

# Health Consultation

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FORMER CARDWELL MEMORIAL HOSPITAL  
STELLA, NEWTON COUNTY, MISSOURI

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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

FORMER CARDWELL MEMORIAL HOSPITAL

STELLA, NEWTON COUNTY, MISSOURI

Prepared by:

Missouri Department of Health and Senior Services  
Division of Community and Public Health  
Section for Disease Control and Environmental Epidemiology  
Bureau of Environmental Epidemiology  
under Cooperative Agreement with the  
Agency for Toxic Substances and Disease Registry

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## **STATEMENT OF ISSUES AND BACKGROUND**

### **Statement of Issues**

The U.S. Environmental Protection Agency (EPA) has requested the Missouri Department of Health and Senior Services (DHSS), in conjunction with the federal Agency for Toxic Substances and Disease Registry (ATSDR), to complete a health consultation for the former Cardwell Hospital site in Stella, Newton County, MO. This health consultation focuses on nearby residents' exposure to contaminants originating from the former Cardwell Hospital.

### **Background**

The former Cardwell Memorial Hospital is located at 700 Ozark Street in Stella, Newton County, Missouri. The facility, built in 1920, operated as a hospital, medical center and/or residential care center until the 1980's. Once closed, the building deteriorated and became subject to trespassers and vandalism. Consequently, the building has been in disrepair for several years. It is a three-story building that is structurally unstable, with gutted rooms, areas where the roof has collapsed, and damaged floors (Figures 1-4). Windows and doors are missing from the facility on the ground and first floors. Asbestos insulation has been found in many parts of the building particularly around the hot water pipes and in the boiler room. Asbestos pipe insulation, as well as other asbestos-containing insulation (Air-o-cell) is in poor condition.

Local teenagers and children have been observed around the building. During a site visit in 2005, children from the community stated that the building was a common playing place. Evidence observed inside suggests that someone had been living/recreating in the facility (1).

### **Sampling Investigations**

From 1995 to 2001, the Missouri Department of Natural Resources (MDNR) Southwest Regional Office (SWRO) and Air Pollution Control Program (APCP) received several public safety complaints from the community about the building. In response, SWRO inspected the hospital several times. The inspections noted that asbestos containing material (ACM) was observed in the facility (1).

On May 19 and 20, 2005, EPA conducted site reconnaissance and sampling activities at the former hospital. Samples of soil, bulk building materials [mostly thermal system insulations (TSI)], and air were collected from the former hospital.

Eight composite soil samples were collected from the area surrounding the building at a depth of 0 to 2 inches. The soil sample locations were strategically positioned in areas to determine if asbestos had migrated from the facility and contaminated nearby soils. Five of the eight samples indicated the presence of asbestos, three of those five indicated asbestos levels greater than 1%. The three samples that did not show asbestos were taken 10 -15 feet from the building. The soil sampling indicates the presence of asbestos inside and outside the building with asbestos concentration decreasing to zero as one moves farther from the building.

Six bulk samples were collected from visible debris found on the floor in six separate areas of the building. The debris included damaged insulation, floor tiles and the associated mastics that were brittle and contained friable asbestos. All six samples contained asbestos indicating extensive ACM throughout the building. The collapsed roof and lack of window glass allow wind to flow freely through the facility, increasing the potential for asbestos fibers to be released. To simulate conditions on a windy day, air samples were collected after a wind scenario was simulated with the strategic placement of five 20-inch box fans throughout the basement of the facility. The box fans were positioned to draw air from the collapsed roof area at the far south side of the facility. With all five box fans running, wind speed averaged 1.5 miles per hour (mph) in the center of the main basement room. The box fans continued to run for the duration of the air sampling event and a leaf blower was turned on for two 5-minute intervals during the air sampling. With the leaf blower running, the wind speed averaged approximately 6 mph at the center of the main basement room (1). Four different locations were sampled and analyzed; all samples had over 0.0009 structures per cubic centimeter (S/cc) (1). EPA has recently established this health-based benchmark of 0.0009 S/cc for asbestos in indoor air as a result of sampling that took place to support planned residential cleanup efforts in Lower Manhattan (2).

## DISCUSSION

As asbestos containing materials (ACM) deteriorate, the asbestos separates into microscopic fibers that can be inhaled by humans. At this site, the major public health concern is inhalation of asbestos fibers from ACM, mostly insulated piping that is in disrepair and has become friable. Some of this ACM has been found outside the building and has contaminated soil surrounding the building.

An “asbestos fiber” is defined as a “structure greater than or equal to 0.5 micrometers ( $\mu\text{m}$ ) and an aspect ratio (length to width) of 5:1 or greater and substantially parallel sides” (3). The NIOSH 7402 method used by EPA derived the “Adjusted fibers per cubic centimeter (F/cc)” and indicated a trend that fiber concentrations found in the building were between 0.01 and 0.07 f/cc (Table 1). These concentrations present an unacceptable risk for lifetime exposures and approach the OSHA worker regulatory concentration of 0.1 f/cc.

