consisted of several phone interviews with the requesters and management to gather information, phone interviews with members of the state health department, a two-day site visit by NIOSH staff, review of the state's tuberculosis control policy manual, and review of the facility's operations and management plan. During the site visit, a NIOSH industrial hygienist conducted a walk-through of the facility's buildings, evaluated building ventilation systems, and interviewed both SVYDC and DJJDP safety officers. A NIOSH medical officer reviewed the facility's TB control program (including skin testing protocols and results for students and employees), inquired about its respiratory protection program, and interviewed the facility and state health department health care personnel responsible for infection control. A TB control nurse consultant from the state health department participated in the site visit, including the review of the facility's TB control program.

The TB control program includes one-step TST at baseline (pre-admission) and every two years for students; and one-step TST at hire for employees. Employees do not receive information on TB as part of their safety training and do not participate in a respiratory protection program for TB. Review of student TST results for the past three years revealed five newly positive results in students who had negative baseline results. According to the facility and state health department health care personnel, there have not been any cases of infectious TB among the students for at least the past three years.

Mold growth in some of the student shower areas was observed. Some of the ventilation ducts had substantial dust build-up. Concentrations of carbon dioxide were found to be elevated in the clinic area when it was occupied by multiple people. Materials identified in the facility's Asbestos Management

Plan as containing asbestos were noted to be intact with the exception of several broken floor tiles in one area.

NIOSH staff conducted a two-day site visit to the Swannanoa Valley Youth Development Center in Swannanoa, North Carolina to address employee concerns about exposure to TB, indoor air quality, exposure to asbestos, and health effects that employees were experiencing. Students are skin-tested for TB every two years. While some students have had tuberculin skin test conversions, there have been no documented cases of infectious TB among students. Employees are skin-tested at hire only. One employee who had a positive test in 2005 when tested by a private physician may have had a workplace exposure. Further investigation is recommended and annual employee testing should be initiated. A respiratory protection program for TB was not in place for employees and should be established. A small amount of mold growth was noted in the student showers and there was evidence of roof leaks in the cafeteria. Real-time measurements indicated that carbon dioxide levels in the clinic area were elevated when it was occupied by multiple people, indicating that fresh air supply was inadequate. Floor tiles in the Greenwood Cottage A-wing had been identified in the Asbestos Management Plan as containing asbestos. Several of these tiles were found to be broken and should be replaced.

Keywords: NAICS Code 9223 (Correctional Institutions), tuberculosis, TB, indoor air quality, IAQ, mold, asbestos

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## INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH) received a confidential Health Hazard Evaluation (HHE) request dated August 5, 2005 from employees at the North Carolina Department of Juvenile Justice and Delinquency Prevention's (DJJDP) Swannanoa Valley Youth Development Center (SVYDC) in Swannanoa, North Carolina. Employees expressed concerns about tuberculosis (TB) exposure, indoor air quality (including exposure to mold), and exposure to asbestos.

## BACKGROUND

The North Carolina DJJDP operates five youth development centers and ten detention centers throughout the state of North Carolina; in addition, there are four county-run detention centers.<sup>1</sup> The DJJDP is separate from the North Carolina Department of Corrections, which operates the adult prison system. Juveniles awaiting trial or placement at the youth development centers are temporarily housed at a detention center. Those committed by the juvenile justice system to the youth development centers are evaluated at the Assessment and Treatment Planning Center at the C.A. Dillon Youth Development Center in Butner before being assigned to a youth development center. This assessment includes a medical evaluation. Juveniles usually spend several weeks at a detention center and up to six weeks at the Assessment and Treatment Planning Center prior to arriving at the assigned youth development center. The average length of stay at a youth development center is approximately one year.

SVYDC is located on a 100-acre fence-enclosed campus with multiple single-story, above-ground buildings in which employees and juveniles ("students") spend most of their indoor time. These buildings consist of: three student dormitories (Greenwood, Sloop, and Sweatt Cottages) built from 1965 to 1973; one school building built in 1978; one administration building (Arledge) built in 1973; one

gymnasium; and one cafeteria. Other buildings on the campus include a maintenance building, a tractor building, a storage building, a chapel, two currently unoccupied dormitories, and a Fun-and-Fitness building. The student clinic is located in Greenwood Cottage.

The students at SVYDC are adjudicated males ranging in age from approximately 10 to 21 years. Currently there are about 80 students, although the facility has accommodated greater numbers of students in the past. The students have been sentenced by the juvenile court to custody and treatment for crimes including violent offenses, sexual offenses, and drug use. While SVYDC is located in a rural area in western North Carolina, its students come from throughout the state, including urban areas. The students are locked in individual rooms at night and are kept on the campus during the day by means of barbed-wire fencing and supervisory staff. Particularly violent students are not allowed to leave the dormitory. Thus while the facility is referred to as a "school" and its occupants as "students," it has many features of a correctional facility.

