

# Health Consultation

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INTERIOR ALASKA INDOOR SHOOTING RANGE

Unorganized area (no borough) in the Fairbanks Recording District

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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

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## HEALTH CONSULTATION

### INTERIOR ALASKA INDOOR SHOOTING RANGE

Unorganized area (no borough) in the Fairbanks Recording District

Prepared By:

Alaska Department of Health and Social Services  
Division of Public Health, Epidemiology Section  
Environmental Public Health Program  
Under Cooperative Agreement with the  
Agency for Toxic Substances and Disease Registry

## **Summary and Statement of Issues**

This document describes an evaluation of lead exposures among members of a high school rifle team from a community in Alaska's Interior (Community A). Blood lead levels were measured in ten of the 13 youth shooters on the team; five (50%) had elevated blood lead levels. The likely source of their lead exposure is the Community A indoor shooting range where they practice. The Alaska Division of Public Health, Section of Epidemiology, Environmental Public Health Program (EPHP) recommend that the students stop using the indoor shooting range until their blood lead levels return to normal, and pathways of lead exposure have been remedied. The school district serving Community A will conduct a lead risk assessment of the shooting range using a certified contractor, and the shooting range will implement needed improvements to reduce or eliminate lead exposure pathways prior to the 2007-08 shooting season. Dry sweeping as a method of cleaning the shooting range should be prohibited, and youth under the age of 18 years should no longer assist with range cleaning. The Alaska Section of Epidemiology is recommending that blood lead testing become standard practice for all high school small bore rifle team members in Alaska. This blood lead testing should occur at the beginning and end of each regular shooting season, and students with an extended shooting season should be tested a third time at the end of their post-season competition.

## **Background**

### **Site Description and History**

On February 23, 2007, EPHP received a report of an elevated blood lead level in a one year old child from an Interior Alaska community (Community A). During follow-up activities, EPHP learned that the exposed child had an older sibling that participates on a high school rifle team.

Alaska has had a history of elevated lead exposures among school rifle team members that practice and/or compete at indoor ranges [1, 2]. Consequently, the EPHP recommended testing of the sibling on the rifle team for a blood lead level, to help determine whether take-home lead from the sibling's clothing might be a potential source of lead exposure for the young child.

In mid-March 2007 the EPHP learned that the older sibling had been tested, and also had an elevated blood lead level. The EPHP determined that a visit to Community A was warranted in order to investigate whether other school rifle team members might also be at risk of elevated lead exposure.

### **Demographics**

Thirteen students participated in Community A's high school rifle team during the 2006-07 shooting season. These students ranged in age from 14 to 17 years. The indoor shooting range where the team practices is also used by children as young as 8 years old on the weekends, and by other community members who enjoy target shooting. The total population of Community A is approximately 5000 persons.

## **Methods**

On March 29, 2007, a health assessor and a public health nurse from the Section of Epidemiology visited Community A to conduct site investigation activities. The health assessor visited the indoor shooting range and was briefed by the coach about the ventilation system and range cleaning practices. Free blood lead testing was offered to all of the rifle team members and their families, the rifle team coach, and other community members who used the indoor shooting range in Community A.

Eleven blood samples were collected; nine team members, one parent, and the coach. A parent of each student signed a consent form to authorize blood lead testing for their child. One current team member refused blood lead testing, and two former team members failed to present for a test. Each tested person completed a short questionnaire, designed to evaluate potential lead exposures both at the shooting range and elsewhere.

The State of Alaska Department of Health and Social Services, Division of Public Health performed and paid for all aspects of the testing. The blood draws were performed at the Public Health Clinic in the community (State of Alaska Division of Public Health clinic and personnel). The public health nurse, who did the blood draws, is an employee of the Division of Public Health, Section of Epidemiology. The analytical tests on the blood samples were conducted at the Alaska State Public Health Laboratory in Anchorage, using biomonitoring funds appropriated by the Alaska State Legislature. The Alaska State Public Health Laboratory is CLIA (Clinical Laboratory Improvement Act) certified for blood lead testing.

