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U.S. CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, D.C. 20207

Report on Lead in Vinyl Miniblinds

Thank you for your request to the Commission. Enclosed are copies of the memoranda and reports reviewing the Commission's investigation of the lead poisoning hazard presented by imported non-glossy vinyl miniblinds, including a section containing questions and answers about "Lead in Miniblinds." The cover page contains a complete index of the records.

Processing this request, performing the file searches and preparing the information, cost the Commission $50.00. In this instance, we have decided to waive all of the charges. Thank you for your interest in consumer product safety. Should you have any questions, contact us by letter, facsimile (301) 504-0127 or telephone (301) 504-0785.

Sincerely,

Todd A. Stevenson

Todd A. Stevenson
Deputy Secretary and
Freedom of Information Officer
Office of the Secretary

Enclosures

U.S. CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, D.C. 20207
September 20, 1996

LEAD POISONING HAZARD FROM IMPORTED VINYL MINIBLINDS

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CPSC Press Release and Miniblind Report

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   - Memorandum dated September 18, 1996, to Ronald Medford, Director, Office of Hazard Identification & Reduction from Mary Toro, Compliance Officer, Office of Compliance - *Transmittal of Miniblind Summary Table*

   - Memorandum dated July 24, 1996, to Mary Toro, Compliance Officer, Office of Compliance from Brian Lee, PhD DABT, Toxicologist, Division of Health Effects - *Evaluation of lead (Pb) in miniblinds reports from Arizona, North Carolina and Virginia*

   - Memorandum dated July 31, 1996, to Mary Ann Danello, PhD, Associate Executive Director for the Directorate for Epidemiology and Health Sciences from Brian C. Lee, PhD DABT, Toxicologist, Division of Health Effects - *Health hazard assessment procedure for lead (Pb) dust from vinyl miniblinds*

   - Memorandum dated June 14, 1996, to Alan Schoem, Executive Assistant, Office of Compliance from Lori Saltzman, MS, Senior Advisor, Directorate for Epidemiology and Health Sciences and Celestine Trainor, Engineering Psychologist, Directorate for Engineering Sciences - *Specification Limit for Lead in Plastic Miniblinds*

3. Questions and Answers for Lead in Miniblinds Prepared by CPSC Staff.

September 20, 1996 TSt
CPSA Section 6(b) Cleared
No Manufacturers, Private Labelers,
Importers Identified

News from CPSC

U.S. Consumer Product Safety Commission

Office of Information and Public Affairs Washington, D.C. 20207

For Immediate Release
June 25, 1996
Release # 96-150

Contact: Kathleen Begala
(301) 504-0580 Ext. 1193

CPSC Finds Lead Poisoning Hazard for Young Children in Imported Vinyl Miniblinds

WASHINGTON, D.C.—After testing and analyzing imported vinyl miniblinds, the U.S. Consumer Product Safety Commission (CPSC) has determined that some of these blinds can present a lead poisoning hazard for young children. Twenty-five million non-glossy, vinyl miniblinds that have lead added to stabilize the plastic in the blinds are imported each year from China, Taiwan, Mexico, and Indonesia.

CPSC found that over time the plastic deteriorates from exposure to sunlight and heat to form lead dust on the surface of the blind. The amount of lead dust that formed from the deterioration varied from blind to blind.

In homes where children ages 6 and younger may be present, CPSC recommends that consumers remove these vinyl miniblinds. Young children can ingest lead by wiping their hands on the blinds and then putting their hands in their mouths. Adults and families with older children generally are not at risk because they are not likely to ingest lead dust from the blinds.

Lead poisoning in children is associated with behavioral problems, learning disabilities, hearing problems, and growth retardation. CPSC found that in some blinds, the levels of lead in the dust was so high that a child ingesting dust from less than one square inch of blind a day for about 15 to 30 days could result in blood levels at or above the 10 microgram per deciliter amount CPSC considers dangerous for young children.

"Some of the vinyl blinds had a level of lead in the dust that would not be considered a health hazard, while others had very high levels," said CPSC Chairman Ann Brown. "Since consumers cannot determine the amount of lead in the dust on their blinds, parents with young children should remove these vinyl miniblinds from their homes."

CPSC asked the Window Covering Safety Council, which represents the industry, to immediately change the way it produces vinyl miniblinds by removing the lead added to stabilize the plastic in these blinds. Manufacturers have made the change and new miniblinds

-more-without added lead should appear on store shelves beginning around July 1 and should be widely available over the next 90 days.

Stores will sell the new vinyl blinds packaged in cartons indicating that the blinds are made without added lead. The cartons may have labeling such as "new formulation," "non-leaded formula," "no lead added," or "new! non-leaded vinyl formulation." New blinds without lead should sell in the same price range as the old blinds at about $5 to $10 each.

CPSC recommends that consumers with young children remove old vinyl miniblinds from their homes and replace them with new miniblinds made without added lead or with alternative window coverings. Washing the blinds does not prevent the vinyl blinds from deteriorating, which produces lead dust on the surface.

The Arizona and North Carolina Departments of Health first alerted CPSC to the problem of lead in vinyl miniblinds. CPSC tested the imported vinyl miniblinds for lead at its laboratory.

The laboratories of NASA's Goddard Space Flight Center and the Army's Aberdeen Test Center used electron microscope technology to confirm that as the plastic in the blinds deteriorated, dust formed on the surface of the blind slats. This testing also established that the dust came from the blinds and not from another source. CPSC laboratory tests confirmed that this dust contained lead.

"This lead poisoning is mainly a hazard for children ages 6 and younger," said Chairman Brown. "Adults and older children generally are not at risk because they are not likely to ingest lead dust from the blinds."

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U.S. CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, D.C. 20207

September 19, 1996

REPORT ON
LEAD IN VINYL MINIBLINDS

Attached is the Consumer Product Safety Commission's report of its investigation of the lead poisoning hazard presented by imported non-glossy vinyl miniblinds. The report includes the following material:

- o September 18, 1996, report of the CPSC Health Sciences Laboratory's testing and analyses of vinyl miniblinds.
- o A summary data table which presents the CPSC's results of the level of lead in the new and used vinyl miniblinds tested, the level of lead in the dust of those miniblinds, and the estimated square inches of dust from the blinds that young children would have to ingest each day for 15 to 30 days to result in elevated blood levels that are a health concern.
- o A CPSC staff review of data from the Arizona and Virginia Departments of Health Services and the North Carolina Department of Environment, Health, and Natural Resources to determine whether sources of lead dust on the miniblinds reported by those states was the likely source of lead posioning for children living in homes with those miniblinds.
- o Procedures for determining the health hazard associated with lead dust from vinyl miniblinds.

The report shows:

- o New vinyl miniblinds tested contained various levels of lead ranging from 0.77 to 1.23 percent by weight. Lead is added to the miniblinds as a stabilizer.
- o The plastic in both new and used miniblinds degrades when exposed to ultraviolet rays and heat.
- o As the plastic blinds degrade, lead dust forms on the

surface of the blinds. The lead dust comes from the lead used as a stablizer.

- The amount of lead dust formed on the surface of the blinds varies from blind to blind.

- The levels of lead on the surface of some of the residential (used) miniblinds and blinds subjected to accelerated aging were high enough to present a lead poisoning hazard to children 6 years of age and younger if they ingested small amounts of dust from the blinds over a short period of time.

- Some states have identified children with elevated blood lead levels attributable to vinyl miniblinds.

- Washing vinyl miniblinds does not prevent them from deteriorating. After accelerated aging, the levels of lead on the surface of the blinds were as high as they were before washing.

United States
CONSUMER PRODUCT SAFETY COMMISSION
Washington, D.C. 20207

SEP 18 1996

MEMORANDUM

TO: Ronald L. Medford, Director, Office of Hazard Identification and Reduction

THROUGH: Andrew G. Ulsamer, Ph.D., Associate Executive Director, Laboratory Sciences AGU

FROM: Warren K. Porter, Jr., Director, Health Sciences Laboratory WKP

SUBJECT: Miniblind Lead Investigation

Introduction:

Laboratory and descriptive reports from the States of Arizona and North Carolina indicated the presence of dust containing lead on miniblinds made of polyvinyl chloride (PVC). In some instances children in the houses where the miniblinds were installed had elevated blood lead concentrations. A review of these data (B.C. Lee, 1996a, 1996b) indicate that where household dust was obtained and analyzed, the only apparent source of lead was the miniblinds. Dust analyzed from other areas of the houses showed the presence of little or no lead. Due to health concerns, the Health Sciences Laboratory (LSHL) began an analysis of the total lead concentrations in miniblinds, lead availability on the surface of the blinds, limited accelerated aging, and microscopic studies of miniblinds. The lead is a component of stabilizers added to polyvinyl chloride polymer compounds. The lead stabilizers provide stability against heat degradation. Preventing the decomposition of the polyvinyl chloride is necessary to maintain the durability of the miniblind.

The blinds studied consisted of both new and used blinds. The new blinds were purchased from local retail stores while the used blinds consisted of the samples received from the state of North Carolina Division of Environmental Health and from members of the CPSC staff.

Methods:

Total lead concentrations in the miniblinds were found by removing fine shavings from the blind with a sharp knife or scalpel. Analysis of the shavings as described in the Association of Official Analytical Chemists 974.02 (AOAC, 1990) provided the total lead concentration in the miniblind

To determine the amount of surface lead, LSHL personnel wiped the surface of the blinds with a piece of moist filter paper to remove loose dust from the surface of the blinds. The filter paper was subsequently analyzed for lead using AOAC 974.02. Initially about one square foot of blind surface was wiped ten times with a single filter paper. In some cases the filter paper began to tear. Thus, the procedure was modified by wiping the convex surface twice with a single piece of filter paper and repeating the double wiping with fresh filter paper an additional four times. The total number of passes was ten. The wiping procedure described above was then repeated on the concave surface. Further when the surface area wiped was reduced from one square foot to

24 to 36 square inches (one slat), the amount of lead removed was easily detected by the inductively coupled plasma spectrophotometer (ICP) used for quantitation. Thus the reduced area was adopted as standard to increase efficiency and to reduce potential errors involved with serial dilutions of the samples. Initially, when a single filter paper wipe (10 times on a given area) was used, the wipings were taken in duplicate. One set was analyzed for total lead according to AOAC 974.02, and the second set was analyzed for extractable lead using dilute hydrochloric (0.07 N) acid for 6 hours at 37°C. The extractable lead procedure evaluated whether the lead in the easily removed surface dust was potentially released in the stomach. The procedure consists of extraction of the filter paper wipes with 25 ml of 0.07 N HCl. The extraction with 0.07 N HCl at 37°C, under gentle agitation, lasted for a total of 6 hours. After 1 hour the acid was replaced with fresh acid, extraction continued for 2 hours, the acid was again replaced and the extraction continued for the final 3 hours. The sum of the mass of lead released with the three extracts was reported as the extractable lead. The data obtained from each of the modifications is described in the results section.

Accelerated aging of blinds was done to determine if clean, new or used blinds would exhibit deterioration upon exposure to 340 ηm ultra violet (UV) radiation and heat (50-55°C). The exposure duration was 8 weeks with samples being removed for analysis of surface lead approximately every 2 weeks. The exposure consisted of a continuously cycling sequence of 6 hours of heat (50 to 55 °C) and UV and 6 hours at room temperature and no UV radiation for the eight week duration. Prior to exposing the samples, they were thoroughly cleaned by rinsing with deionized water and wiping with filter paper. After cleaning the samples were analyzed for surface lead using the wiping procedure described above. Exposure was done in a Q-Panel QUV Accelerated Weathering Tester. A general description of the equipment and testing procedure is given in ASTM G53.

Two new and four used miniblinds were scanned by scanning electron microscopy to determine if there were differences in particle morphology and elemental composition between new and used blinds. This phase of the work was done by the National Aeronautics and Space Administration and by the Department of Defense, U.S. Army Aberdeen Test Center.

Results:

Total Lead:

The analysis of the blinds consisted of determining the lead concentration of the slats in the miniblinds and determination of the amount of lead that could be easily removed by wiping the surface of the miniblinds. Analysis for total lead was repeated four times on the same spot on the blind. The scraping procedure resulted in PVC compound being obtained from successively deeper regions of the miniblind. The scrapings were then digested in concentrated nitric acid for 4 to 6 hours followed by dilution with water. The lead determination was made using the ICP. The data in Table 1 show that the concentration of lead in new miniblinds averaged 1.01 percent by weight (range 0.77 to 1.23 percent by weight). In used blinds (Table 2) that ranged in age from 2 to 20 years, the average lead concentration was 0.90 percent by weight (range 0.32 to 1.21 percent by weight). The data (Tables 3 and 4) show that the concentration of lead remained constant throughout the thickness of the blind in 21 blinds. Thus, the additional 26 miniblinds analyzed were lightly scraped to remove surface material and then a single sample of scrapings was taken and analyzed for total lead in the miniblind.