There are approximately 190 employees at SVYDC, including school staff (teachers, counselors), cottage staff (who provide direct supervision in the dormitories), clinical staff (healthcare workers and psychologists), maintenance staff, cafeteria staff, police officers, administrators, and administrative assistants. Employee health issues, including pre-employment screening tests, are addressed off-campus, through referral to a local medical clinic. Occupational health policies and funding are set by the DJJDP, with input from the North Carolina Department of Health and Human Services (NCDHHS).

The employees requesting the HHE expressed concerns about possible TB exposure, after hearing that at least one of the facility's students was being treated with TB medication and that one employee recently had a positive tuberculin skin test (TST) result when tested by a private physician. They questioned the change in policy that occurred in about 2000, whereby annual skin testing for employees was replaced with

testing at hire only. In addition, the employees expressed concerns about indoor air quality, including exposure to mold. They reported asthma and other respiratory symptoms that occurred when at work and resolved when away from work. Finally, the employees expressed concerns about possible exposure to asbestos. They reported broken floor tiles that they believed contain asbestos as well as construction debris containing asbestos that had been buried on the campus grounds.

TB is a bacterial infection that often affects the lungs. A person who has infectious TB can spread the bacteria to others through the air, via coughing and sneezing. Not everyone who is exposed to TB gets sick right away. Many develop non-infectious or latent TB, a condition in which there are no symptoms. People with latent TB cannot spread TB to others, but they may get sick with TB in the future. Risk factors for developing infectious TB include conditions that weaken the immune system, such as HIV infection, cancer, and substance abuse.

The TST is a way of finding out if someone has been exposed to TB. A person with a positive TST has probably been exposed to TB at some point in the past, and may have infectious TB. Further tests are necessary to determine whether a person with a positive TST has infectious or latent TB. Treatment with oral medication can prevent latent TB from developing into infectious TB. More information about TB can be found at the Centers for Disease Control and Prevention (CDC) website: [http://www.cdc.gov/nchstp/tb/faqs/qa\\_introduction.htm#Intro5](http://www.cdc.gov/nchstp/tb/faqs/qa_introduction.htm#Intro5).

A one-step TST refers to when a single skin test is performed. A two-step TST refers to when one skin test is determined to be negative and is followed, within a few weeks, by a second. A person who was exposed to TB years ago may have a negative result if tested with a one-step TST, but have a positive result on the second test when the two-step method is used. The two-step TST is therefore useful when a person has not had a skin test within the last year.

## METHODS

An industrial hygienist and medical officer from NIOSH visited SVYDC on September 12 and 13, 2005. Following the opening conference on the 12th, the NIOSH staff conducted a walk-through of the campus and its buildings, accompanied by the Acting Director of SVYDC, the Facility Safety Officer of SVYDC, the safety officer of DJJDP, and a TB Control Nurse Consultant from NCDHHS. The walk-through included all of the in-use buildings: the Arledge administrative building, cafeteria, school, maintenance building, chapel, gymnasium, Sloop Cottage, and Greenwood Cottage. The walk-through of Greenwood Cottage included the student clinic located in the A wing. All areas of the buildings were visited although security concerns prevented access to some areas of Sloop and Greenwood Cottages. NIOSH staff also toured Sweatt Cottage, which was undergoing renovation to install new fire alarms, smoke detectors, and updated telephone systems and was unoccupied during the site visit. After the walk-through, NIOSH staff spent additional time interviewing nursing and human resources staff, reviewing records, meeting with employees, evaluating heating, ventilation, and air conditioning (HVAC) units, and conducting air quality measurements. The visit concluded with a closing conference on the 13th.

### **TB Control Program Evaluation**

The NIOSH medical officer reviewed the TB Infection Control Plan (ICP) with the head nurse at the student clinic at SVYDC, using a survey tool previously developed by NIOSH staff. In addition, the ICP was discussed in person with the Human Resources Coordinator at SVYDC and over the phone with the Manager of Health Services and the Assistant Manager of Health Services, DJJDP. Associated documents, including the North Carolina Tuberculosis Policy Manual<sup>2</sup> and DJJDP medical forms, were also reviewed.

The medical officer also examined the aggregated (pooled, without identifiers) results



of student skin tests for the past 3 years and the documentation of actions taken when a student was found to have a positive TST in 2005.