When assessing risk, another factor to consider is that the data were collected using simulated wind conditions. This was an appropriate simulation. However, studies with activity-based asbestos sampling indicate that activity is what drives exposure. According to EPA, the activity can increase exposure greater than 40 times (4). For example, children hitting ACM with a stick, playing ball, etc. would create much higher exposures than measured here. It seems likely that, had activity-based sampling been performed inside the hospital, results would have been even higher. It is therefore important to consider these reported values not as a worst case, but within the range of exposures that could occur.

Soil and bulk sample results were compared to 1% asbestos content as defined in the TSCA, Part 763 – Asbestos, Subpart E – Asbestos –Containing Materials in Schools. TSCA defines ACM as any material or product that contains more than 1% asbestos (1). Three of the eight soil samples

collected around the facility contained greater than 1% asbestos. All bulk samples collected from within the building also contained greater than 1% asbestos.

Because the debris and other materials in the building contain friable asbestos, it becomes an inhalation hazard for people as they move around inside the building, disturbing the ACM and releasing more asbestos particles into the air. Also, because the roof is not intact, certain weather conditions could disturb the materials further or could cause more deterioration of the building. The soil sampling results indicate that the asbestos contamination is not confined within the building. As people, wind, or rain disturb the ACM, it migrates outside the building contaminating the surrounding air and soils.

### **Physical hazards**

The former Cardwell Hospital clearly presents many physical hazards. The former hospital has broken doors and windows, materials falling from the ceiling, areas of roof collapsing, holes in the floors, and asbestos-insulated pipes in disrepair. These problems pose a physical hazard to anyone visiting, playing in, or working on the building.

## **TOXICOLOGICAL EVALUATION**

This section will discuss the potential adverse health effects of exposure to asbestos. Non-cancerous health effects and the likelihood of the contaminants causing cancer will be evaluated.

Asbestos is a naturally occurring mineral with a chain-like crystal structure usually found mixed into other minerals. Over the years, asbestos has been used in many ways. Pipe insulation, automotive brakes, shingles, wallboard, and blown-in insulation are just a few of the products that once contained asbestos. Although the federal government suspended production of most asbestos products in the early 1970s, installation of these products continued through the late 1970s and even into the early 1980s. Asbestos is dangerous only if the broken crystal fibers float in the air after being disturbed and are inhaled and become lodged in the respiratory system.

Inhalation exposure to asbestos can increase the likelihood of lung cancer, mesothelioma (cancer of the lining of the lungs), and non-malignant lung conditions such as asbestosis (restricted function of the lungs due to retained asbestos fibers) and changes in the lung lining. This conclusion is based on studies of these diseases in workers with cumulative exposures. Such health effects could be expected after 40 years of occupational exposure to air concentrations of 0.125 to 30 fiber/cc. The conclusion is supported by results from animal and mechanistic studies (5). Air concentrations of asbestos fibers in ambient (typical) air are 0.00001 to 0.0001 f/cc. The recently established exposure limit for U.S. workplaces is 0.1 fiber/cc (5).

When asbestos fibers are inhaled, most fibers are expelled, but some can become lodged in the lungs and remain there throughout life. Fibers can accumulate and cause scarring and inflammation. Enough scarring and inflammation can affect breathing, leading to disease.

Diseases from asbestos exposure take a long time to develop. Most cases of lung cancer or asbestosis in asbestos workers occur 15 or more years after initial exposure to asbestos. Tobacco smokers who have been exposed to asbestos have a "far greater-than-additive" risk for lung cancer than do nonsmokers who have been exposed, meaning the risk is greater than the individual risks from asbestos and smoking added together. The time between diagnosis of mesothelioma and the time of initial occupational exposure to asbestos commonly has been 30 years or more. Cases of mesothelioma have been reported after household exposure of family members of asbestos workers who brought the material home on their work clothes and in individuals without occupational exposure who live close to asbestos mines (5). Changes in the lining of the lungs (pleura) such as thickening, plaques, calcification, and fluid around the lungs (pleural effusion) may be early signs of asbestos exposure. These changes can affect breathing more than previously thought. Pleural effusion can be an early warning sign for mesothelioma. Most cases of asbestosis or lung cancer in workers occurred 15 years or more after the person was first exposed to asbestos. Most cases of mesothelioma are diagnosed 30 years or more after the first exposure to asbestos. Mesothelioma has been diagnosed in asbestos workers, family members, and residents who live close to asbestos mines. Health effects from asbestos exposure may continue to progress even after exposure is stopped.

People are more likely to experience asbestos-related disorders when they are exposed to high concentrations of asbestos, are exposed for longer periods of time, and/or are exposed more often. Inhaling longer, more durable asbestos fibers contributes to the severity of asbestos-related disorders as well.

Currently, sampling has not shown that fibers have escaped the property. If remediation does not occur, migration off the property is possible, which would cause a potential health hazard for off-site residents. Trespassers are at risk of inhaling asbestos fibers when inside the hospital whether or not they are disturbing the ACM and causing asbestos fibers to be airborne.

### **Children's Health**

Infants and children may be more vulnerable to exposure to environmental contamination than adults. Because children are smaller and their bodies typically retain more of the contaminants, it usually takes less of a contaminant to cause adverse health effects in children than adults.