Surface Lead:

The amount of easily available surface lead was determined by both digestion with concentrated nitric acid and by extraction of a second set of wipes with 0.07 Normal HCl. The extraction with 0.07 N HCl was done to simulate the action of gastric fluid on any ingested dust. The digests and extracts were analyzed for lead with an ICP. A comparison of the data from the total digestion and from the extraction indicated that there was little difference between the two techniques (Table 5 and Figure 1). That is the extraction with hydrochloric acid removed as much lead as the more vigorous digestion with nitric acid (a regression analysis showed a slope of 0.89 and a coefficient of 0.92). Thus, further experiments used only the nitric acid digestion since that technique allowed more samples to be analyzed.

The average of the sum of the five wipes from the concave and convex surfaces is reported as the total easily available lead. Tables 1 and 2 present summary data for available lead from new and used blinds. These data are the average of the surface lead from both convex and concave sides of the blinds. For new blinds the wipings averaged 0.37 $\mu g/in^2$ (range 0.05 to 1.03 $\mu g/in^2$). For used blinds the wipings averaged 20.20 $\mu g/in^2$ (range 0.28 to 416.02 $\mu g/in^2$). The average surface lead for all used blinds, except for the one blind that had 416.02 $\mu g/in^2$, was 7.44 $\mu g/in^2$ (range 0.28 to 51.45 $\mu g/in^2$). Tables 3 and 4 report the data from individual wipes for new and used blinds on both the convex and concave surfaces. The data also show that in some instances the convex or concave side of slats from used blinds have dramatically different amounts of surface lead present. Some examples of these differences are 96-800-2235, 96-792-0490#2, #3, #4, 96-800-2236, and 96-800-2238. They also provide the data on which the wiping and scraping method was developed.

The blind that had the highest surface lead (416 and 364 $\mu g/in^2$ average surface lead levels on two different slats) had only 9.55 $\mu g/in^2$ on the bottom slat of the same blind. That slat had received no direct exposure to strong light due to the extra slats that were stacked one upon another at the bottom of the blind. Further, the color of the bottom slat from this particular blind was white while the slats that had been exposed to light were an ivory to tan color. The differences in surface lead and color suggest deterioration of the slats due to ambient exposures to sunlight and heat. Unfortunately, the amount of exposure this blind and all used blinds analyzed had received could not be reliably determined. In some cases, the direction they faced (north, south, etc.) was known but the amount of shading they received from roof overhangs or trees was not documented and actual hours of exposure were not available.

The Laboratory Sciences staff conducted additional experiments to more firmly establish the surface lead as being a result of the deterioration of the blind with the lead stabilizers becoming available on the surface. The duration of the exposure was eight weeks with samples removed for analysis about every two weeks. Thus, one new and one used blind were initially rinsed and wiped as described in the methods section, to yield surface lead levels of about 1-3 µg/in². The data show that as exposure to cycles of UV (340 ηm) and heat (50°C) continue, the amount of surface lead that is available from either a new or a used blind increases (Table 6 and Figure 2). The blinds after two, four, six, and eight weeks showed surface lead increasing from 9 µg/in² to 36 µg/in² for the new blind, and 9 µg/in² to 74 µg/in² for the used blind. Further both blinds began to noticeably discolor with increasing exposure time. This experiment was expanded upon by exposing four new blinds to the previously described UV/heat sequence. Again significant increases in surface lead and discoloration of the blinds resulted from the deterioration of the blind (Table 7 and Figure 3).

Scanning Electron Microscopy:

Preliminary data received from the scanning electron microscopy (SEM) studies indicates the material loosely bound on the surface of the blind is similar to the material in the intact blind slat. This similarity includes elemental composition and, visually, the distribution of particle sizes removed by carbon tape lift off from both new and used blinds. Further a comparison of the images of the slat material shows the used blind to be "rougher." That is the number of particles that appear to be sitting on the surface is greater than seen with a new blind.

Conclusions:

This study shows that miniblinds manufactured from PVC contain about one percent lead. Further analysis showed the blinds had up to 416.02 µg/in² of lead in an easily removed surface layer. Upon accelerated aging, the blinds showed deterioration both visibly through discoloration and through an ever increasing amount of surface lead with increasing exposure. SEM images show the similarity of the easily removed particles on the surface of a used blind, both in size and elemental composition to particles in the bulk of the intact slat. This strongly indicates that the source of the lead is through gradual erosion of the PVC. This deterioration allows a build up of the fillers, pigments and lead containing stabilizers as a loosely bound layer on the surface of the blind. That layer may lead to ingestion of lead containing material upon handling the surface of the blinds. Such ingestion of lead, which is soluble and if done frequently, could lead to elevation of blood lead levels. In addition, the accelerated aging study demonstrated the deterioration of blinds that underwent cyclical exposure to UV light and heat. The deterioration, seen with accelerated aging, cannot be directly correlated to exposure times under environmental conditions. The continued deterioration after washing or other cleaning suggests that these procedures are not appropriate for elimination of potential exposure to lead.

Acknowledgements:

This report would not have been possible without the expertise, cooperation, and dedicated effort of the Health Sciences Laboratory Staff. In Particular Bhwanji K. Jain, Shing-Bong Chen, and Bharat Bhooshan provided the expertise and considerable effort in development of methods and analysis of the samples.

References

1. Memorandum from Brian C. Lee to Mary Ann Danello, July 31, 1996, *Health Hazard Assessment Procedure for Lead Dust from Vinyl Miniblinds.*

2. Memorandum from Brian C. Lee to Mary Toro, July 24, 1996, *Evaluation of Lead in Miniblinds Reports from Arizona, North Carolina, and Virginia*

3. Method 974.02, Lead in Paint, *Official Methods of Analysis,* Association of Official Analytical Chemists, Fifteenth Edition, Ed. Kenneth Helrich, 1990.

Table 1. New Miniblinds, Total Lead and Surface Lead

Sample #	Color	Origin	Lead in Slat (% by Weight)	# wipes[1]	Surface Lead[2] (ug/in^2)
96-792-0482	Alabaster	Unknown	0.96	10	0.27
96-792-0483	Glossy White	Unknown	0	ND[3]	ND[3]
96-792-0484	Glossy White	Unknown	0	ND[3]	ND[3]
96-800-2123	Rose	China	1.04	5x2	0.37
96-800-2124	Vanilla	China	1.23	5x2	0.8
96-800-2125	White	China	1	5x2	1.02
96-800-2126	Misty Rose	China	1.23	4x2	0.48
96-800-2127	Alabaster	China	1.23	4x2	0.55
96-800-2128	Slate Blue	China	1	4x2	0.82
96-800-2229	Ivory	China	1.03	10	0.27
96-800-2230	Rose	China	0.77	10	0.11
96-792-0491#1	Creamy Apricot	Mexico	0.93	4x2	0.13
96-792-0491#2	Creamy Apricot	Mexico	0.95	4x2	0.15
96-800-2225	Blue	Taiwan	0.89	10	0.05
96-800-2226	White	Taiwan	0.79	10	0.08
96-800-2228	Green	Taiwan	0.91	10	0.14
96-800-2232	Ivory	Taiwan	1.06	10	0.32
96-800-2233	Blue	Taiwan	1.07	10	0.33

Slat Composition:		Wipings	
Avg % Pb =	1.00	Avg ug/in^2	0.37
Max % Pb =	1.23	Max	1.03
Min % Pb =	0.77	Min	0.05
Number =	18.00		

[1] The total number of wipes is equal to the 10 or to the product indicated. When more than one filter paper was used, the number of filters is the first number of the product, 4 or 5, the number of wipes per filter was always 2.

[2] The total surface lead in the wipes is the average of the total of all wipes from the convex and concave sides of the slat. That is the total of sum of the lead from the wipes of the convex side plus the sum of the lead from the wipes of the concave side divided by two.

[3] ND = Not Done

Table 2. Used Miniblinds, Total and Surface Lead

Sample #	Color	Origin	Facing	Lead In Vinyl (% by Weight)	#Wipes[1]	Surface Lead (ug/in²)
96-792-0490#1	White	China	South	0.66	5x2	3.96
96-792-0490#2	White	China	South	0.67	5x2	3.48
96-792-0490#3	White	China	South	0.67	5x2	3.6
96-792-0490#4	White	China	South	0.75	5x2	3.73
96-800-2227	Ivory	China		0.85	10	21.86
96-792-0485#1	Ivory	Taiwan	West	0.98	10	0.53
96-792-0485#2	Ivory	Taiwan	West	1.10	10	0.42
96-792-0486#1	Ivory	Taiwan	Southern	0.96	10	0.50
96-792-0486#2	Ivory	Taiwan	Southern	1.11	10	3.30
96-792-0487	Beige	Taiwan	West, 20 yrs	1.10	10	1.86
96-792-0488	White	Taiwan		1.06	2x5	10.16
96-792-0492#1	Ecru	Taiwan	West;	1.10	5x2	3.75
96-792-0492#2	Ecru	Taiwan	West;	0.91	5x2	1.82
96-792-0492#3	Ecru	Taiwan	West;	0.90	5x2	1.14
96-800-2234	White	Taiwan		1.21	2x5	1.00
96-490-0825#1	Blue	Unknown	S. East	0.88	10	2.18
96-490-0825#2	Light Green	Unknown	Northwest	0.86	10	2.14
96-793-0167#1	White	Unknown	East	0.96	10	0.28
96-793-0167#2	White	Unknown	North	0.82	10	0.50
96-793-0167#3	White	Unknown	North	0.82	10	1.20
96-793-0167#4	White	Unknown	West	0.81	10	0.64
96-800-2235	White, Slat 1	Unknown	Unknown	0.84	4x2	46.02
96-800-2236	White, Slat 1	Unknown	Unknown	0.32	4x2	416.02

Table 2 (Continued). Used Miniblinds, Total and Surface Lead

Sample #	Color	Origin	Facing	Lead In Vinyl (% by Weight)	#Wipes[1]	Lead (ug/in²)
96-800-2237	White	Unknown	S. East	1.01	4x2	7.67
96-800-2238	Ivory	Unknown	Unknown	0.62	5x2	51.45
96-896-7504#1	Pink	Unknown	North#1	1.16	10	1.82
96-896-7504#2	Pink	Unknown	North#2	0.97	10	4.96
96-896-7505#1	Beige	Unknown	South#1	0.99	10	6.26
96-896-7505#2	Beige	Unknown	South#2	0.81	10	22.81
96-860-5777#1	Ivory	Taiwan	Unknown	1.02	5x2	3.53
96-860-5777#2	Ivory	Taiwan	Unknown	0.96	5x2	8.88
96-860-5777#3	Ivory	Taiwan	Unknown	1.01	5x2	5.01

Vinyl Composition	
Avg % Pb =	0.90
Max % Pb =	1.21
Min % Pb =	0.32
Number =	32.00