### **Building Air Quality Evaluation**

The building air quality evaluation was based primarily upon visual inspection of the buildings as a means to identify conditions or characteristics that might impact indoor air quality. Items of focus included those described of concern to employees, namely mold and asbestos. Visual inspection for water damage or mold was conducted in occupied areas including employee offices and bathrooms. Other areas inspected were the kitchen and the mechanical room in Greenwood Cottage.

Its status as an educational facility requires the SVYDC to adhere to the asbestos management rules mandated by the Asbestos Hazard Emergency and Response Act (AHERA; 40 CFR Part 763). As a component of complying with AHERA, the SVYDC had undergone an original asbestos inspection to identify asbestos-containing material (ACM) within the facility. An Asbestos Management Plan (AMP) had been prepared for monitoring and maintaining ACM identified during the inspection and was available on-site. The AMP was reviewed by NIOSH staff and the areas of the buildings known to have ACM were visited to ensure that the material remained intact. Areas of the school grounds known to have buried building debris were observed to ensure that there was no soil erosion in those areas.

The NIOSH industrial hygienist reviewed the ventilation system types and configurations in each building currently in use with both the SVYDC and the DJJDP safety officers. Limited real-time monitoring for temperature, relative humidity, and carbon dioxide concentration was conducted using a Q-trak™ indoor air quality monitor (TSI Incorporated, Shoreview, MN) in some areas. An Accubalance® Air Capture Hood (TSI Incorporated, Shoreview, MN) was used for air-conditioning supply and return airflow measurements in the C pod of Sloop Cottage. A smoke tube was used for visualizing

airflow in the clinic and other areas of Greenwood Cottage A-wing.

## **RESULTS**

The management and staff at SVYDC were very cooperative with the HHE process. NIOSH representatives were given a full tour of the facility, and allowed to observe all areas or items of interest. All questions were answered completely; if the management or staff did not know the answer, the appropriate resource was located. NIOSH representatives were also given full access to records and documents needed to complete the evaluation, including aggregated TST results and operations and management plans.

### **Tuberculosis Control Program Evaluation**

#### ***Infection Control Plan***

SVYDC health care providers do not have a written TB ICP specific to SVYDC, but refer to the North Carolina Tuberculosis Policy Manual for TB control issues.<sup>2</sup> The Manual delineates some TB control measures specific for the Department of Corrections, local jails and detoxification units, homeless shelters, health care facilities, and long-term care facilities, but does not specifically mention the DJJDP. SVYDC does not follow the Manual's requirements for the Department of Corrections (which are set by state law). SVYDC providers work with the DJJDP Health Services to jointly decide on SVYDC-specific TB control issues. There is communication and coordination between SVYDC providers and the local health department (Buncombe County); and between the DJJDP Health Services and the state health department. There is no employee at SVYDC designated as responsible for TB Infection Control, but several people are involved in infection control issues for the facility, including blood-borne pathogens training and TB screening.

#### ***Screening***

Students are screened for TB at the Assessment and Treatment Planning Center prior to admission to SVYDC. This screening consists

of a one-step TST, unless there is documentation that the student has previously tested positive. A Medical Screening Interview form, containing the question "Are you sick now?" is completed by an Assessment and Treatment Planning Center nurse on admission. An Intake Health Assessment form, containing general health questions (without specific mention of TB symptoms) is completed by an Assessment and Treatment Planning Center nurse within 5 days of admission. Thus, for students who receive a TST, there is no TB symptom screening. For students who have previously tested positive for TB, a Record of Tuberculosis Screening form, consisting of questions on TB symptoms, is completed by a nurse. For all students, an Admission History and Physical Examination form is completed by a physician within 7 days of admission.

Once students are admitted to SVYDC, they are screened for TB every two years with a one-step TST (if previous TST was negative). Some students receive an additional TST prior to leaving SVYDC, if they are going to a facility (such as a group home) that requires annual TST. Review of SVYDC records revealed that in 2003, 4 of 67 TSTs done at SVYDC were positive; in 2004, 0 of 56; and in 2005 (as of September), 1 of 14. According to SVYDC and the NCDHHS, there were no cases of infectious TB among SVYDC students from 2003 to September 2005. When a student at SVYDC has a positive TST, he is referred to the local health department for further care, including symptom screening, chest X-ray, and initiation of therapy; symptom screening does not occur at SVYDC. For the one student who had a positive test in 2005, there was a 10-day delay between TST interpretation and symptom screening at the local health department. The health department interpreted the positive TST result as a boosting phenomenon, in which the immune response was more vigorous on the second test (2005), than it had been on the first test (2003), reflecting an old, not recent, TB exposure. The student was treated for latent (non-infectious) TB, using directly observed therapy (DOT).