## **Results**

Including the student shooter who was tested prior to the site investigation, a total of five of the ten students tested had blood lead levels greater than 10  $\mu\text{g}/\text{dl}$  (Table 1). Blood lead results for the parent and coach could not be divulged in this report, to protect participant confidentiality.

Blood lead levels in the student team members were highly correlated with two factors gleaned from the questionnaire and site visit records. Those team members who reported shooting the most frequently had higher blood lead levels, and current team members who had been shooting more recently had higher blood lead levels. According to the coach, six former team members had not shot at the range since late November 2006. This group included two team members not tested, and four of the five team members with normal blood lead levels.

All students who completed a questionnaire reported that they had helped to clean the range, and all reported that they had engaged in dry sweeping activities as part of the cleaning process.

## **Discussion**

The Centers for Disease Control and Prevention (CDC) recognized blood lead levels of  $\geq 25$   $\mu\text{g}/\text{dl}$  in adults [3] and  $\geq 10$   $\mu\text{g}/\text{dl}$  in children aged  $\leq 6$  years [4] as levels of concern; no similar level has been set for older children and adolescents. In this evaluation, we considered blood lead levels  $\geq 10$   $\mu\text{g}/\text{dl}$  as “elevated” in the student shooters. In the United States, 95% of youth between the ages of 12-19 years old had blood lead levels less than 3  $\mu\text{g}/\text{dL}$  during a national study conducted in 1999-2002 [5]. Based on the results of this investigation, it is likely that Community A’s indoor shooting range is a source of lead exposure to members of the high school rifle team. The specific deficiencies in the facility’s operation and maintenance that are responsible for the elevated lead exposures have not been pinpointed. A thorough environmental evaluation and lead risk assessment of the shooting range by an EPA/HUD-certified lead inspector is needed to evaluate the ventilation system, maintenance practices and extent of lead contamination.

Dry sweeping of indoor shooting ranges is not an approved method for cleaning an indoor shooting range floor, because this activity disperses lead dust into the air where it can remain suspended for hours. Standard industrial hygiene practices for indoor firing range maintenance indicate that dry sweeping should be prohibited [6]. It has also been recommended that youth under the age of 18 should not participate in range maintenance or clean-up activities, because children and adolescents are at risk for adverse effects from lower levels of lead exposure [2].

Long-term health consequences due to brief blood lead elevations in teenagers are not known at this time. Studies have reported adverse health effects in adults with blood lead levels between 25-40  $\mu\text{g}/\text{dL}$ , including hypertension, subtle or sub-clinical central nervous system deficits, and adverse reproductive outcomes [3]. It is important to remove the students from the lead exposure source until their blood lead levels decline to normal levels. The parents of each student with an elevated blood level have been contacted, and provided medical follow-up instructions consistent with CDC recommendations for managing elevated blood lead levels among young children (Table 1)[7]. Each case will be followed by the EPHP program until blood lead levels return to normal.

## **Child Health Considerations**

In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than are adults from certain kinds of exposure to hazardous substances. Children play outdoors and sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than are adults; this means they breathe dust, soil, and vapors close to the ground. A child’s lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Finally, children are dependent on adults for access to housing, for access to medical care, and for risk identification. Thus adults need as much information as possible to make informed decisions regarding their children’s health.

Children are more susceptible to lead toxicity than adults [8]. Lead can delay or impair brain development in children and adversely affect IQ, and can cause anemia and impaired metabolism of vitamin D. Absorption of lead appears to be higher in children who have low dietary iron or calcium intakes, so a healthy diet is important. Adequate intake of zinc is also important to help protect against health effects from lead exposure.

