Health Consultation

DOWNTOWN SCHOOL UPDATE #3
STATE OF TENNESSEE DCERP SITE #79-212

MEMPHIS, SHELBY COUNTY, TENNESSEE

AUGUST 13, 2008

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

DOWNTOWN SCHOOL UPDATE #3
STATE OF TENNESSEE DCERP SITE #79-212

MEMPHIS, SHELBY COUNTY, TENNESSEE

Prepared By:
Tennessee Department of Health
Under Cooperative Agreement with the
The U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

Foreword

This document summarizes an environmental public health investigation performed by Environmental Epidemiology of the State of Tennessee Department of Health. Our work is conducted under a Cooperative Agreement with the federal Agency for Toxic Substances and Disease Registry. In order for the Health Department to answer an environmental public health question, several actions are performed:

Evaluate Exposure: Tennessee health assessors begin by reviewing available information about environmental conditions at a site. We interpret environmental data, review site reports, and talk with environmental officials. Usually, we do not collect our own environmental sampling data. We rely on information provided by the Tennessee Department of Environment and Conservation, U.S. Environmental Protection Agency, and other government agencies, businesses, or the general public. We work to understand how much contamination may be present, where it is located on a site, and how people might be exposed to it. We look for evidence that people may have been exposed to, are being exposed to, or in the future could be exposed to harmful substances.

Evaluate Health Effects: If people could be exposed to contamination, then health assessors take steps to determine if it could be harmful to human health. We base our health conclusions on exposure pathways, risk assessment, toxicology, cleanup actions, and the scientific literature. Make Recommendations: Based on our conclusions, we will recommend that any potential health hazard posed by a site be reduced or eliminated. These actions will prevent possible harmful health effects. The role of Environmental Epidemiology in dealing with hazardous waste sites is to be an advisor. Often, our recommendations will be actions items for other agencies. However, if there is an urgent public health hazard, the Tennessee Department of Health can issue a public health advisory warning people of the danger, and will work with other agencies to resolve the problem.

If you have questions or comments about this report, we encourage you to contact us.

Please write to: Environmental Epidemiology
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Or call us at: 615-741-7247 or toll-free 1-800-404-3006 during normal business hours

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Introduction

In 1996, the Tennessee legislature passed law that created the Drycleaner Environmental Response Program (DCERP). This program was established to create a fund that could be used for investigation and cleanup of sites where drycleaning solvents have been released to the environment. The program is primarily funded by registration fees and surcharges on the purchase of drycleaning solvents that are paid by drycleaner operators throughout the state.

The Memphis City School System has an elementary school on the site of a former drycleaner in downtown Memphis, Shelby County, Tennessee. The site was remediated several years ago. Caution has always been used to protect school children and the general public from any potential drycleaner solvent vapors that might have intruded into the breathing air of the school.

As part of their continued commitment to maintaining former drycleaner sites for safe new uses, the Tennessee Department of Environment and Conservation (TDEC) Drycleaner Environmental Response Program (DCERP) has continued to monitor the site. On September 3, 2007, following remedial work at the site, an additional indoor air test for drycleaner solvent vapors was performed within the Downtown School gymnasium (a/k/a multipurpose room).

In December 2007, DCERP contacted the Environmental Epidemiology Program (EEP) of the Tennessee Department of Health (TDH) to review this indoor air data for the Downtown School.

Background

On August 12, 1998, DCERP entered into an agreement with Nations Bank to perform a voluntary cleanup of the 10 North Fourth Street property owned by the bank. The property was the former site of Henry Loeb and Company Laundry and Memphis Steam Laundry Stable. A map dated 1907 details these structures. By the 1990s, the laundry and cleaners had been removed and an asphalt parking lot was in place. The property was later sold to the city of Memphis to be used as the site for a new elementary school.

The property was investigated for contamination from its past use as a laundry. A series of investigations determined that soils contained tetrachloroethylene (PCE) and total petroleum hydrocarbons (TPH). Analysis of shallow groundwater detected contamination from tetrachloroethylene (PCE), trichloroethylene (TCE), total petroleum hydrocarbons (TPH), cis-1,2-dichloroethene (1,2-DCE), and vinyl chloride (VC).

In 1999 and 2001, cleanup projects removed contamination from the site. A pump-and-treat system was installed to extract and reduce pollutants in the groundwater. Then the Downtown School was constructed on the site.

Environmental Epidemiology under a Cooperative Agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR) prepared three previous health consultations for the Downtown School Site. The initial reports released by ATSDR on January 2 and March 13, 2003, concluded there was no apparent health hazard from vapor intrusion of the drycleaner solvent tetrachloroethylene or any of its breakdown products. School classes began in the fall

semester 2003. A one-year follow up health consultation was published by ATSDR on February 27, 2004. Again, no apparent health hazard was concluded. The indoor air sampling data has never shown elevated levels of drycleaner solvent or breakdown products at levels that would harm children attending, staff working, or people visiting the school.