Wipings	ug/sq. in.
Avg =	7.44
Max =	416.03
Min =	0.28

Table 3. Comparison of Convex and Concave Sides of Slats from New Blinds

					Filter Paper Number, 2 wipes per filter paper (μg/in²)					
Sample Number	Color/Source	%Pb in Slat		Surface	1	2	3	4	5	Total Surface Lead
96-800-2123	Rose	1.04		concave	0.21	0.11	0.08	0.04	0.01	0.45
	China			convex	0.23	0.05	0.01	0.00	0.00	0.29
96-800-2124	Vanilla	1.23		concave	0.55	0.13	0.11	0.08	0.04	0.91
New	China			convex	0.33	0.14	0.09	0.07	0.05	0.68
96-800-2125	White	1.00		concave	0.35	0.11	0.11	0.16	0.10	0.83
New	China			convex	0.44	0.25	0.26	0.15	0.12	1.22
96-800-2126	Misty Rose	1.23		concave	0.19	0.08	0.06	0.08	0.05	0.46
	China			convex	0.21	0.10	0.09	0.06	0.03	0.49
96-800-2127	Alabaster	1.23		concave	0.25	0.15	0.09	0.08	0.07	0.64
	China			convex	0.20	0.10	0.08	0.05	0.03	0.46
96-800-2128	Slate Blue	1.00		concave	0.39	0.23	0.07	0.06	0.06	0.81
				convex	0.29	0.17	0.11	0.13	0.12	0.82
96-792-0491#1	Beige	0.93		concave	0.13	0.02	nd	nd	nd	0.15
	Mexico			convex	0.09	0.01	0.00	nd	nd	0.10
96-792-0491#2	Beige	0.95		concave	0.13	0.05	0.01	nd	nd	0.19
	Mexico			convex	0.09	0.03	nd	nd	nd	0.12
Initial experiments with 1 filter paper, 10 passes per wipe.		Slat PB content	Scraping Number				HNO$_3$ Digest[1]	0.07 N HCL Extraction[1]		
		Average %	1.00	2.00	3.00	4.00	μg/in²	μg/in²		
96-800-2232	Ivory	1.06	1.07	0.96	1.14	1.06	0.30	0.29		
	Taiwan						0.34	0.30		
96-800-2233	Blue	1.07	1.16	1.10	0.91	1.10	0.34	0.46		
	Taiwan						0.32	0.38		
96-800-2225	Blue	0.89	0.89	0.90	0.89	0.89	0.04	0.08		
	Taiwan						0.06	0.07		
96-800-2226	White	0.79	0.80	0.76	0.79	0.80	0.10	0.07		
	Taiwan						0.05	0.06		
96-800-2228	Hunter Green	0.91	0.84	0.98	0.88	0.92	0.10	0.09		
	Taiwan						0.18	0.22		
96-800-2229	Ivory	1.03	1.05	0.98	1.04	1.04	0.25	0.33		
	China						0.28	0.35		
96-800-2230	Rose	0.77	0.75	0.79	0.77	0.78	0.13	0.22		
	China						0.09	0.14		
96-792-0482		0.95	0.91	0.91	0.99	1.01	0.27	0.23		
96-792-0483	Blind Contained no lead, no further analysis done.									
96-792-0484	Blind Contained no lead, no further analysis done.									

[1] These wipes from these samples were both digested in concentrated nitric acid and a second set of wipes extracted with 0.07 N HCl to simulate gastric contents. Analyses were run in duplicate.

nd = None Detected

Table 4. Comparison of Convex and Concave Sides of Slats from Used Blinds

Sample Number	Color/Source	%Pb in Slat	Scraping Number				Total Surface Lead ($\mu g/in^2$)	
			1	2	3	4	HNO_3 Digest	0.07 HCl Extract
96-800-2227	Ivory	0.85	0.94	0.84	0.80	0.82	18.94	19.40
	China						24.78	20.96
96-793-0167#1	East	0.96	0.93	1.00	0.97	0.96	0.28	0.24
96-793-0167#2	North	0.81	0.82	0.80	0.80	0.86	0.50	0.27
96-793-0167#3	North	0.81	0.79	0.78	0.83	0.86	1.35	1.87
	All 0167 White						1.05	1.98
96-793-0167#4	West	0.81	0.76	0.81	0.84	0.82	0.57	1.07
	All 0167 White						0.70	0.80
96-896-7504#1	North		1.23	1.14	1.14	1.15	1.94	1.71
	Pink						1.70	4.91
96-896-7504#2	North #2	0.97	1.02	0.96	0.97	0.92	4.74	8.11
	Pink						5.19	7.25
96-896-7505#1	South	0.99	1.07	0.91	0.97	0.99	8.35	4.16
	Beige						4.18	4.64
96-896-7505#2	South	0.81	0.80	0.83	0.80	0.79	26.18	26.67
	Beige						19.44	28.85
96-490-0825#1	South East	0.88	0.90	0.89	0.81	0.93	1.82	2.76
	Blue						2.55	2.72
96-490-0825#2	North West	0.87	0.86	0.82	0.89	0.89	1.65	5.50
	Light Green						2.62	4.82
96-792-0485#1	West	0.99	0.87	1.04	0.99	1.04	0.46	0.17
	Ivory						0.60	0.55
96-792-0485#2	West	1.10	1.08	1.08	1.07	1.15	0.43	0.45
	Ivory						0.41	0.42
96-792-0486#1	Ivory	0.96	0.93	0.97	1.00	0.94	0.45	0.42
	Taiwan						0.58	0.41
96-792-0486#2	Ivory	1.11	1.04	1.23	1.02	1.15	2.88	1.87
	Taiwan						3.73	1.83
96-792-0487	Beige	1.10	1.19	1.03	1.07	1.11	1.68	1.33
	Taiwan						2.03	1.45

4 or 5 Papers 2 wipes/paper, 8 or 10 Wipes Total				Filter Paper Number (2 wipes per filter paper)					Total Surface Lead ($\mu g/in^2$)
			Surface	1	2	3	4	5	
96-800-2235	White	0.84	concave	56.31	15.04	2.80	1.08		75.23
			convex	5.00	6.75	3.88	1.18		16.81
96-800-2235	Duplicate	1.07	concave	15.26	11.96	4.75	1.66	2.16	35.79
	Middle Slat		convex	0.99	1.58	0.34	0.45	0.28	3.64
96-800-2235	Bottom Slat	1.17	concave	1.26	0.87	0.29	0.24	0.00	2.66
			convex	1.10	0.79	0.40	0.24	0.15	2.68
96-800-2237	White		concave	3.08	3.56	1.67	1.54		9.85
			convex	2.11	1.36	0.57	1.44		5.48

Table 4. Comparison of Convex and Concave Sides of Slats from Used Blinds Continued

Sample Number	Color/Source	%Pb in Slat	Surface	Filter Paper Number (2 wipes per filter paper) 1	2	3	4	5	Total Surface Lead µg/in²
96-792-0490#1	White, South	0.66	concave	2.19	0.71	0.30	0.20	0.13	3.53
	China		convex	1.95	0.98	0.61	0.54	0.32	4.40
96-792-0490#2	White, South	0.67	concave	0.97	0.43	0.25	0.10	0.08	1.83
	China		convex	2.76	0.83	0.65	0.55	0.33	5.12
96-792-0490#3	White, South	0.67	concave	1.00	0.39	0.14	0.11	0.07	1.71
	China		convex	2.56	1.19	0.69	0.54	0.50	5.48
96-792-0490#4	White, South	0.75	concave	1.10	0.44	0.16	0.13	0.08	1.91
	China		convex	2.55	1.65	0.65	0.30	0.39	5.54
96-792-0492#1	Ecru	1.10	concave	1.48	1.41	0.48	0.28	0.08	3.73
	Taiwan		convex	1.51	1.48	0.46	0.26	0.05	3.76
96-792-0492#2	Ecru	0.91	concave	0.72	0.25	0.08	0.03	0.03	1.11
	Taiwan		convex	1.00	0.82	0.34	0.31	0.06	2.53
96-792-0492#3	Ecru	0.90	concave	0.62	0.14	0.10	0.03	0.02	0.91
	Taiwan		convex	0.97	0.25	0.10	0.04	0.00	1.36
96-800-2238	Ivory	0.62	concave	0.36	0.22	0.14	0.12	0.11	0.95
			convex	40.32	29.27	13.49	10.67	8.19	101.94
96-860-5777#1	Ivory	1.02	concave	1.37	1.11	0.79	0.37	0.30	3.94
	Taiwan		convex	1.23	0.59	0.45	0.59	0.25	3.11
96-860-5777#2	Ivory	0.96	concave	4.65	2.73	1.96	1.00	0.68	11.02
	Taiwan		convex	1.49	1.95	1.16	1.29	0.85	6.74
96-860-5777#3	Ivory	1.01	concave	1.52	2.07	1.35	0.99	0.70	6.63
	Taiwan		convex	0.76	0.73	1.06	0.39	0.44	3.38
96-800-2236	white	0.32	concave	178.43	141.60	91.33	85.56		496.92
			convex	183.91	80.04	50.39	20.79		335.13
96-800-2236	Duplicate	0.59	concave	246.34	119.12	76.08	24.17	10.52	476.23
			convex	173.86	47.76	18.79	8.38	3.65	252.44
96-800-2236	Bottom Slat		concave	5.86	2.46	1.36	0.88	0.74	11.30
			convex	2.86	1.15	1.57	1.24	1.00	7.82
				Wipe 1	Wipe 2	Total Lead			0.07 N HCl Extractable Lead
2 Papers/blind, 5 Wipes per Paper, 10 Wipes Total									
96-792-0488	White	1.06		7.16	2.84	10.00			10.88
	Taiwan			8.07	2.24	10.31			11.88
96-800-2234	White	1.21		0.46	0.22	0.68			1.64
	Taiwan			0.84	0.47	1.31			1.94

Table 5. Comparison of Total lead by HNO_3 Digestion and Lead by Extraction with 0.07 N HCl

Sample Number	Total Lead, HNO_3 Digestion	Extractable Lead, 0.07 N HCl
New Blinds		
96-792-0482	0.27	0.23
96-800-2232	0.30	0.29
	0.34	0.30
96-800-2233	0.34	0.46
	0.32	0.38
96-800-2225	0.04	0.08
	0.06	0.07
96-800-2226	0.10	0.07
	0.05	0.06
96-800-2228	0.10	0.09
	0.18	0.22
96-800-2229	0.25	0.33
	0.28	0.35
96-800-2230	0.13	0.22
	0.09	0.14
Used Blinds		
96-800-2227	18.94	19.40
	24.78	20.96
96-793-0167#1	0.28	0.24
96-793-0167#2	0.50	0.27
96-793-0167#3	1.35	1.87
	1.05	1.98
96-793-0167#4	0.57	1.07
	0.71	0.80
96-896-7504#1	1.94	1.71
	1.70	4.19
96-896-7504#2	4.74	8.11
	5.19	7.25
96-896-7505#1	8.35	4.16
	4.18	4.64
96-896-7505#2	26.18	26.67
	19.44	28.85
96-490-0825#1	1.82	2.76
	2.55	2.72
96-490-0825#2	1.65	5.50
	2.62	4.82
96-792-0485#1	0.46	0.17
	0.60	0.55
96-792-0485#2	0.43	0.45
	0.41	0.42
96-792-0486#1	0.45	0.42
	0.58	0.41
96-792-0486#2	2.88	1.87
	3.73	1.83
96-792-0487	1.68	1.33
	2.03	1.45

Table 6. Affect of UV and Heat Exposure on the Amount of Available Surface Lead

6 hrs UV @ 53 C, 6 hours no UV room temp cycled

24 holders with one used (96-896-7505#2) and one new (96-800-2226#1) Analyses in duplicate

96-800-2226 #1[1] (New Blind)	wipe#1	wipe#2	wipe#3	wipe#4	wipe#5	Total	Average
Week 0, Cleaned						0.246	
Week 2	4.21	1.62	2.88	1.60	1.59	11.90	9.45
	3.99	1.56	0.72	0.41	0.32	7.00	
Week 4	2.86	2.81	2.56	3.09	2.23	13.55	13.72
	3.29	2.55	2.33	2.27	3.45	13.89	
Week 6	7.73	3.48	4.51	2.80	2.42	20.94	20.25
	8.20	3.66	2.13	2.61	2.96	19.56	
Week 8	26.27	3.83	2.05	1.99	1.45	35.59	36.61
	29.54	3.64	1.56	1.09	1.78	37.62	
7505#2[1]							
Week 0, Cleaned						1.47	
week 2	4.48	0.99	1.34	1.50	1.24	9.55	9.26
	5.09	2.17	0.68	0.49	0.54	8.97	
Week 4	17.03	2.32	1.71	1.69	2.20	24.95	23.45
	16.20	2.57	1.10	0.79	1.30	21.96	
Week 6	26.88	5.20	1.66	1.51	2.32	37.57	39.92
	33.55	4.43	1.56	1.33	1.40	42.27	
Week 8	70.13	4.47	1.63	1.13	1.03	78.38	73.78
	58.40	5.04	1.92	1.90	1.92	69.18	

[1] After Rinsing and wiping blind 2226 had 0.25 μg/in² and blind 7505 had 1.47 μg/in² of removable lead.

Table 7. Four New Blinds with Different Total Lead Concentrations, 8 Weeks Accelerated Aging.