## **Conclusions**

1. Current design, function, operation and/or maintenance of the Community A indoor shooting range are contributing to unacceptable levels of lead exposure in some range users. Moreover, based on blood lead testing results, some members of the Community A high school rifle team have been exposed to excessive quantities of lead at the Community A indoor shooting range. For these reasons, exposure to lead dust at the Community A indoor shooting range is a current and past Public Health Hazard to people using the indoor shooting range.
2. Remedial measures are needed to reduce pathways of exposure to lead at the Community A indoor shooting range.
3. During the 2006-2007 shooting season, members of the Community A high school rifle team participated in dry sweeping activities to clean the range floor. Dry sweeping activities are a known risk factor for elevated lead exposures at indoor shooting ranges.
4. Members of the Community A high school rifle team that have elevated blood lead levels need medical follow-up, as recommended by CDC, until their blood lead levels return to normal.
5. Excessive lead exposures are a recurring problem among student shooting teams that use indoor ranges in Alaska.

## **Recommendations**

1. An EPA/HUD certified contractor should conduct a comprehensive lead risk assessment of the Community A indoor shooting range to assess the extent of lead contamination in the facility, the effectiveness of the ventilation system, and current cleaning and maintenance protocols. The risk assessment report should include, if found to be necessary, an evaluation and recommendation of personal protective equipment (PPE) appropriate for use in an indoor shooting range to eliminate lead exposure pathways. PPE recommendations such as the use of half-mask respirators, although used as a last resort, should be considered if environmental remediation can not reduce exposure to lead debris to acceptable levels in the shooting range.
2. Implement remediation activities, operations/maintenance practices, and PPE recommendations obtained from the lead risk assessment described in Recommendation #1.
3. Remove student rifle team members from further lead exposure by having them refrain from shooting at the Community A indoor shooting range until pathways of exposure have been remedied, as determined by a comprehensive lead risk assessment described in Recommendation #1.
4. Prohibit dry sweeping as a method to clean the indoor shooting range floor. Do not allow youth under age 18 to assist with cleaning the shooting range.
5. Perform medical follow-up for all youth with elevated blood lead levels in Community A, consistent with CDC guidelines. Family members of student shooters, especially siblings, should consider blood lead screening as a precautionary measure.
6. As standard practice for the sport, perform blood lead testing on all students participating on small bore rifle teams in Alaska. Blood lead testing should be conducted at the beginning and end of each regular shooting season for all team members, and for members with an extended shooting season a third blood lead test should be conducted at the end of their post-season competition.

## **Public Health Action Plan**

### **Actions undertaken:**

- High school rifle team members have been removed from the pathway of lead exposure. They have stopped using the Community A indoor shooting range. The students will not resume their use of the facility until their lead levels have returned to normal, and the problematic pathways of lead exposure have been remedied.
- Blood lead testing was offered to the coach, and to family members of the student shooters. The coach and one parent participated in the testing opportunity. Their results are not reported in this document, in order to protect participant confidentiality.

### **Actions under way:**

- The Section of Epidemiology is participating in medical follow-up activities for children with elevated blood lead levels in Community A, until their blood lead levels return to normal. The Section of Epidemiology has partner relationships with Medical Toxicologists at the Poison Control Center, who are also available to doctors and parents for medical consultation.

### **Actions planned:**

- The School District responsible for the Community A high school will contract with an EPA/HUD certified company to perform a lead risk assessment for the Community A indoor shooting range. The risk assessment will be conducted prior to the beginning of the 2007-2008 small bore rifle season.
- By June 2007, the Section of Epidemiology will contact the Alaska School Activities Association and the State of Alaska Department of Education and Early Development to recommend that blood lead testing become mandatory standard practice for all high school small bore rifle team members in Alaska. Blood lead testing should occur at the beginning and end of each regular shooting season for all shooting team members, and team members with an extended shooting season should be tested a third time at the end of their post-season competition.