Employees are screened for TB at hire with a one-step TST at a local occupational medicine

clinic. Those with a positive result are referred to the local health department for further evaluation and care. Prior to 2000, employees were also screened annually with TST, but currently there is no screening offered after hire.

One employee who had negative TST results in the years prior to 2000 had a TST in 2005 by a private physician and was found to have a positive (>15 mm) result. Further evaluation by the private physician and the local health department concluded that this was not infectious TB. This employee had no risk factors for TB outside of employment at a correctional facility. One other employee was evaluated in 2005 by a private physician and had a negative TST. No other post-hire employee TST results were available for analysis to determine whether a cluster of conversions had occurred.

The SVYDC staff was unsure whether employees would receive TST after exposure to a student with infectious TB. They indicated that they would consult the DJJDP Manager of Health Services and the North Carolina State Bureau of Workers' Compensation if this type of exposure should occur. The North Carolina Tuberculosis Policy Manual delineates procedures for contact investigation (the process of identifying individuals who may have been exposed to TB, who need further evaluation and testing).

Student screening for HIV infection is done on a voluntary basis through an off-site agency, which maintains the records. From January 2004 to August 2005, 224 new students were admitted to SVYDC and a total of 117 were tested for HIV. SVYDC providers were not aware of any positive results among these 117 tests. The measurement (in millimeters) used to determine a positive TST is based on the assumption that students are HIV negative.

#### ***Sputum Collection***

In the case of a student complaining of symptoms of TB, the SVYDC staff would contact the local health department and likely transfer the student to a hospital. SVYDC does

not have airborne infection isolation rooms and does not collect TB sputum specimens.

### ***Medical Documentation***

Students' medical records are kept at the facility clinic. TST results are documented in these records. The records are transferred with the student if he is sent to another DJJDP facility. TST results are sent monthly to the DJJDP Health Services, but at this time no aggregate database is maintained at SVYDC.

Employee medical records are kept at SVYDC, in files separate from personnel files. TST results are documented in these records. The medical records are maintained for 5 years. There is no aggregate database for TST results.

### ***Employee Tuberculosis Training***

Employees do not receive training on TB at hire or during employment. The SVYDC safety officer conducts infection control training on blood-borne pathogens for employees, but TB is not currently included in this training.

### ***Engineering Controls***

No engineering controls were in place for maintaining any area as an isolation room. Airflow measurements were conducted in two air-conditioned student rooms (Rooms 2 and 3) in Sloop Cottage Pod C. Measurements in Room 3 found it to be slightly positive when the air conditioner was operating (supply air provided at 140 cubic feet per minute (cfm) and return air exhausted at 110 cfm). Room 2 was neutral pressure (supply 100 cfm, return 100 cfm). Airflow in the hallway return outside these rooms was 101 cfm.

Air conditioning for the clinic (located in Greenwood Cottage) was provided by window air-conditioning units. Smoke tube visualization found the treatment room to be positive with respect to the main room of the clinic with the door closed. Pressurization between the clinic entrance door and the hallway was neutral. A student sleeping room with the window open and the door closed was found to fluctuate in its pressurization from positive to negative as outdoor air moved through the open window.

### ***Respiratory Protection Program***

North Carolina is one of 22 states and jurisdictions that administer their own occupational safety and health program through an agreement with the Occupational Safety and Health Administration (OSHA), U.S. Department of Labor.<sup>3</sup> With just a few exceptions, North Carolina has adopted the Federal OSHA Standards, including 29 CFR 1910.134, which addresses respiratory protection.<sup>4</sup> Currently, SVYDC does not have a written Respiratory Protection Program. Employees with potential exposure to TB are not trained on respirator use and the facility does not provide N-95 respirators to clinic or transportation employees.

### ***Building Air Quality Evaluation***

Central HVAC units provide heating and cooling for Sloop Cottage, the school building, vocational buildings, and chapel. All other buildings are heated by low-pressure boilers with convection heaters and cooled through open windows or window air-conditioning units.

All buildings were found to be generally clean and well maintained. Visible mold was found in a bathroom in Sloop Cottage Pod C. The mold appeared to be the result of moisture condensation on the painted wallboard above the ceramic tile shower stall and to be located only on the wall surface. The surface area covered by the visible mold was less than 10 square feet.

Shower grout in the Greenwood Cottage bathroom showed some signs of discoloration but no obvious mold growth was observed. Ventilation for the bathroom appeared adequate and was reported to be left on during the entire time period showers were in use. Four student rooms in Greenwood Cottage were visited to examine the toilet and sink areas. Two of the rooms were described by employees as having had roof leaks and to occasionally have a musty smell. NIOSH staff did not observe water damage or visible mold.