	Sample # 96-800-	Total % Pb	Wipe 1	Wipe 2	Wipe 3	Wipe 4	Wipe 5	Total Surface Lead ug/in.sq.
Week 0	2127							0.48
	2230							0.11
	2126							0.55
	2232							0.32
Week 2	2127	1.23	20.67	10.68	5.55	5.33	4.28	6.20
	2230	0.77	12.86	11.71	4.82	3.57	3.23	4.83
	2126	1.23	338.90	40.72	6.93	15.67	11.36	55.14
	2232	1.06	24.76	8.16	6.69	14.09	9.24	8.39
Week 4	2127		802.08	64.77	53.30	48.60	55.86	136.61
	2230		487.49	36.08	30.32	29.08	27.82	81.44
	2126		1342.28	127.89	38.02	41.49	44.30	212.53
	2232		164.16	73.14	65.44	141.83	197.22	85.57
Week 6	2127		2039.76	121.94	52.37	47.54	35.19	306.24
	2230		1029.89	73.89	39.63	26.31	29.22	159.86
	2126		1702.19	125.05	58.21	47.28	54.11	264.91
	2232		232.07	110.25	27.22	110.25	114.12	79.19
Week 8	2127		1397.03	91.73	19.08	16.61	23.12	206.34
	2230		795.40	37.08	19.65	12.68	17.18	117.60
	2126		1252.37	110.76	41.64	43.47	44.74	199.06
	2232		127.76	124.36	86.05	68.65	209.70	82.20

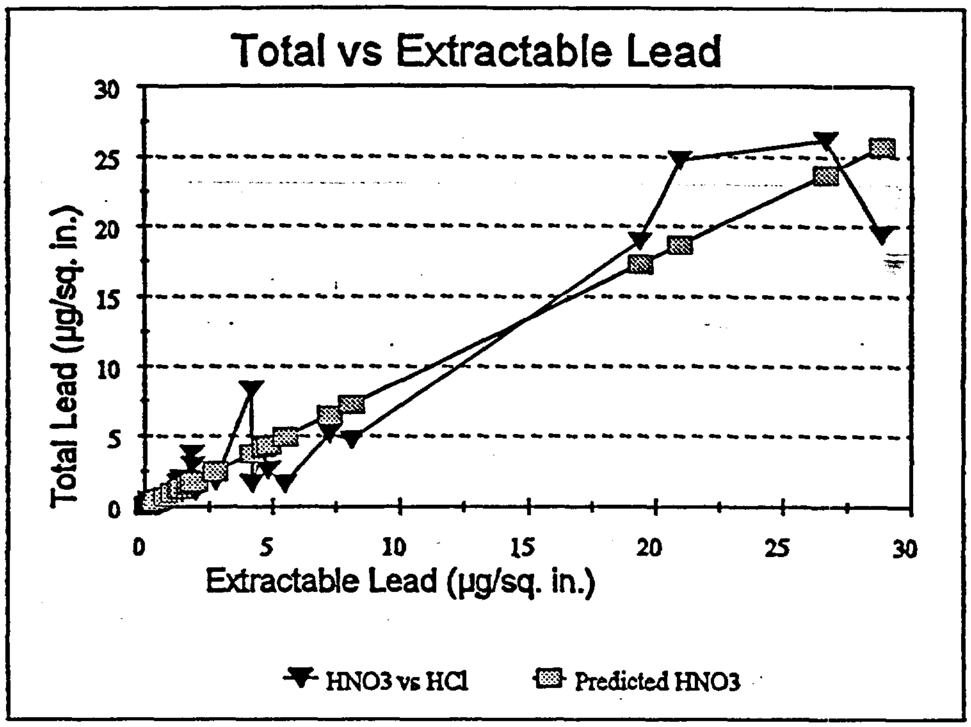

Figure 1. Surface Lead; HNO_3 digestion vs 0.07 N HCl extraction.

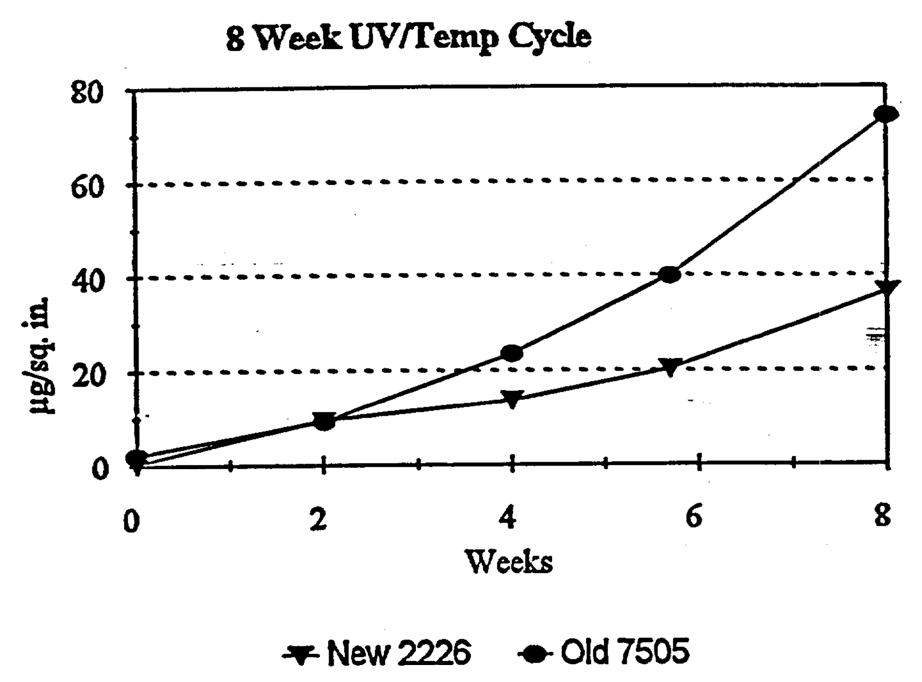

Figure 2. Accelerated Aging of New and Used Miniblinds

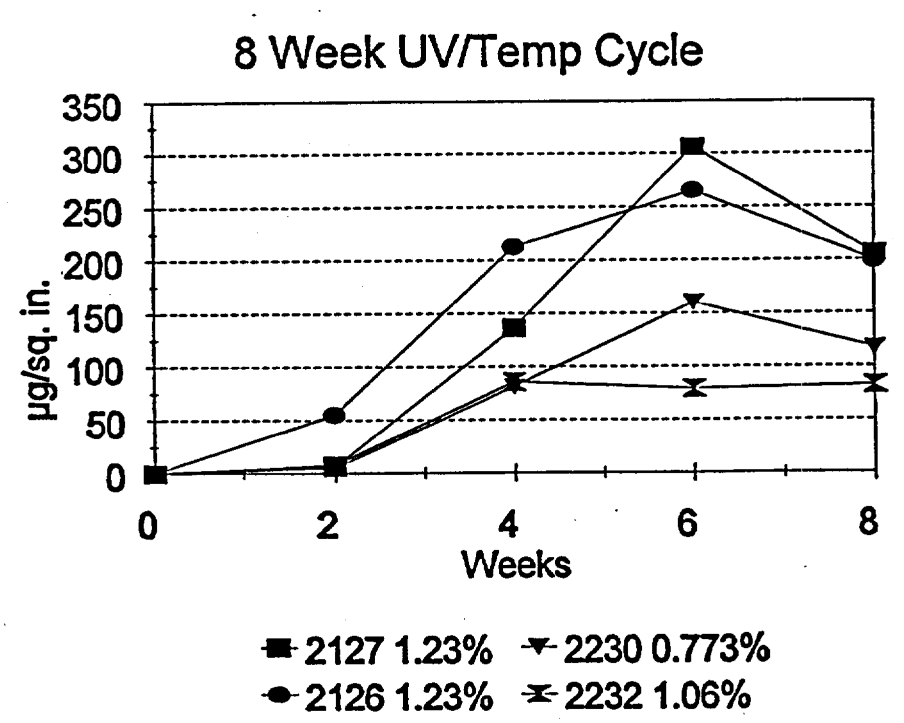

Figure 3. Accelerated aging of four new blinds with different concentrations of lead.

UNITED STATES GOVERNMENT

Memorandum

U.S. CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, D.C. 20207-0001

Date: SEP 18 1996

To: Ronald L. Medford, Director, Office of Hazard Identification and Reduction

Through: Robert G. Poth, Director, Division of Regulatory Management

From: Mary F. Toro, Compliance Officer - ext.1378

Subject: Transmittal of Miniblind Summary Table

This memorandum transmits a summary data table that presents the Laboratory Sciences' test results for the determination of lead in vinyl miniblinds and the daily ingestion estimates provided by the Directorate for Epidemiology and Health Sciences. The summary table reports the analysis of new and consumer "used" miniblinds for total lead, the amount of lead "dust" on the surface of the slats, and summarizes the estimated square inches of dust from the blinds that must be ingested per day for fifteen to thirty days to increase the blood lead level to 10 μg/dl, a federal agency-wide level of concern. The CPSC staff recommends a maximum allowable intake of lead from consumer products of 15 μg/day, for 15 to 30 days, to prevent young children from exceeding the 10 μg/dl blood lead level.

In addition to the data presented here in tabular form, the staff also reviewed data from the Arizona and Virginia Departments of Health Services (ADHS and VHS respectively) and the North Carolina Department of Environment, Health and Natural Resources (DEHNR) to determine whether other sources of lead dust on the miniblinds was likely. (Tab A)

CPSC staff reviewed 12 cases from ADHS and 32 from DEHNR concerning lead in miniblinds. In 7 ADHS cases and 15 DEHNR cases, the lead dust on the miniblinds could not be attributed to other likely sources. A direct link between elevated blood lead (Pb) levels and the miniblind lead (Pb) dust could not be firmly established. In 3 of 7 ADHS cases and 10 of the 15 DEHNR cases with elevated blood lead (Pb) levels, hazardous exposure to the miniblind dust was assumed since no other likely sources were found, according to the information and data provided. However, most of the investigations were in response to elevated blood lead (Pb) levels being found, so the cases were not randomly selected. Cases which had no blood lead (Pb) testing or did not have elevated blood Pb levels may therefore be under-represented.

The staff first determined the total lead present in the polyvinylchloride (PVC) matrix of the miniblind slats (Column C). The total lead present in the PVC matrix ranged from 0.66-1.23%.

The amount of lead dust on the surface of the miniblind slats was determined by wiping the surface of the slats with moistened filter paper and then analyzing the wipes for lead using either mild hydrochloric acid extraction (WE) or nitric acid digestion (WD) (Column D). The amount of lead dust found ranged from 0.06-51.45 $\mu g/in^2$.

In some cases, when the data provided results for both the concave and convex sides of the blinds, it was reported both individually and as an average. We believe the difference in lead dust levels among miniblinds and between the two sides of the same miniblind was related primarily to the widely differing sun and temperature exposure on the window treatment and the subsequent deterioration of the vinyl.

