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Donald R. Stern, M.D., M.P.H., Acting Commissioner
Grayson B. Miller, Jr., M.D., Epidemiologist

Editor: Elizabeth Eustis Turf, Ph.D.
Layout Editor: Vickie L. O'Dell

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Elevated Blood Lead Levels in Virginia's Children*

Background

Although lead poisoning is preventable, it has become one of the most common childhood diseases in the United States today. Lead is a poison that affects virtually every system in the body and is particularly harmful to the developing brain and nervous system of fetuses and young children.[1] Levels once thought to be safe have now been shown to result in an increased chance of neurological disorders. Children with blood lead levels as low as 10 to 20 micrograms per deciliter (µg/dL) have been shown to suffer the adverse effects of decreased intelligence, behavioral disturbances, developmental disabilities, and hematologic disorders.[2]

The key to childhood lead poisoning prevention is the identification of, and subsequent control or elimination of the source of exposure. Potential sources of lead exposure include lead-based paint found in many older homes; contaminated soil or dust stirred by renovations; contaminated water from lead pipes or lead soldered joints; air pollution from vehicle exhaust or lead smelting facilities; contaminated foods; some traditional medicines or imported cosmetics; parental occupations or hobbies involving lead; and some imported varieties of porcelain or pottery. In some instances, multiple sources may be identified as contributing to the problem of elevated blood lead levels.

Young children are at greater risk for lead poisoning than older children or adults. Their bodies absorb more lead which, in turn, has a greater effect on their developing body systems. In addition, typical childhood behavior includes placing a variety of items in the mouth, which makes children more susceptible to swallowing leaded paint chips or dust, or chewing objects contaminated with lead. Unfortunately, the effects of low levels of lead exposure may not be outwardly obvious in children and, as the lead accumulates in the body, symptoms that do occur may be mistaken for other common illnesses. Symptoms of mildly elevated blood lead may include stomachache, irritability, fatigue, vomiting, constipation, headache, sleep disorders, and/or poor appetite.

Universal Screening

The American Academy of Pediatrics (AAP) Committee on Environmental Health has stated that "Lead poisoning can be prevented with routine screening followed by appropriate educational and case management programs."[3] This position is supported by the Centers for Disease Control and Prevention (CDC), which in 1991 published guidelines on preventing childhood lead poisoning through universal screening of blood lead levels in children six months to six years of age.[1] Due to an accumulation of data on the potential problems in children exposed to low levels of lead, the 1991 guidelines lowered the recommended intervention level from 25 µg/dL to 10 µg/dL with varying degrees of medical and/or environmental interventions proposed as the lead concentration increases. (See Summary)

Summary of CDC Childhood Lead Poisoning Prevention Guidelines

- **Virtually all U.S. children are at risk for lead poisoning so universal screening is recommended.**
- **The 1985 intervention level of 25 µg/dL has been revised downwards to 10 µg/dL.**
- **A multitiered approach to followup has been adopted.**
- **If many children in the community have blood lead levels of 10 µg/dL or higher, prevention activities should be initiated.**
- **Interventions for individual children should begin at blood lead levels of 15 µg/dL.**
- **Medical evaluation and environmental investigation and remediation should be done for all children with blood lead levels of 20 µg/dL or higher.**
- **Medical treatment and environmental assessment and remediation should be done for all children with blood lead levels of 45 µg/dL or higher.**

Testing for Serum Lead

The screening test of choice is serum lead measurement because the procedure used to measure erythrocyte protoporphyrin (EP) levels is not considered sensitive enough to identify lead levels below 25 µg/dL of whole blood.

The fingerstick method may be used to measure the lead levels in capillary blood.

If results are 10 µg/dL or above, they should be confirmed with a venous blood test.

If venous results are 15 µg/dL, in children 15 years of age or younger, they should be reported to your local health department.

For further information on testing and recommended interventions, contact your local health department or the Childhood Lead Poisoning Prevention program at 1-800-523-4019 or 786-7367.