NIOSH staff observed roof leaks in the cafeteria building with one side of the serving line not in use because of a roof leak above it. The

cafeteria is heated by ceiling-mounted heaters and cooled by open windows and kitchen exhaust. The building has a non-air-conditioned crawlspace known to be a source of moisture, resulting in visible condensation on the cafeteria floor surface. Free-standing fans are used in the cafeteria during periods of high humidity to increase airflow and prevent moisture build-up.

General indoor air quality measurements (temperature, relative humidity, and carbon dioxide level) were conducted in two student rooms and the common area of Pod C at Sloop Cottage. All measurements were found to be within the range recommended by the American Society for Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE). Recommended summer ranges for temperature are 73-79° Fahrenheit and relative humidity between 30-60 percent.<sup>5</sup> The recommendation for carbon dioxide levels is that indoor levels not exceed 700 parts per million (ppm) greater than the level measured outdoors.<sup>6</sup> Outdoor levels are usually in the range of 300-400 ppm, making recommended indoor level maximums 1000-1100 ppm. Air supply and return vent covers were of the type designed for suicide prevention. The vent covers were in need of cleaning. Some showed signs of rust but overall, most were in good condition.

Greenwood Cottage temperature and relative humidity were within the ASHRAE recommended range.<sup>5</sup> Carbon dioxide levels in the student sleeping rooms and the common areas were within the ASHRAE recommended range with fresh air supplied mainly through open windows.<sup>6</sup> Heating vent covers were also of a type made for suicide prevention. All of the covers observed in the student rooms were found to be very dirty. One cover was partially painted over, disrupting the airflow.

The clinic was air-conditioned by two window air-conditioning units, one in the main clinic area and one in the treatment room. Temperature and relative humidity were within the ASHRAE recommendations.<sup>5</sup> However, with ten people present, the carbon dioxide levels were recorded to be 1400 ppm, exceeding the ASHRAE recommendations.<sup>6</sup>

Some of the individual employee offices in the Arledge building were provided with window air-conditioning units and some office areas shared a single unit. General indoor air quality measurements were within the ASHRAE recommendations.<sup>5,6</sup>

### **Asbestos Evaluation**

All ACM identified in the AMP was in good condition with the exception of the floor tiles in Greenwood Cottage. During the site visit, NIOSH staff observed that a few of these floor tiles were missing and a few remaining tiles were cracked or broken. Floor tiles in the Guard House at the front gate were also found to be damaged and broken but these had not been identified as ACM in the AMP so the tiles were assumed to not contain asbestos. Asbestos-containing shingles on the Guard House were intact. Areas in buildings known to contain ACM were appropriately placarded. The area on the school grounds known to have buried ACM was also placarded and a policy was in place to prohibit access to that area.

## **DISCUSSION AND CONCLUSIONS**

### **Tuberculosis Control Program Evaluation**

The United States experienced a resurgence of TB in the 1980s, in part due to a decline in attention to TB control. Since that time, increased awareness and resources have contributed to a substantial decrease in TB incidence nationwide.<sup>7</sup> Historically, North Carolina had one of the highest TB incidences in the nation; in 1980, it ranked 3<sup>rd</sup> among the 50 states and the District of Columbia.<sup>8</sup> In the years following, great strides were made in the state, such that by 2003, North Carolina's rank had fallen to 21<sup>st</sup> in the nation.<sup>9</sup> However, the annual rate of TB in North Carolina still remains above the national goal for the year 2000, and North Carolina experienced an increase in TB cases in 2004.<sup>10</sup> Meeting the goal of TB elimination will require continued vigilance, and "correctional facilities should be viewed as

being among the most important sites of transmission of [TB] in the United States.”<sup>7</sup>

### ***Infection Control Plan***

SVYDC and the North Carolina DJJDP have established good lines of communication with local and state public health officials. The North Carolina Tuberculosis Policy Manual<sup>2</sup> is an excellent reference tool for SVYDC staff. However, because it is meant to be comprehensive for the entire state, and because it does not mention the DJJDP, there are instances when the Tuberculosis Policy Manual is not specific enough for SVYDC’s needs. In addition, multiple people are involved in parts of TB Infection Control at SVYDC, but no single person has been designated as responsible. SVYDC should develop a written ICP specific to the facility and designate a person responsible for TB Infection Control. Chapter VIII of the North Carolina Tuberculosis Policy Manual describes the elements of a TB ICP, in accordance with the Centers for Disease Control and Prevention recommendations,<sup>11</sup> and gives a sample ICP. Further information, including an ICP template for jails, can be obtained from the Francis J. Curry National Tuberculosis Center.<sup>12</sup> It would be appropriate to incorporate the ICP elements for the Department of Corrections that are included in the North Carolina Tuberculosis Policy Manual into an ICP for SVYDC.