**Author of the Report**

Lori A. Verbrugge, Ph.D.  
Department of Health and Social Services  
Division of Public Health  
Section of Epidemiology  
3601 C Street, Suite 540  
Anchorage, AK 99503

**Agency for Toxic Substances and Disease Registry (ATSDR)**

Robert Knowles, M.S., REHS  
Alaska Technical Project Officer

Alan Crawford, REHS/RS  
Technical Project Officer

## References

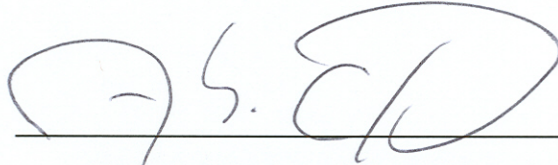
1. Alaska Division of Public Health. School rifle teams exposed to lead at indoor firing ranges. 1-9-2003. Anchorage, AK, Section of Epidemiology. Epidemiology Bulletin.
2. Lynn T, Arnold S, Wood C, Castrodale L, Middaugh J, Chimonas M. Lead exposure from indoor firing ranges among students on shooting teams - Alaska, 2002-2004. MMWR. 2005;54:577-579.
3. Centers for Disease Control and Prevention. Adult blood lead epidemiology and surveillance - United States, 1998-2001. In: Surveillance Summaries, December 13, 2002. MMWR 2002; 51 (No. SS-11):1-10.
4. Centers for Disease Control and Prevention. Screening young children for lead poisoning: guidance for state and local public health officials. Atlanta, GA: US Department of Health and Human Services, CDC; 1997.
5. Centers for Disease Control and Prevention. Third national report on human exposure to environmental chemicals. Atlanta, GA: US Department of Health and Human Services, CDC, National Center for Environmental Health Pub. No. 05-0570, July 2005.
6. Navy Environmental Health Center. Indoor firing ranges industrial hygiene technical guide. Portsmouth, VA: Department of the Navy, Navy Environmental Health Center; 2002. TM6290.99-10 Rev. 1.
7. Centers for Disease Control and Prevention. Managing elevated blood lead levels among young children: Recommendations from the Advisory Committee on Childhood Lead Poisoning Prevention. Atlanta, GA: US Department of Health and Human Services, CDC; 2002.
8. Agency for Toxic Substances and Disease Registry. Draft Toxicological Profile for Lead. Atlanta, GA: US Department of Health and Human Services, Public Health Services; 2005.

**Table 1: Blood lead levels in Community A high school rifle team members ( $\mu\text{g}/\text{dl}$ ), and corresponding relevant medical follow-up recommendations from CDC [7].**

<i>Student</i>	<i>Blood Lead (<math>\mu\text{g}/\text{dl}</math>)</i>	<b>Medical Follow-up Recommended by CDC</b>
A	3.3	Blood lead levels are normal; no medical follow-up needed
B	4.4	
C	5.5	
D	7.8	
E	8.1	
F	14.4	Follow-up blood lead test in 1 to 3 months; repeat until blood lead value is below 10 $\mu\text{g}/\text{dl}$
G	15.8	
H	17.2	
I	24	<ol style="list-style-type: none"> <li>1. Follow-up blood lead test in 1 month; continue blood lead monitoring until blood lead value is below 10 <math>\mu\text{g}/\text{dl}</math></li> <li>2. Complete history and physical exam</li> <li>3. Lab work: hemoglobin or hematocrit, and iron status</li> </ol>
J	36.9	

## Certification

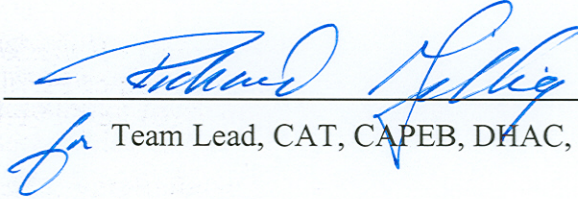
This Health Consultation was prepared by the Alaska Department of Health and Social Services, Division of Public Health, Epidemiology Section, Environmental Public Health Program under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodologies and procedures existing at the time the health consultation was initiated. Editorial review was completed by the Cooperative Agreement partner.



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Technical Project Officer, CAT, CAPEB, DHAC

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



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Team Lead, CAT, CAPEB, DHAC, ATSDR