Column E of the attached table reports the surface area of miniblind slats that a child would be required to wipe the dust from with the hands and then ingest through hand-to-mouth transfer of the dust to obtain a 15 μg/day exposure. The data for this column was calculated using the health hazard assessment procedure for lead. (Tab B)

The CPSC staff recommends a maximum allowable intake of lead from consumer products of 15 μg/day for 15-30 days. A child exposed to this level for fifteen to thirty days would be at risk for a blood lead level of 10 μg/dl, a federal agency-wide level of concern. (Tab B)

Summary Table
Lead in Vinyl Miniblinds

Sample number (A)	Color / Exposure (B)	Total Lead % (C)	Wipe* Extract(WE) or Digestion(WD) $\mu g/in^2$ (D)	Dust Ingestion** in^2/day (E)	Country of Origin (F)
New Samples					
96-792-0482		0.95	0.27	66	Taiwan
96-792-0483		ND - Glossy	Test not performed		No t available
96-792-0484		ND - Glossy	Test not performed		Taiwan
96-792-0491	Vanilla	0.93	0.13 (WD) Concave 0.146 Convex 0.107	119	Mexico
	Creamy Apricot	0.95	0.15 (WD) Concave 0.181 Convex 0.124	98	Mexico
96-800-2123	Rose	1.04	0.37 (WD) Concave 0.45 Convex 0.29	41	Taiwan
96-800-2124	Vanilla	1.23	0.80 (WD) Concave 0.91 Convex 0.68	19	Taiwan
96-800-2125	White	1.00	1.02 (WD) Concave 0 .83 Convex 1.22	15	China
96-800-2126	Misty Rose	1.23	0.48 (WD) Concave 0.46 Convex 0.49	32	China
96-800-2127	Alabaster	1.23	0.55 (WD) Concave 0.64 Convex 0.46	27	China
96-800-2128	Slate Blue	1.00	0.82 (WD) Concave 0.81 Convex 0.82	18	Taiwan
96-800-2225	Slate Blue	0.89	0.08 (WE)	204	Taiwan
96-800-2226	Soft White	0.78	0.06 (WE)	236	Taiwan
96-800-2228	Green	0.91	0.15 (WE)	68	Taiwan
96-800-2229	White	1.03	0.34 (WE)	45	China
96-800-2230	Rose	0.77	0.18 (WE)	69	China
96-800-2232	Alabaster	1.06	0.30 (WE)	51	Taiwan
96-800-2233	Slate Blue	1.07	0.42 (WE)	36	Taiwan

CONSUMER and RELATED HEALTH DEPARTMENT SAMPLES

Sample number	Color \Exposure	Total Lead %	Wipe Extract* (WE) or Digestion (WD) µg/sq. in	Dust Ingestion ** in^2 /day	Import country
96-490-0825	Southeast-blue	0.88	2.74 (WE)	5	Taiwan
	Northwest-green	0.86	5.16 (WE)	3	Taiwan
96-792-0485	West #1	0.99	0.36 (WE)	27	Taiwan
	WEST #2	1.10	0.44 (WE)	34	Taiwan
96-792-0486	southern-up	0.96	0.42 (WE)	36	Taiwan
	southern down	1.11	1.85 (WE)	8	Taiwan
96-792-0487	west-20 yrs	1.10	1.39 (WE)	11	Taiwan
96-792-0488		1.06	11.38 (WE)	1.3	Taiwan
96-792-0490	south-3-4	0.66	3.96 (WD) Concave 3.53 Convex 4.40	3.8	China
	south-3-4 yrs	0.67	3.48 (WD) Concave 1.83 Convex 5.12	4	China
	south 3-4 yrs	0.67	3.60 (WD) Concave 1.71 convex 5.48	4	China
	south-3-4 yrs	0.75	3.73 (WD) Concave 1.91 convex 5.54	3.7	China
96-792-0492	Western	1.1	3.75 (WD)	4	Not available
	Western	0.91	1.82 (WD)	8	Not available
	Western	0.90	1.14 (WD)	13	Not available
96-793-1067	West 2yrs White	0.81	0.94(WE)	16	Not available
	North #1 -White	0.82	1.92 (WE)	8	Not available
	North #2-White	0.82	0.27 (WE)	49	Not available
	East-White	0.96	0.24 (WE)	64	Not available
96-800-2227	2 years	0.85	20.18 (WE)	0.74	China
96-800-2234	Craven County child with elevated Pb levels	1.21	1.79 (WE)	8	Taiwan

CONSUMER and RELATED HEALTH DEPARTMENT SAMPLES

Sample number	Color \Exposure	Total Lead %	Wipe Extract* (WE) or Digestion (WD) µg/in²	Dust Ingestion ** in²/day	Import country
96-800-2235	Apt with child with elevated Pb-5yrs old-White	0.84	46.02 (WD) concave 75.23 convex 16.81	0.33	Not available
96-800-2236	Apt with child with elevated Pb-5 years old-White	0.32	416.03 (WD) concave 496.92 convex 335.13	0.04	Not available
96-800-2237	Apt vacant same bldg as above	1.01	7.67 (WD)	2.0	Not available
96-800-2238	ivory-fr. daycare facility	0.62	51.45 (WD) concave 0.95 convex 102	0.29	Not available
96-860-5777	South	1.02	3.52 (WD)	4	Taiwan
	South	0.96	8.88 (WD)	1.7	Taiwan
	South	1.01	5.01 (WD)	3.0	Taiwan
96-896-7504	North #1-Pink	1.16	4.91 (WE)***	3	Not available
	North #2-Pink	0.97	7.68 (WE)	2	Not available
96-896-7505	South #1-Beige	0.98	4.40 (WE)	3	Not available
	South #2-Beige	0.80	27.76(WE)	0.5	Not available

Revised 7/05/96 nomfr.tbl

*Wipe Extract and Wipe Digestion: The surface of the blinds was wiped with moistened filter paper and the wipes were then analyzed for Pb using either mild hycrochloric acid extraction (WE) or concentrated nitric acid digestion (WD). Where results were reported for both the concave and convex sides of the blinds the table presents the averaged value and also the individual results. All other results were reported as an average.

**The number in this column reflects the calculated area on the miniblinds that would have to be wiped and the dust ingested by a child with a certain hand-breadth for a period of 15-30 days.

***Highest data point. Done in duplicate. Values of 1.71 & 4.91. For risk assessment use higher value.

TAB A

United States
Consumer Product Safety Commission
Washington DC 20207-0001

MEMORANDUM

Date: 24 July 1996

To: Mary F. Toro, Compliance Officer, (CRM)

Through: Marilyn L. Wind, PhD, Acting Director (EHHE) mlw

From: Brian C. Lee, PhD DABT, Toxicologist (EHHE) Brian Lee

Subject: Evaluation of lead (Pb) in miniblinds reports from Arizona, North Carolina, and Virginia

This evaluation examines reports on lead (Pb) in miniblinds and information received by CPSC staff from Arizona, North Carolina, and Virginia to determine whether other sources of Pb dust on the miniblinds were likely. The reports from Arizona consisted of environmental sampling and lab reports from the Arizona Department of Health Services (ADHS) [1] on a lead poisoning case involving miniblinds CPSC CR #T-869-8571, a table from ADHS of additional results on miniblinds and homes subsequently investigated [2], a 20 May 1996 conversation with ADHS (Patricia Arreola), and further case information from ADHS [3]. The reports from North Carolina consisted of lab analysis reports from the Guilford County (NC) Dept. of Public Health [4], and North Carolina Department of Environment, Health, and Natural Resources (DEHNR) environmental sciences analysis reports [5], a table with samples from the Mecklenburg County (NC) Health Department [6], and a conversation with DEHNR (Ed Norman) on 20 May 1996. A report from Virginia consisted of a conversation with the Portsmouth (VA) Health Department (Randy Ussery) on 13 May 1996.

Risks assessed for a miniblind may differ depending on the sampling procedure used. The miniblind Pb dust sampling procedure used by the CPSC Health Sciences Laboratory (LSHL) involves 10 passes with a tightly squeezed filter paper with a filter paper change every other pass. ADHS and DEHNR used 1 to 3 unsqueezed passes with baby wipes for sampling Pb dust, an accepted practice. However, the dust pickup characteristics between filter paper and baby wipes may differ. DENHR investigators followed a double pass (horizontal, then vertical) serpentine pattern for sampling a 1 ft by 1 ft area of slats. This method could have collected Pb dust less efficiently than the LSHL method since wiping across the slats (vertically) may not be a smooth process.

Cases where other likely sources of Pb were eliminated are marked with a + along the left margin. A dust wipe level from a nearby surface, e.g. sill or floor, was considered the most significant data in determining that the Pb dust on the miniblind was not from some other source. A high Pb dust level on the sill or nearby floor or counter could indicate that at least part of the dust on the miniblinds was from some other source. However, a low Pb dust level on the sill or nearby floor or counter, and a much higher Pb dust level on the slats would indicate that the Pb dust on the slats is not likely to be contamination from other sources. It should be cautioned that a Pb dust level is not a perfect indicator for eliminating non-miniblind Pb sources. A recently cleaned surface will have a lowered dust Pb level, which may result in an incorrect assessment of the Pb source and hazard.

Results of the Pb content determinations (%Pb by weight) may not be comparable between laboratories due to variations in sample preparation. LSHL showed that when the plastic is scraped or broken into small pieces, the extraction of Pb will be higher than from large pieces [10]. Since the plastic matrix was not entirely destroyed by extraction with concentrated nitric acid, results probably reflected less than the true "total Pb".

CPSC staff has recommended a maximum allowable intake of Pb from consumer products of 15 ug/day [8-9]. The Environmental Protection Agency (EPA) recommended Pb dust clearance levels are 100 ug/ft^2 (0.694 ug/in^2) for floors and 500 ug/ft^2 (3.472 ug/in^2) for windowsills [7]. These are also used as guidance levels in Pb risk assessments of homes. Unit equivalents are 144 in^2 per 1 ft^2 and 6.45 cm^2 per 1 in^2.

ARIZONA

ADHS collected and analyzed miniblinds for Pb content and Pb dust. Some of the cases were associated with elevated blood Pb levels. Table 1 summarizes the cases.

Original case, ADHS #95013/94031 [1,3]

The original case [1,3] involved a lead-poisoned child approximately 1½ years old who resided in a trailer in San Luis, AZ. The blood Pb results ranged from 20-46 ug/dl. An 11-month old cousin who also lived in the house had a blood Pb of 20 ug/dl. Earlier investigations by ADHS found a utility post (presumably outdoors) and a child's desk bearing Pb paint, both of which were removed. There was no interior paint in the trailer, only plastic laminate and paneling. Quick-screening of interior surfaces with a chemical test kit gave negative results, except for a questionable result on a cooler that was out of the child's reach and a positive on some varnished kitchen cupboards. Pb dust levels were below detection (<50 ug Pb/sample) on the floors. A clump of dust from a windowsill in the child's room contained 2200 mg Pb/kg dust, however, a wipe of the sill was negative. Laboratory analysis of exterior paint and soil found no lead. Water samples were also negative. The child spent some time with an aunt and a grandmother. A check of the aunt's and grandmother's homes, including water, dust, floor tiles, and paint found no Pb sources.

Pb dust sampling of the miniblinds, conducted with "multiple" passes of a wet filter paper, found a 1021 ug/ft^2 (7 ug/in^2) level. ADHS later discarded the filter paper method in other cases in favor of baby wipes, due to the physical deterioration of the filter paper during wiping. The miniblind plastic was analyzed by ADHS as containing 0.21% Pb.

Interpretation:

Sources of Pb in the home other than the miniblinds were unlikely. Paint, water, and soil/dust were eliminated as possibilities. The one clump of Pb dust from a windowsill might have been contaminated with flakes or dust from the miniblinds, as suggested by positive test kit results in areas of the sill in contact with the miniblinds. Additionally, miniblind dust on the hands of the investigator was positive for Pb. The child was known to regularly mouth the miniblinds.

Subsequent cases [2]

Four miniblinds samples (FQ 5/5A, 6/6A, 7/7A, 8/8A) were collected from offices or office/adult classrooms where they had been installed for 5-7 years. The windows did not open in these offices. Dust wipings from two miniblinds, FQ 5/5A and FQ 6/6A, measured 235 and 438 ug/ft^2, respectively.

Five additional miniblind samples (FQ 1, 2, 4/4A, 9/9A, 10/10A) were collected from residences. One additional sample, FQ 3, was brand-new and sampled for Pb dust immediately after opening the packaging. Four of the cases had no other likely sources of Pb dust on the miniblind, other than the miniblind itself. Blood Pb was measured in only one (FQ 1) of these four cases.

Table 1
Miniblind Cases from the Arizona Department of Health Services

+ Indicates other sources of Pb on the miniblinds were not likely.
* Indicates elevated blood Pb when other sources of Pb on the miniblinds were not likely.

ADHS#	blood Pb ug/dl	miniblind dust ug Pb /ft²	comments
+*95013	20-46	1021	Original case. Child regularly mouthed miniblinds.
+*94031	20	1021	cousin of 95013
+*FQ1	27	1605	Child touched miniblinds regularly, 1980s construction, interior paint, exterior paint, soil, and water were negative for Pb.
+FQ 2		1470	2 month old miniblinds, no Pb paint, 1990s construction.
+FQ 3/3A		259	Newly purchased, uninstalled, previously unopened packaging.
+FQ 4/4A		2874	2 year old miniblinds, no Pb paint, 1990s construction.
+FQ 5/5A		255	Office/adult classroom, 5-7 yr old miniblinds, no Pb paint, 1980s construction.
FQ 6/6A		438	Office/adult classroom, 5-7 yr old miniblinds, no other testing conducted.
FQ 7/7A			Office, 5-7 yr old miniblinds, no dust wipe of miniblinds.
FQ 8/8A			Office, 5-7 yr old miniblinds, no dust wipe of miniblinds.
FQ 9/9A	43	749	Stored in closet not accessible to victim, some Pb paint and Pb in soil.
FQ 10/10A	22	722	Mother indicates victim does not touch miniblinds, no Pb paint.