### ***Screening***

TB screening for students emphasizes TST, both at the Assessment and Treatment Planning Center and at SVYDC. This should be supplemented with TB symptom screening, such that all students, not just those with a previously positive TST, are screened for TB symptoms on entry to the Assessment and Treatment Planning Center, as per CDC recommendations.<sup>13</sup> In addition, when a student’s follow-up TST is positive, a TB symptom screening should be performed and documented at SVYDC prior to evaluation at the local health department. Any student with a positive TB symptom screening should receive a medical evaluation immediately. Using symptom screening in this way will ensure that employees and other students are not exposed to a student with symptoms of TB during the time between

screening and medical evaluation (up to 7 days at the Assessment and Treatment Planning Center and up to 10 days at SVYDC). The Record of Tuberculosis Screening form (DHHS 3405), which includes questions on unexplained productive cough, unexplained fever, and night sweats, would be appropriate for this purpose and is included with this report (Appendix). Finally, if symptom screening is not being used for students entering the detention centers, it should be adopted there as well. Exposures that occur during the weeks spent in the detention centers may not be identified by positive TST results at the Assessment and Treatment Planning Center, given the time needed to develop a response.

TB screening for employees at hire should include a two-step TST, as per CDC recommendations<sup>7,13</sup> and the North Carolina Tuberculosis Policy Manual.<sup>2</sup> Use of two-step TST at hire will allow accurate interpretation of positive TSTs later on in employment, such as in the context of a contact investigation. For instance, a new employee who was exposed to TB years before hire may not be able to react to the one-step TST at hire, resulting in a negative TST. However, the TST itself may serve to stimulate the immune system and cause a more vigorous response to the next TST, resulting in a positive TST. This is termed the “boosting phenomenon,” and only occurs in people with prior exposure to TB. With a two-step TST, a second skin test is administered 1-3 weeks after a negative one; if the second result is positive, it is likely to represent boosting rather than a recent infection. For employees tested with just a one-step TST at hire who later have a positive result during employment, it is difficult to determine whether the positive result reflects a recent exposure (which would require further investigation) or boosting (which would not).

Employees expressed concern about the TB Control Program in part because of the discontinuation of annual employee screening with TST. Chapter VIII of the North Carolina Tuberculosis Policy Manual discusses health-care setting facility risk assessment, which is in accordance with CDC guidelines published in 1994.<sup>11</sup> This risk assessment was designed for

health-care facilities, but is recommended for medical facilities within correctional facilities as well.<sup>13</sup> The lowest risk category is “minimal.” The first requirement to be classified as “minimal” is that there are no TB cases in the facility’s community within the past year. SVYDC admits students from counties throughout North Carolina and as such, the state represents SVYDC’s “community.” Because there have been cases of TB in North Carolina in the past year, SVYDC cannot be classified as “minimal” risk. The next risk category is “very low,” meaning that in the past year there have been TB cases in the community, but no infectious TB cases in the facility and no evidence of transmission among students or workers. SVYDC appears to meet these conditions: there have been no documented cases of infectious TB in the past year and no evidence of transmission among students or workers, based on currently available information.

However, employees were also concerned that one employee had a positive TST result in 2005. It is possible that this employee had a workplace exposure to TB in the 5 years since the last test. This employee had serial negative results previously, making the recent positive result less likely to represent boosting. Other explanations include a cross-reaction to bacteria related to TB (non-tuberculous mycobacteria) or a non-work-related TB exposure. However, the size of the TST reaction (approximately 30 mm) makes TB more likely than non-tuberculous mycobacteria.<sup>14</sup> Furthermore, like other SVYDC employees, this individual lives in western North Carolina, an area with one of the lowest TB incidences in the state, making community exposure less likely.<sup>15</sup> Thus, further investigation in the workplace is warranted. While there have been no documented cases of infectious TB among SVYDC students, TB has gone unrecognized at other correctional facilities, even those with TB ICPs in place.<sup>16</sup> SVYDC should conduct a TST survey of all TST-negative employees with student contact to determine if there are any other employees with newly positive TST results. If this survey shows no other employees have newly positive TST results, then a workplace exposure is less likely;

if other employees do have newly positive TST results, then careful interpretation will be necessary, particularly given the one-step testing used at hire. Interpretation of these results should therefore be done in consultation with the local or state health department.