The CDC protocol supports initial screening at six months of age if a child is considered to be at a high risk for lead exposure. For all other children, the recommendation is for testing at 12 months and, if resources are available, again at 24 months. Decisions about additional testing are based on previous blood lead level results and the child's risk of exposure. Children are considered as being at high risk if they are between six and 72 months of age and:

- live in or regularly visit a house with peeling or chipping paint built before 1960†,
- live in or regularly visit a house built before 1960† with recent, ongoing or planned renovations,
- have a brother, sister, or playmate being followed or treated for lead poisoning,
- live with an adult whose job or hobby involves lead exposure,
- live near an active lead smelter, battery recycling plant, or other industry involving lead.[1]

† *Houses build prior to 1978 may also contain lead paint.*

Public Health Response

In recognition of childhood lead poisoning as a public health problem, the Virginia Department of Health established a lead poisoning prevention program in the Office of Family Health Services. The program is funded by federal grants and is responsible for coordinating local health departments' education and prevention activities as well as educational efforts to other groups throughout the state. In addition, five cities in Virginia were identified as being at high risk for childhood lead poisoning and qualified for additional federal funds. These five programs are located in the cities of Richmond, Petersburg, Lynchburg, Norfolk, and Portsmouth. A lead poisoning surveillance system was also established, based on an amendment to the Regulations for Disease Reporting and Control that requires physicians, medical care facilities, and laboratories to report elevated blood lead levels in children to the health department.

Since July 1, 1993, any child 15 years of age or younger, found to have a **venous** blood lead level greater than or equal to 15 µg/dL, must be reported to the local health department. The Office of Epidemiology serves as the central location for gathering statewide data, assuring its completeness, maintaining the statewide database, and disseminating information based on the reported data. Reports on children with elevated blood lead levels have been received from a wide network of sources including both private and state laboratories, hospitals, medical clinics, physicians, and local health departments. This article summarizes data based on reports received during the last four quarters, i.e., October 1, 1993 - September 30, 1994. Only incident cases are recorded in the database. Thus, if a child was first reported in 1993 and had follow-up testing performed in 1994, the child would not be re-counted in 1994.

Reported Cases of Elevated Blood Lead Levels in Children in Virginia

During the 12 month period of October 1, 1993 through September 30, 1994, a total of 1019 Virginia children were reported to have blood lead levels of 15 µg/dl or higher. The mean blood lead level was 20.9 µg/dl. More than half of the children reported (577 cases, 56.6%) had lead levels in the 15 - 19 µg/dL range. There were three reported cases in the above 69 µg/dL range (mean blood lead level = 87 µg/dL),

Influenza Update

Since seasonal influenza surveillance began in Virginia on October 2, reports from sentinel physicians have indicated low levels of influenza-like illness and no laboratory confirmed cases of influenza have been detected. Nationwide, reports from state and territorial epidemiologist and from sentinel physicians have also indicated low levels of influenza-like illness. Only two of 2693 specimens submitted to WHO collaborating laboratories have yielded influenza virus (one each from New York and New Mexico).

Although the time of onset of influenza epidemics can vary substantially by year, the pattern observed this year is typical for influenza activity, which usually begins in December and peaks in January or February.

The optimal time for organized vaccination campaigns for persons in high-risk groups is usually from mid-October to mid-November. However, it is appropriate for high risk people and their associates who have not yet been vaccinated to be immunized throughout the influenza season (until April). A person does not have full protection for two weeks or more after vaccination.

Information about influenza surveillance is updated weekly from October through May, and is available by contacting Dr. Craig Conover of the VDH Office of Epidemiology (804-786-6261). National information is available through the CDC Voice Information Service (404-332-4555).

all of whom required immediate medical treatment. Figure 1 shows the number of cases in each of the CDC-recommended intervention ranges and the mean blood level for each group.

The age distribution of reported cases is shown in Figure 2. The mean age of cases was 2.9 years, although children two years of age or younger accounted for 52.2% of the reported cases. Reporting was much less common in children over age five compared to younger children.