NORTH CAROLINA

A Mecklenburg County table of samples listed total Pb in the slat plastic and dust wipes from new miniblinds [6]. All manufacturers and retailers were identified. The total Pb levels in the slat plastic ranged from 0.37 to 1.03% by weight. All samples tested were leaded. Pb dust levels were 70-359 ug/ft^2 (0.49-2.49 ug/in^2). These samples were not evaluated by CPSC staff since the miniblinds were not installed.

Thirty-two cases from DEHNR [2-5] are summarized in Table 2. About a third of the DEHNR cases are child/infant day care inspections and do not involve elevated blood Pb levels.

PORTSMOUTH, VA

2 male infants; PbB= 7 and 7 ug/dl
2 female infants; PbB= 58 and 16 ug/dl
No dust samples. Miniblind plastic was 0.82% Pb.

All cribs were in the same room, but only the females were able to access the miniblinds from their cribs. The miniblinds were torn up and several pieces had teeth marks. The home was 1983 construction and no Pb paint was found in the home.

Interpretation:

This case indicates that when tiny pieces of the leaded plastic were regularly ingested and mouthed, then hazardous Pb exposure can result. This was estimated in early Pb hazard assessments of the miniblinds [11]. Human Factors believes chewing of the miniblinds slats would be unusual. CPSC staff is currently aware of only this one case where miniblinds were chewed.

Table 2

Miniblind Cases from the North Carolina Department of Environment, Health, and Natural Resources

+ Indicates other sources of Pb on the miniblinds were not likely.
* Indicates elevated blood Pb when other sources of Pb on the miniblinds were not likely.
<det Indicates below level of quantitation ("detection") of 0.10% by weight or 10 ug/ft².

DEHNR#	blood Pb ug/dl	miniblind ug Pb/ft²	other sources ug Pb/ft² unless specified	comments
+*Cabarrus	17			
960535-960537		66440		
961043-961047		15145	37 sill	Pb dust on the miniblinds was much higher than on the windowsill.
Craven	24			
961408-961414		9102	98 sill	
		49495	<det miniblind	
961415-961416		181		Dust on the miniblinds had much higher Pb levels than on the windowsill. Pb was not detected in the miniblinds. Elevated blood Pb may be due to other possible sources.
+Cumberland	17			
960992-960996		400	41 sill	
960982-960991			0.12-7.23% paint	Pb dust on the miniblinds was much higher than on the windowsill. There were many areas of Pb paint throughout the inside of the home which could have contributed to the elevated blood Pb level but not to the Pb dust on the miniblinds. If the dust was from the paint, the dust level on the sill would be higher.
Cumberland				
960423-960434		10	<55 toys, furniture	Wooden miniblinds had barely detectable Pb dust.

DEHNR#	blood Pb ug/dl	miniblind ug Pb/ft²	other sources ug Pb/ft² unless specified	comments
+ *Davidson 960934-960937	21	262	85 floor	Pb dust on the miniblinds was much higher than on the nearby floor. Possible chewing and ingestion of miniblinds.
Davidson 961368-961381	25	165 136	691 sill 1725 trough <det floor 1354 window well 10 floor 120 floor 4.90% ext paint	Pb dust on the miniblinds was the same or less than on the windowsills, window troughs, or floor.
Duplin 961293-961296		115 687 214		Only miniblind Pb dust levels were reported.
Durham 961320-961327	49	69	0.14% paint stair baseboard 501 stairway floor 970 ppm soil <det floor	Pb dust on the miniblinds was less than on the nearby floor. Victim frequented two homes, one with Pb paint and a moderate Pb dust level on the floor.

DEHNR#	blood Pb ug/dl	miniblind ug Pb/ft²	other sources ug Pb/ft² unless specified	comments
Edgecombe 961307-961313	20	404 417	338 floor	Pb dust on the miniblinds was only slightly higher than on the nearby floor.
Edgecombe 961341-961352	28	1263	1803 stool 77 floor 0.35-3.49% paint	Pb dust on the miniblinds was high, but window stool (interior sill) was higher. Lower Pb dust on floor level was not consistent with level on windowsill. Pb paint on the porch, exterior siding, and interior trim including the stool probably contributed to the elevated blood Pb level.
+*Forsyth 961037-961042	39	652 1567	0.97% paint 96 sill 0.61%, 0.54% paint	Pb dust on the miniblinds was much higher than on windowsill. Low dust level on windowsill suggested Pb paint did not contribute to the Pb dust on the miniblinds.

DEHNR#	blood Pb ug/dl	miniblind ug Pb/ft²	other sources ug Pb/ft² unless specified	comments
+*Forsyth	21			
961026-961036		235	12 floor	
		421	<det carpet	
		386	21 ppm soil	
			48 ppm vac bag	Pb dust on the miniblinds was much higher than on the floor or carpet. The dust in the vacuum cleaner bag was also low, suggesting no other Pb dust sources were likely in the home.
+*Guilford	17			
960306-960317		5701	179 trough	
		212	119 toy phone mouthpiece	
		14598	36 toy phone base	
956325-956350			232 trough	
			11 ppm soil	
			57 ppm vac bag	
			<det floors	
			<det car interiors	
CPSC 960312HNE5090	>20			Pb dust on the miniblinds was much higher than on the floors. The Pb source was not on the workclothes or at other destinations where the car was used for transportation. The low Pb dust level in the soil and vacuum bag suggest no other Pb dust sources were likely in the home.

DEHNR#	blood Pb ug/dl	miniblind ug Pb/ft²	other sources ug Pb/ft² unless specified	comments
+*Guilford	36			
960946-960956		743	55 floor	
		100	12 floor	
		1165		
			168 ppm soil side	
			56 floor	
960938-960945		290		
		1728	55 floor (previous)	
			25 floor	
			19 floor	
			32 ppm soil front	Pb dust on the miniblinds was much higher than on the floors. Pb dust on the floors was low. The soil Pb level was also low.
+Guilford	22			
961194-961227		77	14 floor	
			14 sill	
			21 floor	
			<det carpet	
			<det teether, walker	
			17 crib	
			1375 front fender car	
			2220 front fender car	
			115 ppm soil	Pb dust on the miniblinds was higher than on the respective floor, carpet, and windowsill. Pb dust level on the miniblinds was too low to account for elevated blood Pb level. The Pb dust levels on the front fenders suggest the vehicle was in an area with Pb dust. That area may have contributed significantly to the elevated blood Pb level. Possible chewing ingestion of the miniblinds.

DEHNR#	blood Pb ug/dl	miniblind ug Pb/ft²	other sources ug Pb/ft² unless specified	comments
Guilford 961419-961420	20	277		Only the miniblind Pb dust level was reported.
Harnett 961254-961256	17	3327	2112 ppm soil nr bldg 5.94% ext paint	Although the Pb dust level on the miniblinds was high, there was no indication that other likely sources were sampled from the interior. Pb paint on the exterior may be contributing to the elevated Pb level in the soil.
+*Henderson 961360-961367	33	730 46	<det floor <det table <det plastic table cover	Pb dust level on the miniblinds was well above the levels on the nearby table and floor. Pb was not found in the plastic table cover.

DEHNR#	blood Pb ug/dl	miniblind ug Pb/ft^2	other sources ug Pb/ft^2 unless specified	comments
+Hoke 961466-961473		34704	1538 sill <det floors 2.67% paint window 3.49% paint porch column 0.22% paint porch floor 319 ppm soil	Pb dust level on the miniblinds was well above the level on the windowsill and floors. Paint and soil do not appear to be likely sources of Pb dust, as suggested by the below-detection dust levels on the floors. If Pb paint on window was the source, then the level on the floors would be higher.
Lenoir 961502-961507	17	139	89 sill 0.77% paint door 64 ppm soil	Pb dust level on the miniblinds was marginally higher than the Pb dust level on the windowsill. The Pb soil level was low.
Lenoir 961669-961676	35	235	161 sill 0.49% paint sill 0.53% paint door 112 floor 94 ppm soil	Pb dust level on the miniblinds was marginally higher than on the windowsill. Pb paint on the windowsill may have contributed to its Pb dust level.

DEHNR#	blood Pb ug/dl	miniblind ug Pb/ft^2	other sources ug Pb/ft^2 unless specified	comments
Lenoir 961228-961231			0.31-0.54% miniblinds	Only the miniblind Pb content was reported.
McDowell 960593-960602		<det	944 window	
		11	104 sill	
			0.52% miniblinds	
			7.79% paint door bead	
			8.88% paint siding	
			<det chalk	Pb dust levels on the miniblinds were well below the levels on the window or windowsills.

DEHNR#	blood Pb ug/dl	miniblind ug Pb/ft²	other sources ug Pb/ft² unless specified	comments
Mecklenberg	27			
960288-960295		<det	<det sill	
		77	<det sill	
956304-956314			2.58% paint trough exterior	
			3.26% paint sash exterior	
			4.64% paint door jamb	
			1.06% paint door casing	
			0.53% paint window casing	
			1.18% paint porch column	
			176 sill	Low or no dust Pb levels were found on the miniblinds and no Pb dust was detected on the respective sills. Other components of the home had Pb paint might be contributory to the elevated blood Pb, but further dust samples would be needed to better assess the risk. The lowest detectable Pb level reported for a plastic miniblind was in sample 960295 (0.12%) and corresponded to the 77 ug/ft² level.
Mecklenberg				
960569-960581		217	0.44% paint window sash	
		395	1.02% paint window sash ext.	
			0.41% paint window casing ext.	
			0.12% paint door jamb	
			<det paint sill	The two miniblinds Pb dust levels are from different sides of the same miniblinds. Pb dust levels for nearby windowsills or floors were not reported.

DEHNR#	blood Pb ug/dl	miniblind ug Pb/ft²	other sources ug Pb/ft² unless specified	comments
+Mecklenberg				
961481-961489		766	30 sill	
			0.22% ext paint mullion	
			0.92% ext paint door	
				Pb dust level on the miniblinds was much higher than on the windowsill. The low Pb dust level on the windowsill suggested the Pb paint on the mullion was not contributory.
Nash				
961764-961773		119	63 dust	
			<det dust	
			0.20% paint	
			1.32% paint	
			30 ppm soil	
			55 ppm soil	The sampling location of the dust and paint samples were not stated.
New Hanover	32			
961303-961304		1242		
960317-960343			0.12% paint door	
			6.81% paint baseboard	
			2.95% paint stair rail	
944233-944237			0.26% paint kitch door	
			21.79% paint front door	
			404 ppm soil 3' from home	
			431 ppm soil 25' from home	
				Pb dust level on the miniblinds was high, but various building components had Pb paint. No dust samples were taken.

DEHNR#	blood Pb ug/dl	miniblind ug Pb/ft²	other sources ug Pb/ft² unless specified	comments
+*Rowan 960912-960925	23	675	31 sill 0.59-7.4% paint window 0.82% paint door 14 ppm soil 150 ppm ashes <det floor <det carpet	Pb dust level on the miniblinds was much higher than on the windowsill or flooring. The low levels on the windowsill and flooring suggested the Pb paint was not contributory to the miniblind Pb dust. Soil and ashes did not appear to be signficant contributors to the miniblind dust.
Wake 961264-961277	22	75	126 sill <det stair <det floor 41 sill 33 sill	
+*		955	21 sill	One of the two miniblinds had much higher Pb dust levels than on the respective windowsill. The other had a dust Pb level lower than on the respective windowsill.

DEHNR#	blood Pb ug/dl	miniblind ug Pb/ft^2	other sources ug Pb/ft^2 unless specified	comments
+*Washington	22			
961235-961248		4228	<det carpet	
			<det carpet	
			0.15% toy teapot	
		552	10 ppm soil	
			6.11% ext paint	
		806		Pb dust levels on the miniblinds were high, while the levels on the flooring were not detectable. Although Pb paint was on the exterior, the soil level was low. Along with the non-detectable flooring levels, the soil level suggested the exterior paint was not contributing to the miniblind Pb dust.
+Wayne				
961398-961407		108	13 sill	
		1420	12 sill	
		2694	38 sill	Pb dust levels on the windowsills were much lower than the respective miniblinds.

CONCLUSIONS

CPSC staff reviewed 12 cases from ADHS and 32 from DENHR concerning lead in miniblinds. In 7 ADHS cases and 15 DEHNR cases, the Pb dust on the miniblinds could not be attributed to other likely sources. Information on the behavior of the Pb-poisoned victims was unavailable in most cases to determine whether exposure to the miniblinds occurred. A direct link between elevated blood Pb levels and the miniblind Pb dust could not be firmly established. In 3 of 7 ADHS cases and 10 of the 15 DEHNR cases with elevated blood Pb levels, hazardous exposure to the miniblinds dust was assumed since no other likely sources were found, according to the information and data provided. Most of the investigations were triggered by an elevated blood Pb level, so the cases were not randomly selected. Cases which had no blood Pb testing or did not have elevated blood Pb levels may therefore be under-represented.