In its description of facility risk assessment of health-care facilities, CDC notes that most employees in very low risk health-care facilities do not need routine (i.e., annual) TST after the baseline test is done.<sup>11</sup> Currently, North Carolina does not require annual TST for employees of very low risk health-care facilities.<sup>2</sup> However, North Carolina requires annual TST for employees in the Department of Corrections,<sup>2</sup> and an update of the 1994 CDC guidelines published on December 30, 2005 recommends that all correctional facilities be classified as at least medium risk and conduct annual employee TB screening.<sup>17</sup> SVYDC’s juveniles are not “students” in the typical sense, but share many of the risk factors that make inmates of traditional correctional facilities more likely to develop TB, including low socioeconomic status, history of substance abuse, and congregate housing.<sup>13</sup> HIV is also an important risk factor for infectious TB; while HIV tests of SVYDC students have been negative to date, only half of the students have been tested. Adoption of the standards set for the Department of Corrections, which would include annual TST for both employees and students, would therefore be appropriate.

#### ***Sputum Collection***

It is appropriate that SVYDC not collect sputum samples or care for students suspected to have infectious TB, given the absence of negative-pressure (airborne infection isolation) rooms. SVYDC should include in its ICP a written plan to refer students with suspected TB to a collaborating health-care facility that is equipped to evaluate and manage TB patients.

#### ***Medical Documentation***

Student medical records are appropriately maintained at SVYDC and made available to receiving DJJDP facilities when students are transferred. SVYDC should consider compiling an aggregate database of TST results which

would include the number of tests done and the number of positive results. This could be used to track trends and conduct an annual facility risk assessment.

Employee records should be maintained for the duration of the employment plus thirty years, as per OSHA requirements.<sup>18</sup> Again, an aggregate database of TST results may be helpful, particularly if annual testing is used.

### ***Employee Tuberculosis Training***

SVYDC employees were concerned about TB in part because they did not understand the level of risk at their facility, the distinction between latent (non-infectious) and active (infectious) disease, and the changes made to the employee screening program. This highlights a need for employee education on TB, through both initial and periodic training. Such training could potentially be incorporated into current infection control sessions conducted on blood-borne pathogens. CDC's Division of Tuberculosis Elimination offers a slide series on the prevention of transmission of TB that can enhance training. These slides can be found at: <http://www.cdc.gov/nchstp/tb/pubs/slidesets/transmission/default.htm>. Additional training materials, including web-based courses, pamphlets and fact sheets, can be found at: <http://www.cdc.gov/nchstp/tb/pubs/pem.htm>. Local and state health departments may be good resources for training materials as well.

### ***Engineering Controls***

The treatment room in the clinic in Greenwood Cottage was determined to be under positive pressure compared to the main clinic room, which was under neutral pressure compared to the hallway. This is an undesirable condition that could result in the spread of airborne infections (TB and others) from inside the clinic to other adjacent areas. To prevent the possible spread of infectious diseases, the treatment room and clinic should be under negative pressure with respect to the hallway.<sup>19</sup>

Since the student rooms were found to be either slightly positive or neutral to the hallway, they do not meet the criteria for airborne infection

isolation rooms and should not be used for TB isolation.

### ***Respiratory Protection Program***

While SVYDC does not have airborne infection isolation rooms and would not be performing cough-inducing procedures, its employees could nonetheless require respiratory protection during the initial evaluation or transportation of a student with suspected TB. Currently, such respiratory protection is not available to SVYDC employees.

In accordance with 29 CFR 1910.134, a written Respiratory Protection Program, with an identified program administrator, is required for any facility that requires employees to wear respirators. Initial fit testing by a trained individual is required for all employees that will potentially wear a respirator. Repeat fit testing is further required upon major changes to the facial features of the respirator user (i.e. major weight gain/loss, change in facial hair, scarring, etc.). Although annual fit testing is required under 29 CFR 1910.134, in 2004 Congress passed the Consolidated Appropriations Act for fiscal year 2005 exempting employers from conducting annual fit testing for occupational exposure to TB. However, this act does not exempt employers from initial fit testing of employees.

SVYDC should establish a Respiratory Protection Program and identify a program administrator responsible for its operation. Employees involved in the initial evaluation and transport of students with suspected TB should be included in the Respiratory Protection Program. These employees should receive initial fit testing; a supply of N-95 respirators of the models and sizes that were used during the fit test should be readily available in the workplace.

### ***Building Air Quality Evaluation***

The visible mold found on the surface of the bathroom wall in Sloop Cottage Pod C is considered to be an amount that may be cleaned by general maintenance personnel. Cleaning should be conducted according to the New York

City Department of Health and Mental Hygiene and Environmental Protection Agency guidance.<sup>20,21</sup> After cleaning, the area should be maintained in a manner that will prevent regrowth of mold. This may require additional ventilation of the bathroom to prevent moisture condensation. Use of mold-resistant paint during re-painting of bathrooms should be considered.