Race information is often missing from reports of this condition, especially reports from laboratories to whom race data are not available. For the 12 month period being analyzed, race was unknown for 39.5% of the cases. Among the 613 cases for whom race was reported, blacks accounted for 84.7% (519 cases), whites 14% (86 cases); Asians 0.3% (2 cases); and others 1% (6 cases). Four cases were reported to be of Hispanic ethnicity. Cases were somewhat more likely to be male (586 cases, 57.5%) than female (433 cases, 42.5%).

Reports of elevated blood lead levels were received from all health department planning regions in the state. The distribution of these cases was as follows: Northwest, 38 cases; North, 16 cases; Southwest, which includes the lead prevention program in Lynchburg, 217 cases; Central, which includes the programs in Petersburg and Richmond, 422 cases; and Eastern, which includes the programs in Norfolk and Portsmouth, 326 cases.

Figure 1. Elevated Blood Lead Levels: Ages 0-15 October 1993 - September 1994

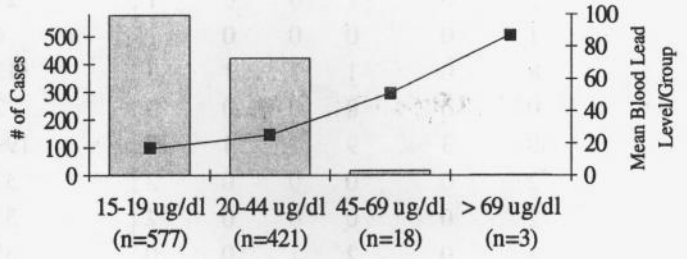
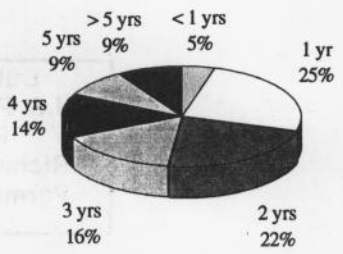


Figure 2. Elevated Blood Lead Levels: Age Distribution



Lead Prevention Program

Detailed information, covering the three month period from July 1, 1994 to September 30, 1994, is available from the five funded lead programs mentioned previously. These data indicate that from 1.4% to 4.4% of all children tested in these programs had confirmed blood lead levels greater than or equal to 15 µg/dL. Forty-eight percent of the confirmed cases (78/164) were less than 36 months of age, 37% were between 36 and 72 months of age, and the age was unknown for the rest. The majority of confirmed cases in these five cities were black (77%), 6% were white, 1% were Asian/Pacific Islanders, with race unknown for 16%. Seventeen percent of the confirmed cases received therapeutic chelation during that three month time period.

As part of the investigation into a case of childhood lead poisoning, there is a thorough environmental assessment of the child's home and/or day care in an attempt to identify the source of the exposure. Sixty-three percent of the premises inspected during this three month time period required remediation of lead hazards. Lead-based paint accounted for 66% of the identified exposures, paint together with a non-paint lead hazard were identified in 18% of the premises, a non-paint hazard was identified in only 1%, and no lead-based hazard could be identified in 15%.

Conclusion

CDC guidelines recommend that blood lead screenings begin at 12 months for most children with repeat testing at 24 months, if resources are available. The age distribution of reported cases indicates that when screenings are performed the guidelines are being followed and elevated levels are being detected early. Upon detection, local health departments can work with the private health care community to ensure appropriate environmental management, nutritional counseling, and educational interventions within the families and possibly within the communities.