Blood Pb levels should decline when exposure to a significant Pb source (miniblinds) is removed. Cautious interpretation of the medical records would be needed as blood Pb levels can be confounded by chelation treatment of Pb-poisoned victims. Follow-up data will be collected by the states.

If ingestion of the leaded plastic occurred regularly, hazardous exposure would result. For example, assuming 100% bioavailability of the lead extracted from bulk slat pieces with concentrated nitric acid, it was estimated that chronic ingestion of 2.5 mg plastic per day from plastic containing 0.61% Pb could result in a 10 ug/dl blood Pb level of concern [11,12]. Mild acid extraction of the slats to estimate bioavailability of the lead was not conducted. However, chronic ingestion of an estimated 25 mg of plastic per day (a small amount) with an optimistic assumption of 10% lead bioavailability could also result in a hazardous exposure. The 25 mg is probably an overgenerously high estimate since breaking the plastic into small pieces, such as by chewing, increases the bioavailability of the lead. Cases involving chewing and ingestion of the miniblind plastic, such as the one in Portsmouth, VA, are believed by CPSC Human Factors staff to be in the minority. However, DEHNR investigators have seen chew and bite marks on several miniblinds in homes with young children, indicating this is not a rare situation.

It was not practical to conduct a comprehensive environmental sampling, interview, and custom exposure assessment of all possible Pb sources for each case. Therefore, the interpretations of the cases were based upon the provided information, which was sometimes limited. Nevertheless, the efforts of the Arizona Department of Health Services, North Carolina Department of Environment, Health, and Natural Resources, Guilford County (NC) Department of Public Health, Mecklenberg County (NC) Health Department, and the Portsmouth (VA) Health Department are acknowledged in collecting and sharing their valuable information with CPSC staff.

REFERENCES

[1] ADHS, Arizona Dept. of Health Services, case #94031, transmitted by ZE Weaver (FOWR-Arizona). 13 February 1995.

[2] ADHS. Samples submitted to Fiberquant. 7 December 1995. Comments letter from Patricia Arreola to RL Medford (EXHR) 19 July 1996, and clarifications with BC Lee (EHHE) on 23 July 1996.

[3] ADHS. Environmental lead investigation, #94031/95013 and 95049. 29 May 1996.

[4] Guilford Co. (NC) Dept. of Public Health, Stacey Peace. 11 Mar 1996.

[5] DEHNR, North Carolina Dept. of Environment, Health, and Natural Resources, Environmental Health Services Section, Ed Norman. Environmental sciences analysis reports and blood lead levels. 22 May 1996. Clarifications with BC Lee (EHHE) on 19 July 1996.

[6] Mecklenberg Co. (NC) Health Dept., Dennis Salmen. 7 May 1996.

[7] US Environmental Protection Agency (1995)- "Guidance on identification of lead-based paint hazards." Federal Register 60 175 47248-47257. 11 September.

[8] CPSC (1990)- "Revision of the CPSC 0.06% lead in paint standard". Memorandum from BC Lee to SC Eberle, 22 June. Tab C in OS #4367.

[9] CPSC. "Lead (Pb) dust ingestion hazard assessment for plastic miniblind slats, 96-800-2235 to 96-800-2237, and 96-792-0492." Memorandum from BC Lee to MF Toro. 5 June.

[10] CPSC (1996)- Laboratory/Compliance Summary for 96-792-0482, 96-792-0483, 96-792-0484. WK Porter. 22 April.

[11] CPSC. "Lead (Pb) hazard assessment for plastic miniblind slats, 96-792-0482, 96-792-0483, and 96-792-0484". Memorandum from BC Lee to MF Toro, 1 May 1996.

[12] CDC, Centers for Disease Control and Prevention (1991). Statement on Lead. September.

United States
Consumer Product Safety Commission
Washington DC 20207-0001

TAB B

MEMORANDUM

DATE : 31 July 1996

TO : Mary Ann Danello, PhD, Associate Executive Director (EH)

Through: Marilyn L. Wind, PhD, Acting Director (EHHE) MLW

FROM : Brian C. Lee, PhD DABT LLRA (EHHE), Toxicologist

SUBJECT: Health hazard assessment procedure for lead (Pb) dust from vinyl miniblinds

This memorandum summarizes the health hazard assessment procedure for the accidental ingestion of dislodgeable lead ("Pb dust") from polyvinylchloride miniblinds by young children.

The Consumer Product Safety Commission (CPSC) [1] along with the Centers for Disease Control and Prevention [2] and other Federal agencies state that blood Pb levels above 10 ug/dl are of health concern. Levels of 10 ug/dl or greater have been associated with several adverse health effects including deficits in neurobehavioral function and intellectual performance, developmental delays, decreased stature, and diminished hearing acuity. CPSC staff recommends a chronic ingestion maximum of 15 ug Pb per day from paint and other consumer products [3] to prevent young children from exceeding the 10 ug/dl blood Pb level of concern.

The amount of surface area of miniblind slats that would contain sufficient dust for an intake of 15 ug Pb/day [3], was estimated by dividing the Pb dust level into the 15 ug/day ingestion rate, or

$$15 \text{ ug Pb/day} / \_\_\_ \text{ ug Pb/in}^2 = \_\_\_ \text{ in}^2\text{/day}.$$

Example: If the dust level was 30 ug Pb/in^2, then the surface area containing 15 ug of Pb would be 15 ug /30 ug/in^2 = 0.5 in^2.

CPSC Human Factors staff determined the likelihood of children ingesting the dust from miniblinds [4]. A variety of factors made it difficult to generalize about the exposure rate for the "average" child. These factors included the accessibility of the blinds, how many blind slats were accessible, how often a child touched the blinds, and if the child touched the same or a different location on the blinds. The human factors determination indicated a child of age six or under who touched the blinds, would ingest lead dust as part of normal hand-to-mouth behavior. The surface area of the slats that a child would ingest dust from by touching the slats and then putting the hands in the mouth is equivalent to the area of half of one side of one hand of a child, or 5 in^2/day [4]. The Pb dust level of concern on the minblinds was then estimated by dividing the maximum allowable ingestion rate by this surface area, or

$$15 \text{ ug/day} / 5 \text{ in}^2/\text{day} = 3 \text{ ug/in}^2.$$

In the example, the 5 in^2 that would be touched and wiped by a child is a much larger area than the 0.5 in^2 of the slats containing 15 ug of Pb. Therefore, the 30 ug Pb/in^2 dust level on the slats could be hazardous if the exposure occurred for more than 15-30 days.

Adults and families with older children were generally considered not at risk because of the lack of likelihood of their ingesting Pb dust from the miniblinds. Additionally, the Pb dust also does not appear to blow off the miniblinds to contaminate the home. When other sources of Pb were not present in homes, the Pb dust levels were not elevated on windowsills and floors near miniblinds with high dust levels [5].

References

[1] CPSC, Consumer Product Safety Commission (1989). "Review of low level lead toxicology." Memorandum to SC Eberle from BC Lee. 10 May. Tab B in CPSC (1992), Notice of regulatory investigation requesting information concerning limits for lead in paint. Briefing package OS# 4367. 24 January.

[2] CDC, Centers for Disease Control and Prevention (1991). Statement on Lead. October.

[3] CPSC (1990)- "Revision of the CPSC 0.06% lead in paint standard". Memorandum from BC Lee to SC Eberle, 22 June. Tab C in OS #4367.

[4] CPSC (1996)- "Specification limit for lead on plastic miniblinds." Memorandum from LE Saltzman & CM Trainor to AH Schoem. 14 June.

[5] CPSC (1996)- "Evaluation of lead (Pb) in miniblinds reports from Arizona, North Carolina, and Virginia." Memorandum from BC Lee to MF Toro. 24 July.

United States
CONSUMER PRODUCT SAFETY COMMISSION
Washington, D.C. 20207

MEMORANDUM

DATE : June 14, 1996

TO : Alan H. Schoem, Executive Assistant
Office of Compliance

Through: Ronald L. Medford, Assistant Executive Director RLM
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Mary Ann Danello, PhD, Associate Executive Director MAD
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SUBJECT: Specification Limit for Lead in Plastic Miniblinds

INTRODUCTION

Lead occurs in vinyl (plastic, polyvinyl chloride) miniblinds as an intentional additive and as an incidental contaminant. According to the manufacturers, lead is added as a stabilizer to ensure heat stability, rigidity and durability of the plastic used in the miniblinds. Recent testing by CPSC indicated that as these vinyl miniblinds degrade, the lead contained in the plastic becomes available for ingestion as lead dust. Levels over 100 ug/in^2 were found on some miniblinds in homes where other likely sources of lead were discounted.

Importers of vinyl miniblinds have indicated that they are moving to assure that vinyl miniblinds in the future will be produced without the addition of lead as a stabilizer. They requested that CPSC staff provide a guidance limit for lead to assist them in the specification of materials used in the manufacture of the plastic.

RECOMMENDATION

The staff recommends 0.02% by weight as a specification limit for lead. The staff believes that this level will reduce the risk of lead poisoning from plastic miniblinds when manufacturers discontinue using leaded formulations during the manufacturing process and follow good manufacturing practices. This limit is based on the following: the Health Sciences' assessment of the health effects associated with the ingestion of lead; the lead limit for lead dust derived from Human Factors' assessment of the likelihood of children ingesting dust from miniblinds and the surface area of one hand of children between 2 and 6 years; and a presumptive association between the percent total lead in the miniblind and the formation of lead dust based on a reasonable upper level found in the CPSC laboratory test data. Staff believes that any ingestion of lead is undesirable. Because the effects of lead ingestion are cumulative and other sources of lead may be available to children, the staff urges the manufacturers to use the lowest amount of lead below 0.02% that is technologically feasible.

RATIONALE

A. HEALTH ASSESSMENT

The specification limit is recommended primarily to protect consumers from developing blood lead levels greater than 10 ug/dl (CPSC, 1992 a,b; CPSC, 1993a,b). Significant adverse health effects in young children, such as developmental delays, deficits in neurobehavioral function and intellectual performance, decreased stature and diminished hearing acuity, have been observed with blood lead levels as low as 10 ug/dl (ATSDR, 1990; CDC, 1991; CPSC, 1989; EPA, 1990). At the 10 ug/dl blood lead level, the Federal agency consensus dictates community-wide preventive measures. A maximum allowable limit of 15 ug of lead ingested per day is recommended based on human chronic exposure models relating ingested lead to blood lead levels (CPSC, 1989, 1990, 1992a). Included in the 15 ug/day recommendation is consideration of several parameters including amount of lead ingested, lead absorption, and other "background" sources of lead.

B. LIMIT FOR DUST - HUMAN FACTORS ASSESSMENT

The Division of Human Factors examined the likelihood of children ingesting the dust from miniblinds. The exposure rate is dependent on a variety of factors, such as, the accessibility of the blinds, how many blind slats are accessible, how often the child touches the blinds, and if the child is touching the same location on the blinds or all over the blinds. Due to the variety of these factors, they cannot be generalized to estimate the exposure for the "average" child. However, it is reasonable to assume that children who do touch the blinds will ingest the lead dust simply because of normal hand-to-mouth behavior.

According to anthropometric data (Highway Safety Research Institute, 1977), the 50th percentile 2 to 2.5-year-old, has a hand length of 3.9 inches and a hand breadth of 2.0 inches. The 50th percentile 4.5 to 5.5-year-old has a hand length of 4.7 inches and a hand breadth of 2.2 inches. Based on 50% of the area of one hand, assuming that dust may not get on all of the hand and/or not all the dust on the hand is transferred to the mouth, approximately 3.9 in^2 and 5.2 in^2 of dust may be found on one hand of children between 2 and 6 years of age.

The staff submits that the lead level for the dust should not exceed 3 ug/in^2. This takes into account the Division of Human Factors' concern when the miniblind slat surface area containing 15 ug of dust is less than 5.2 in^2. For comparison, the Environmental Protection Agency (EPA) recommended lead dust clearance levels are 100 ug/ft^2 (0.694 ug/in^2) for floors and 500 ug/ft^2 (3.472 ug/in^2) for windowsills (EPA, 1995). These are also used as guidance levels in lead risk assessments of homes. (Unit equivalents are 144 in^2 per 1 ft^2 and 6.45 cm^2 per 1 in^2.) If exposure to window miniblinds is considered similar to windowsills, then a dust level of 3.5 ug/in^2 may be considered reasonably "clean" by EPA/HUD standards. At 3.5 ug/in^2, the maximum recommended allowable ingestion of lead of 15 ug (CPSC, 1990) would be found on a miniblind slat surface area of about 4 in^2. This level (3.5 ug/in^2) approximated the level 3.0 ug/in^2 calculated by CPSC staff.