Discussion

Introduction to Chemical Exposure

To determine whether persons are, have been, or are likely to be exposed to chemicals, Environmental Epidemiology of the Tennessee Department of Health evaluates mechanisms that could lead to human exposure. An exposure pathway contains five parts:

- a source of contamination
- contaminant transport through an environmental medium
- a point of exposure
- a route of human exposure, and
- a receptor population.

An exposure pathway is considered complete if there is evidence that all five of these elements are, have been, or will be present at the site. A pathway is considered potential if there is a lower probability of exposure. If there is no evidence that at least one of the five elements listed is, has been, or will be present at the site, then it is considered an incomplete exposure pathway. For this site, there is a completed exposure pathway for the inhalation of drycleaner solvent vapors.

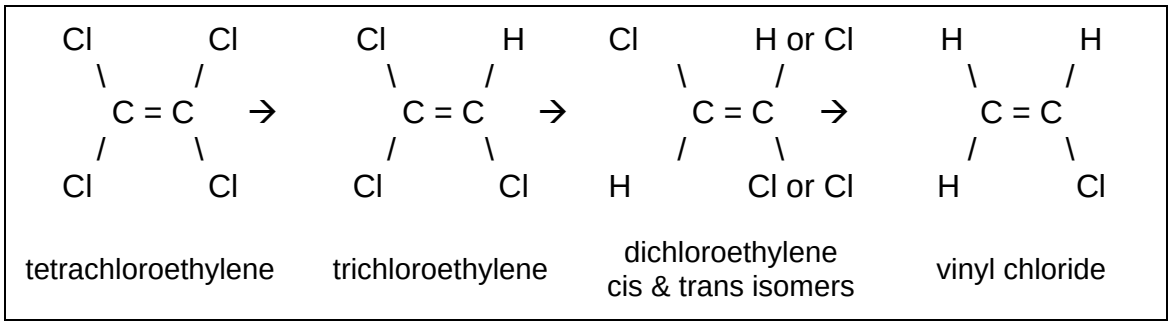
Physical contact alone with a potentially harmful chemical in the environment by itself does not necessarily mean that a person will develop adverse health effects. A chemical's ability to affect public health is controlled by a number of other factors, including:

- the amount of the chemical that a person is exposed to (dose)
- the length of time that a person is exposed to the chemical (duration)
- the number of times a person is exposed to the chemical (frequency)
- the person's age and health status, and
- the person's diet and nutritional habits.

To better understand the likelihood for exposure of the students, faculty, or the general public to chemical vapors an indoor air sample was collected. The purpose of this public health consultation is to continue to examine the Downtown School property in regard to any potential health hazard from drycleaner solvent or breakdown products.

Drycleaner Solvent Explanation

The process of drycleaning is not truly dry, but it uses so little water that it has come to be known as drycleaning. Instead of water, chemical solvents are used in the cleaning process. The most commonly used solvent for drycleaning is tetrachloroethylene (PCE) or perc. It is a colorless liquid and has sweet smell (ATSDR 1997). Perc is a volatile organic compound. It will quickly evaporate into a gas at room temperature. As its name implies, tetrachloroethylene has four chlorine anions on a two-carbon molecule. As these chlorine anions react, the molecule breaks down into other chlorinated volatile organics. Each of these breakdown products has slightly different chemical properties and toxicities. The following diagram is a example of how one chemical can breakdown to form other chemicals.



For example, tetrachloroethylene (PCE) can breakdown to trichloroethylene (TCE), then to dichloroethylene (DCE) and its isomers, and then to vinyl chloride (VC). Each of these breakdown products can act independently. The only way to truly know the ratio of these breakdown products is to collect environmental samples. The drycleaner solvent, tetrachloroethylene, and all of its breakdown products plus their isomers were carefully considered in developing this report.

To evaluate exposure to a hazardous substance, health assessors often use health guidance values. If the chemical concentrations are below the guidance value, then health assessors can be reasonably certain that no adverse health effects will occur in people who are exposed. If concentrations are above the guidance values (ATSDR 2007a, 2008) for a particular chemical, then further site evaluation is needed.

ATSDR environmental media evaluation guidelines (EMEGs) and minimum risk levls (MRLs) are based on conservative assumptions about chemical exposure. EMEGs and MRLs consider non-cancer adverse health effects. Exposure durations are defined as acute (14 days or less), intermediate (15–364 days), and chronic (365 days or more) exposures. For cancer effects, ATDSR uses US Environmental Protection Agency (EPA) information to set their cancer risk evaluation guidelines (CREGs) for lifetime exposure.