The effects of asbestos on children are thought to be similar to the effects on adults. However, children could be particularly susceptible to asbestos exposure because of the following factors:

- Children are more likely to disturb fiber-laden soils or indoor dust while playing.
- Children are closer to the ground and thus more likely to breathe contaminated soils and dust.
- Children could be more at risk than people exposed later in life because of the long latency period between exposure and onset of asbestos-related respiratory disease.

At this site, child exposures are of particular concern because it has been observed to be a common play/hangout place for school aged children and teenagers.



## CONCLUSIONS

The concentrations of asbestos found in the facility and outdoors on the property are too high, and thus unsafe, for community exposure. In addition, the property poses a physical hazard to trespassers. Therefore, the former Cardwell Hospital site in Stella, Missouri is considered to be a *Public Health Hazard* for past, present, and future exposures. The public health hazard classification is used for sites that pose a public health hazard because of the presence of hazardous substances at levels that could result in adverse health effects after long-term exposure. This classification is based on the following conclusions:

1. Asbestos concentrations found in the air inside the building exceed acceptable long-term exposure values. If the facility is allowed to remain in place and continue to deteriorate, migration of asbestos off the property could occur, leading to a potential health hazard for nearby residents.
2. Because of the nature of ACM and the probability of it being disturbed and further disbursed by children during play inside the building, test results may have been higher had activity-based sampling been employed.
3. ACM was found in abundance throughout the building and was found to have migrated outside of the boundaries of the building, but not off the hospital property.
4. The building itself is difficult to secure to prevent further disruption of the deteriorating materials and to prevent community residents from entering the building.

## RECOMMENDATIONS

1. Access to the building should be restricted immediately.
2. In order to prevent future exposures, all ACM should be removed from the building and grounds.
3. Any ACM found on the building grounds or removed from the property should be disposed of properly. It is important that children not be allowed on the site.
4. If the long-term remedy is to remediate the property by removing the building, proper safe guards need to be employed to minimize the transport of dust off-site so as not to expose the adjacent neighborhood.
5. The community should be made aware of the hazard the building poses until such time as the situation can be resolved.

## **PUBLIC HEALTH ACTION PLAN**

This Public Health Action Plan (PHAP) for the Former Cardwell Hospital site contains an explanation of the actions to be taken by the Missouri Department of Health and Senior Services (DHSS), the Agency for Toxic Substances and Disease Registry (ATSDR), and other stakeholders. The purpose of the PHAP is to ensure that this public health consultation not only identifies public health hazards, but provides an action plan to mitigate and prevent adverse human health effects resulting from past, present, and future exposures to hazardous substances at or near the site. Below is a list of commitments of public health actions to be implemented by DHSS, ATSDR, or other stakeholders at the site:

1. DHSS/ATSDR will coordinate with MDNR and EPA to implement the recommendations in this public health consultation.
2. DHSS/ATSDR will coordinate with MDNR and EPA to address community health concerns and questions as they arise and provide necessary community and health professional education.
3. DHSS/ATSDR will update this public health consultation as needed.

### **Preparers of the Report:**

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## CERTIFICATION

This Cardwell Hospital, Stella, Missouri, Public Health Consultation was prepared by the Missouri Department of Health and Senior Services (DHSS) under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with the approved methodologies and procedures existing at the time the health consultation was initiated. The Cooperative Agreement partner completed editorial review.



Technical Project Officer, CAT, CAPEB, DHAC

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.



Team Lead, CAT, CAPEB, DHAC, ATSDR

## References

1. Tetra Tech EM Inc. (2005) Pre-CERCLIS Screening Report, Stella Hospital Site, Stella, Missouri. Superfund Technical Assessment and Response Team. Contract No. 68-S7-01041, Task Order No. 008.27.
2. Contaminants of Potential Concern (COPC) Committee of the World Trade Center Indoor Air Task Force Working Group. (2003) World Trade Center Indoor Environmental Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks.
3. TSCA, Part 763, Subpart E, Appendix A
4. USEPA (2005) <http://www.epa.gov/Region9/toxic/noa/eldorado/pdf/eldorado-asb-flyer-426-final.pdf>
5. <http://www.atsdr.cdc.gov/asbestos/index.html>

**Figure 1. Photo of Former Cardwell Hospital in Stella, MO.**



**Figure 2. Photo of Side Entrance of Former Cardwell Hospital in Stella, MO.**





**Figures 3 and 4. Photos of Asbestos Pipe and Tiles inside the Former Cardwell Hospital, Stella, MO.**



**Table 1. May 2005 Air Sampling Results, Former Cardwell Hospital, Stella, MO**

<b>Sample Number</b>	<b>Sampling Result*</b>	<b>ATSDR CREG†</b>	<b>OSHA‡</b>
A-01	0.006	0.000004	0.1
A-02	0.011	0.000004	0.1
A-03	0.014	0.000004	0.1
A-04	0.013	0.000004	0.1

All values are in F/cc = Fibers per cubic centimeter  
\* Analyzed using Transmission electron microscopy.  
†ATSDR Cancer Risk Evaluation Guides (CREG).