C. SPECIFICATION LIMIT FOR MINIBLINDS

The CPSC laboratory testing of older miniblinds is very limited and the many parameters and mechanisms associated with the process of aging and degradation are complex and not well defined. However, a presumptive association between the lead in the plastic (%) and the lead dust on the slats (ug/in^2) can be used to establish a specification limit, based on the following: a) the average lead dust level of about 123 ug/in^2 found in the highest samples (with an average total lead content of 0.69%) represents a reasonable upper level and b) if all miniblinds were subjected to the same environmental conditions as these miniblinds, they could be expected to degrade as these miniblinds do. Thus, the specification for lead in miniblinds should be at a maximum of:

123 ug/in^2 of lead dust on blind surface / 3 ug/in^2 lead dust limit = 41
0.69% lead by weight / 41 = 0.02%

However, if we use our experience with lead in paint we can assume that with no lead intentionally added and good manufacturing practices followed, much lower lead levels are technologically feasible. Staff urges the industry to achieve the lowest technologically feasible level of lead, since any lead to which a child is exposed adds to their body burden.

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Q and A's for Lead in Miniblinds Prepared by CPSC Staff

Question: Why is the CPSC concerned about lead in vinyl miniblinds?

Response: All non-glossy vinyl miniblinds tested by CPSC contained lead. Some of the non-glossy blinds tested had high levels of lead on the surface. The lead was in the form of a layer of dust that could be easily dislodged and ingested by young children. Children 6 years and under often put their hands in their mouths. If they regularly touch the miniblinds with high levels of lead dust and then put their hands in their mouths, they could develop blood lead levels that have been linked with behavior and learning problems, damage to the brain and nervous system, slowed growth, and hearing problems.

Question: What testing was conducted to support the CPSC's conclusions that some vinyl miniblinds are a lead hazard?

Response: CPSC's Health Sciences Laboratory investigated the potential release of lead from various brands of miniblinds by measuring the amount of lead in the miniblind and the amount of lead available in the dust on the surface of the blind. In some cases, an assessment of the home also was conducted to rule out other likely environmental sources of lead. For some miniblind samples, the investigation also included accelerated aging with ultraviolet light and high temperatures. The accelerated aging attempted to simulate exposure to sunlight to determine whether the vinyl would deteriorate.

Initial testing indicated that non-glossy miniblinds contained lead, but glossy miniblinds did not. This testing was later confirmed by the industry who reported that lead was used as a stabilizer only in non-glossy miniblinds. Reportedly, all of the non-glossy vinyl miniblinds are imported.

CPSC staff then focused its investigation on both "brand new" and "used" imported non-glossy vinyl miniblinds. The used blinds were obtained from consumers; the "new" blinds were purchased at retail stores. The testing indicated that as the plastic deteriorates from exposure to sun and heat, the lead contained in the plastic becomes available for ingestion as dust on the surface of the slats. Further, in homes with no other likely sources of lead, lead dust levels on floors and window sills near the miniblinds with high lead dust levels, were not elevated. This indicated that the likely source of lead on the surface of the slats was from the slats.

Lead dust levels varied from blind to blind. Differences in environmental conditions (exposure to sunlight, heat, etc.) and the chemical composition of the miniblinds probably caused much of the variability in the dust levels.

Further testing at the laboratories of the National Aeronautics and Space Administration and the Army's Aberdeen Proving Grounds using scanning electron microscopy (SEM) supported the findings that non-glossy vinyl blinds deteriorate with age under certain environmental conditions. SEM revealed distinct differences between the new blinds and used blinds. The particles at the surface of the new blinds were largely bound in the vinyl matrix. In contrast, the used blinds showed a greater quantity of loose particles at the surface. Further, because silica (common to dirt and clays) was not found on the surface of used blinds (verbal communication with labs), the testing established that the lead came from the blind and not from another source, such as house dust.

Question: I saw my child touch the miniblinds and then put his/her hands in his/her mouth. Should I take my child to the doctor or hospital?

Response: No, it is not necessary to be alarmed if your child has touched the non-glossy vinyl miniblinds once or even a few times and then put his/her hands in his/her mouth. If you think that the child has done this repeatedly you might want to consult a physician and tell him/her that you suspect your child may have been exposed to lead. The physician will determine what if anything needs to be done. Additionally, we would recommend that you remove the miniblind(s) that your child is able to reach so he/she does not touch them repeatedly.

Question: How does lead get into vinyl miniblinds?

Response: According to the manufacturers, lead has been intentionally added to the non-glossy vinyl as a stabilizer to make the plastic more heat stable, rigid and durable.

Question: Can something other than lead be used as a stabilizer?

Response: Yes, manufacturers of polyvinyl chloride in the United States have been using stabilizers other than lead. Companies have provided CPSC with the names of several stabilizers that are currently being used. A monomethyltin and a dimethyltin being used in miniblinds have been approved by the FDA for use in plastics used for food storage and for the manufacture of pipes intended for contact with water in food processing plants. The two tin stabilizers approved by the FDA for contact with food surfaces were approved based primarily upon the low exposure expected. While there is toxicity associated with the organotins being used as stabilizers, if exposure to these organotins is kept to a minimum, staff believes that use of these stabilizers is acceptable. CPSC staff has indicated to the manufacturers that they are responsible for ensuring the safety of the stabilizers they are using. Staff will continue to monitor the use of these non-lead stabilizers.

Question: Will there still be lead in the vinyl miniblinds once the manufacturers stop using lead stabilizers?
Response: There may be low levels of lead as a contaminant in blinds even after lead is no longer used as a stabilizer. But, these levels should not present a health hazard. For example, when lead was no longer used as an intentional additive in paints, the majority of paints CPSC tested had lead levels less than 0.02%. If manufacturers of miniblinds clean their factories appropriately and follow good manufacturing practices, similarly low lead levels could be achieved.

Question: If children 6 years and under can develop health problems due to exposure to lead from vinyl miniblinds, why is CPSC not recalling all vinyl miniblinds?

Response: CPSC did not recall the blinds because a several factors must exist for there to be a problem: 1) the vinyl miniblinds must have been exposed to sun and heat; 2) the home must have a child six years and under; 3) the miniblinds must be within reach of these children, and 4) the child must gain access to the blinds and ingest enough lead dust for 15-30 days to result in elevated blood lead levels. Because of the variety of factors that must be present for there to be a problem, no recall was sought in this case. To eliminate the possibility of this hazard in the future, companies are changing their formulations.

Question: Why is the Consumer Product Safety Commission not banning the future production of lead-containing vinyl miniblinds or setting a mandatory standard for the amount of lead allowed in vinyl miniblinds?

Response: When the Commission staff became aware of the potential problem of lead in vinyl miniblinds, they called in the industry and the major industry association, the Window Covering Safety Council, an umbrella group representing 90% of the vinyl miniblinds manufacturers. These manufacturers/importers/retailers have been working with us to solve the problem. They have indicated to us that they have begun to produce a vinyl miniblind with no lead intentionally added. In addition, they have cleaned up their manufacturing plants to minimize the amount of lead present from contamination. These new vinyl miniblinds with no lead stabilizer added started appearing in stores around July 1, 1996. Because companies are discontinuing the use of lead, no standard appears to be needed.

Question: I have children 6 years old and under and have old non-glossy vinyl miniblinds that the children can reach. What should I do?

Response: The Commission staff recommends that you remove these vinyl miniblinds from your windows and dispose of them.

Question: How can I dispose of my vinyl miniblinds?

Response: You can discard non-glossy vinyl miniblinds from residences with your regular trash. Make sure that when you dispose of the blinds they are not readily accessible to young children.

Question: Do consumers who remove vinyl miniblinds with lead need to wash their window sills and surrounding areas?

Response: The Commission staff does not believe that the dust on the blinds will become airborne during removal. However, during removal, it is possible that some of the dust might wipe off on the window sill or other areas of the window area that might be accessible to young children. If consumers are concerned, they could wet wipe the sills and accessible parts of the frame with a general purpose household cleaner.

Question: Instead of disposing of my vinyl miniblinds, can I just wash the lead containing surface dust off them on a regular basis?

Response: No. Even with vigorous scrubbing, you probably will be unable to remove all the lead containing dust. In addition, deterioration of the vinyl miniblind will continue. The rate of deterioration depends upon the amount of heat and sun to which the blind is exposed as well as its chemical composition. We cannot tell you what this rate is and how often you would have to clean your blinds. That is why, if you have children 6 years and under and the blinds are within their reach, the safest thing to do is to remove them and throw them away.

Question: Can I vacuum the lead dust off the miniblind?

Response: No. Vacuuming the dust will probably not remove all of the lead dust. In addition, the deterioration of the non-glossy vinyl miniblind will continue. The rate of deterioration depends upon the amount of heat and sun to which the blind is exposed as well as its chemical composition. CPSC staff cannot tell you what this rate is and how often you would have to vacuum your blinds to insure that the dust level was kept to a minimum. If you have children 6 years and under and the blinds are within their reach, the safest thing to do is remove them.

Question: Are adults and older children still exposed to the lead dust by inhalation even though they don't ingest the lead dust?

Response: CPSC staff believes that the surface lead containing dust from the deteriorating vinyl does not become airborne and is not inhaled by people in the household. In homes with no other likely sources of lead, lead dust levels on floors and window sills near the miniblinds with high lead dust levels, were not elevated.

Question: Were/are any vinyl miniblinds made without lead?

Response: To the best of our knowledge, lead was not and is not used as a stabilizer in glossy miniblinds, only in non-glossy miniblinds. Non-glossy vinyl miniblinds made without the intentional addition of lead began appearing on the shelves of retail stores around July 1, 1996. The packaging of these blinds should bear labeling such as "New Formulation," "non-leaded formula," "no lead added," or New! Non-leaded vinyl formulation" or in some other way convey the message that they were made without the lead stabilizer.

Question: How can I tell if my miniblinds are old or deteriorating?

Response: Unfortunately there is no easy way to tell if your miniblinds are old or deteriorating. Some old, deteriorating miniblinds look no different from brand new miniblinds.

Question: Can I use a lead test kit to determine whether my miniblinds pose a hazard?

Response: The Commission staff does not recommend the use of lead test kits to test miniblinds. Tests on paint conducted in the Commissions's laboratory indicated that lead test kits did not accurately discriminate between lead and non-lead based paints. In addition, lead test kits were not designed to measure lead in plastic.

Question: Was any color more hazardous than others?

Response: No, the lead in miniblinds was unrelated to color.

Question: Are metal miniblinds safer?

Response: We are presently not aware of any lead hazards from metal miniblinds.

Question: Should I be concerned about lead in other vinyl products?

Response: The Commission staff is looking at the potential of lead release from other vinyl consumer products normally exposed to sun and heat.

Question: My child has an elevated blood lead level and lives in a house with these miniblinds. Do I need to report this case to you? Do you want the miniblinds?

Response: No, it is not necessary to report cases to the CPSC. You should follow the recommendations of your state or local health department, local poisoning prevention program or personal physician. This would include removing non-glossy vinyl miniblinds if they are accessible to your young child.

Question: What is the difference between vinyl, polyvinyl chloride (PVC) and plastic?

Response: For the purposes of the discussion of lead in vinyl miniblinds, the terms vinyl and polyvinyl chloride are used interchangeably. Polyvinyl chloride is a type of plastic.

Question: Do the blinds pose a special hazard for pregnant women?

Response: While maternal exposure to lead and low blood lead levels measured in umbilical cord blood have been associated with deficits in cognitive test performance and neuromotor performance in children, staff do not believe that these miniblinds pose a special hazard for pregnant women. The hazard posed by miniblinds is the result of ingesting the dust containing lead that forms on the surface of the blinds as they degrade, not from an inhalation hazard. Staff believes that the hazard posed by miniblinds containing lead as a stabilizer is an ingestion hazard, especially for young children who typically exhibit hand-to-mouth behavior. This is generally not a problem for adults and older children who are not expected to touch the blinds with their hands and then put their hands in their mouths.