A limited amount of visible mold was found during the walk-through. Further medical evaluation by a physician familiar with occupational respiratory disease patterns may be useful to those employees with persistent symptoms.

The differences in types of building ventilation throughout the facility should be addressed by developing maintenance protocols based upon the ventilation type for each building. Buildings with central HVAC units should have standard maintenance and filter change-out schedules. The buildings with boilers did receive regular maintenance but those buildings should also receive periodic cleaning of air supply and return vent surfaces and inspection of ducts for cleanliness and proper airflow. Window air-conditioning units differed by age, style, and manufacturer. Each unit should be maintained according to the manufacturer's recommendations and the employee using the unit should be informed about proper operation. Adequate fresh (outdoor) air should be supplied to rooms without central HVAC, such as the clinic, to avoid elevated carbon dioxide levels when occupied.

### **Asbestos Evaluation**

With the exception of the flooring in the A-wing of Greenwood Cottage, all known ACM was found to be intact. The facility was complying with the AHERA requirements in that there was a designated person to conduct periodic surveillance of the ACM and there was a policy for informing short-term workers about the location of ACM. However, SVYDC did not meet the following AHERA requirements: 1) it had been more than three years since the last asbestos inspection; 2) documentation and

training of custodial and maintenance personnel were not as prescribed by the regulation; and 3) there was no program for annual notification of parent, teacher, and employee organizations about the availability of the AMP and any asbestos response actions taken or planned.

## **RECOMMENDATIONS**

### **Tuberculosis Control Program**

- Designate one person responsible for TB Infection Control at SVYDC (Infection Control Officer)
- Develop a written TB Infection Control Plan (ICP) specific to SVYDC
- In addition to TST, use TB symptom screening for all students
- Use two-step TST for new employees at hire
- Conduct a TST survey of employees to investigate the possibility of a workplace TB exposure and interpret the results with the assistance of the state health department
- Conduct annual employee TB screening (TST)
- Consider the use of an aggregate database for student and employee TST results
- Include TB in initial and periodic infection control training for employees
- Isolate the clinic from other areas by maintaining negative air pressure relative to the hallway
- Establish a Respiratory Protection Program with a program administrator, initial fit testing, and N-95 respirator supply; include employees who are at risk of exposure to a student with TB, such as clinic and transport staff

### **Building Air Quality**

- Ensure that all HVAC systems are operating according to design specifications and that they are maintained on a routine basis



- In those buildings/areas that do not have central heating and cooling, ensure that adequate fresh air is supplied in relation to the number of occupants
- Remove dust and paint from air supply and return vents
- Ensure that ventilation ducts are kept clean and are inspected on a periodic basis
- Properly ventilate restrooms to prevent condensation and mold growth
- Repair roof leaks as they occur
- Encourage employees to report air quality concerns and health symptoms to management

### Asbestos Management

- Conduct an asbestos re-inspection and update the Asbestos Management Plan accordingly
- Establish a system for annual notification to parent, teacher, and employee organizations regarding the school's AMP and plans or actions for asbestos abatement
- Remove and replace damaged asbestos-containing floor tiles in Greenwood Cottage
- Encourage employees to report damaged building materials including suspected asbestos-containing material to management
- Employees should avoid using mechanical cleaning devices that could disrupt the surface of asbestos-containing tiles

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Purpose: To be used for persons who:

- (1) have had a significant reaction to the tuberculin skin test;
- (2) have had a negative chest X-ray; and
- (3) need a record of their tuberculosis status.

Preparation: To be completed by a licensed medical professional.

**Section A:** Record the person's answers to questions 1-6.

- (1) If all answers are *no*, have person sign where specified and continue to Section B.
- (2) If any two answers are *yes*, **do not** complete the record. Refer person for evaluation as appropriate.

**Section B:** Complete information as specified.

**NOTE:** Document this visit in person's clinical record and specify outcome, i.e., indicate that the record or a referral was given to the person.

Disposition: 

- (1) If all answers in Section *A* are *no*, no copy required. Document as noted above.
- (2) If any two answers in Section *A* are *yes*, retain original and any further referral form in record. Destroy in accordance with Standard 5, *Records Disposition Schedule*, published by the N.C. Division of Archives and History.

Additional forms may be ordered from: Department of Health and Human Services  
General Communicable Disease  
Epidemiology Section  
Tuberculosis Control  
1902 Mail Service Center  
Raleigh, NC 27699-1902

DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Centers for Disease Control and Prevention  
National Institute for Occupational Safety and Health  
4676 Columbia Parkway  
Cincinnati, OH 45226-1998

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