Although cases of elevated blood lead levels have been identified in all of the health planning regions, the skewed distribution of reported cases correlates with the areas targeted for additional funds. The identification of large numbers of cases in those areas is probably the result of more than one factor. First, these cities were selected after being identified as high risk locations for lead poisoning. Therefore, the incidence of elevated blood lead levels would be expected to be higher there than in other areas of the state. Second, the influx of supplementary funds provides for increased screening throughout the community, improved educational efforts towards families and health care providers regarding the importance of childhood testing, and consequently, the identification of a greater number of cases. As awareness of the dangers of lead exposure increases, it is hoped that additional funding will become available to ensure screening of all children in Virginia. The resulting data will, in turn, allow for a more detailed examination of the epidemiology of elevated blood levels in children, and be useful in identifying the needs for childhood lead poisoning prevention programs and activities.

References

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2. Merians D, Martin J. Blood lead levels and prevalence rates for children in New Mexico. Epidemiology Report State of New Mexico Department of Health. June 1994.

3. Wical BS. Lead: who bears the burden? Archives of Pediatric & Adolescent Medicine. 1994; 148:760-761.

**Submitted by Lala Wilson, Bureau of Toxic Substances*

Cases of Selected Notifiable Diseases, Virginia, September 1 through September 30, 1994.*

Disease	Total Cases Reported This Month						Total Cases Reported to Date in Virginia		
		Regions							
	State	NW	N	SW	C	E	This Yr	Last Yr	5 Yr Avg
AIDS	126	8	27	7	30	54	859	1368	627
Campylobacteriosis	82	22	16	14	21	9	583	528	500
Gonorrhea†	1214	-	-	-	-	-	10034	8648	12041
Hepatitis A	17	2	7	0	1	7	126	108	157
Hepatitis B	8	0	3	1	2	2	92	109	170
Hepatitis NANB	2	0	0	1	1	0	20	29	35
Influenza	1	0	0	0	0	1	824	1029	902
Kawasaki Syndrome	2	0	1	0	0	1	21	20	20
Legionellosis	1	0	0	0	0	1	6	6	11
Lyme Disease	8	0	1	3	1	3	113	57	80
Measles	0	0	0	0	0	0	2	2	31
Meningitis, Aseptic	38	3	9	5	4	17	190	217	240
Meningitis, Bacterial‡	2	0	0	0	0	2	57	72	101
Meningococcal Infections	2	0	0	0	0	2	53	35	41
Mumps	3	0	2	1	0	0	35	25	65
Pertussis	2	0	0	0	1	1	29	50	25
Rabies in Animals	36	13	1	5	12	5	298	287	220
Reye Syndrome	0	0	0	0	0	0	1	3	2
Rocky Mountain Spotted Fever	3	0	1	1	0	1	15	9	14
Rubella	0	0	0	0	0	0	0	0	0
Salmonellosis	127	27	33	15	25	27	817	721	919
Shigellosis	43	4	14	2	14	9	562	508	296
Syphilis (1° & 2°)†	84	2	0	9	4	69	591	470	579
Tuberculosis	43	7	9	3	13	11	255	309	323

Localities Reporting Animal Rabies: Accomack 5 raccoons; Augusta 1 fox, 1 raccoon, 1 skunk; Campbell 1 skunk; Charles City 1 fox; Chesterfield 2 raccoons; Clarke 1 raccoon; Craig 1 raccoon; Fairfax 1 fox; Frederick 1 raccoon; Halifax 2 raccoons; Hanover 1 raccoon; Henrico 1 raccoon; Nelson 1 bat; Page 1 groundhog; Patrick 1 skunk; Petersburg 1 fox, 1 raccoon; Powhatan 2 skunks; Prince George 1 bat; Rockbridge 1 raccoon, 1 skunk; Rockingham 1 raccoon, 1 skunk; Shenandoah 1 bat, 1 cow; Tazewell 1 dog; Wythe 1 raccoon.

Occupational Illnesses: Asbestosis 51; Carpal Tunnel Syndrome 35; Coal Workers' Pneumoconiosis 28; De Quervain's Syndrome 1; Lead Poisoning 1; Loss of Hearing 13; Silicosis 1.

*Data for 1994 are provisional.

†Total now includes military cases to make the data consistent with reports of the other diseases.

‡Other than meningococcal.

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