Environmental Sampling

On September 3, 2007, Pickering Environmental Consultants, Inc., under the authorization of TDEC DCERP, performed vapor monitoring in the school gymnasium (a/k/a multi-purpose room). A Summa canister was deployed at breathing height within the gymnasium. It collected an air sample over an 8-hour period. Method TO-15 was used for analysis (Pickering 2007).

TABLE 1. Indoor air data for the Downtown School, Memphis, Shelby County, TN. Collected on September 3, 2007, over 8 hours with a Summa canister (Pickering). Analytical method detection limits were appropriately low. Values reported in parts per billion (ppb). Health screening guidelines based on chronic exposure duration (ATSDR 2007a, 2008).

Chemical	Acronym	09/03/2007 indoor air concentration	ATSDR MRL/EMEG (HI=1) (non-cancer)	ATSDR CREG (10^{-6} excess cancer risk)
		ppb	ppb	ppb
tetrachloroethylene	PCE	ND	40	na
trichloroethylene	TCE	ND	100	0.9^{NY}
1,1-dichloroethylene	1,1-DCE	ND	20i	nc
cis-1,2-dichloroethylene	cis-1,2-DCE	ND	ngv	nc
trans-1,2-dichloroethylene	trans-1,2-DCE	ND	200i	nc
vinyl chloride	VC	ND	30i	0.04
1,1-dichloroethane	1,1-DCA	ND	ngv	ngv
1,2-dichloroethane	1,2-DCA	ND	600	0.01

Notes:

ND = not detected (above the analytical detection limit in the air sample)
na = not applicable (Due to a lack of federal guidance and the placement of PCE on a continuum between carcinogenic classifications, only the guidance value for non-cancer effects was considered.)
NY = New York State Department of Health's guidance (used in absence of federal guidance)
i = intermediate value for 15-364 days exposure; typically higher than a chronic value
nc = not classified as a carcinogen
ngv = no guidance value available
bold = value exceeds a guidance value

Drycleaner Solvent and Breakdown Products

There was no detection of tetrachloroethylene (PCE) vapors in the gymnasium air sample. Furthermore, there were no detections of any chemical breakdown products such as trichloroethylene (TCE), dichloroethylene (DCE), or vinyl chloride (VC). All analytical detection limits were only a fraction of a part per billion. There were no vapors related to the former drycleaner site found during the air test performed on September 3, 2007. Based on this data, there is no indoor air health hazard.

This result is similar to the previous health consultation written for the site which showed that no chemical vapors were detected in the gymnasium (a/k/a multi-purpose room) in December 2003.

Benzene

The chemical, benzene, was detected in the air sample. Benzene is not associated with drycleaning. The benzene may be from a product used within the school. Or the benzene may be part of the normal ambient air for the downtown urban area as it is a component of automobile exhaust. Benzene was measured at 2.2 ppb. The ATSDR MRL for chronic exposure to benzene in air is 3 ppb. In a study of six states in the Great Lakes region, benzene was found in an average concentration of 2.35 ppb (ATSDR 2007). Average concentrations of benzene in outdoor ambient air from EPA hazardous air pollutant monitors across the United States for 2003 and 2004 were 0.523 and 0.406 ppb, respectively. The value measured in the Downtown School is consistent with these US background ambient air levels. This means that benzene vapors, whatever their source, are not a health hazard.

Child Health Considerations

The Tennessee Department of Health and the Agency for Toxic Substances and Disease Registry emphasize protecting child health. Children of elementary school age are likely to be more sensitive to the effects of pollutants than adults. Children generally have lower body weights, breathe air closer to the ground, and are more often in contact with the ground than adults. Although children's lungs are usually smaller than adults, children breathe a greater relative volume of air compared to adults. TDH carefully considered the potential exposure of children to drycleaner solvent or breakdown products when preparing this report to ensure protection of children's mental and physical wellbeing.

Conclusions

No public health hazard exists within the Downtown School based on the September 2007 air sampling for former drycleaner solvent and breakdown product vapors that might have originated from DCERP Site #79-212.

Recommendations

None at this time.

Public Health Action Plan

This report and any needed explanation will be provided to the TDEC DCERP, to the Downtown School Principal, and to the Memphis City School System.

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Certification

This Public Health Consultation: *Downtown School – Update 3, State of Tennessee DCERP Site #79-212, Memphis, Shelby County, Tennessee*, was prepared by the Tennessee Department of Health Environmental Epidemiology under a Cooperative Agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It was prepared in accordance with the approved methodology and procedures that existed at the time the health consultation was begun.

Technical Project Officer, CAT, SPAB, DHAC, ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health assessment and concurs with the findings.

Team Leader, CAT, SPAB, DHAC, ATSDR