UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, DC 20207

BRIEFING PACKAGE

PETITION TO BAN CHROMATED COPPER ARSENATE (CCA)-TREATED WOOD IN PLAYGROUND EQUIPMENT (PETITION HP 01-3)

February 2003

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EXECUTIVE SUMMARY

On May 22, 2001, the Environmental Working Group (EWG) and the Healthy Building Network (HBN) submitted a request to the U.S. Consumer Product Safety Commission (CPSC) that it enact an immediate ban of chromated copper arsenate (CCA)-treated wood for use in playground equipment and review the safety of CCA-treated wood for general use. In their submission, the EWG and the HBN asserted that a ban on CCA-treated wood playgrounds is necessary because "[r]ecent research has shown that arsenic is more carcinogenic than previously recognized, that arsenic is present at significant concentrations on CCA-treated wood and in underlying soil, that the health risks posed by this wood are greater than previously recognized, and that past risk assessments were incomplete." They urged the Commission to consider new information on arsenic, including a study by the National Research Council (NRC) of the National Academy of Sciences (NAS) concluding that arsenic is a more potent carcinogen than was previously recognized and that it causes bladder and lung cancer, which had not been previously accepted.

To quantitatively estimate the potential risk to children, CPSC staff completed toxicological reviews of chromium, copper, and arsenic, three of the chemical components of CCA, and conducted laboratory and field studies to estimate the amount of arsenic to which a child might be exposed during a typical play time on CCA-treated wood playsets. Because CPSC staff believes that arsenic is the most potent of these three chemicals, the staff's risk assessment is focused on arsenic. The CPSC staff also believes that the principal exposure to arsenic from CCA-treated wood in playground equipment occurs through transfer of wood surface residues to a child's hand and subsequent hand-to-mouth transfer that can occur when children put their hands or fingers in their mouths, and also from indirect transfer to food or toys, which are then put in the mouth.

CPSC staff performed studies that measured the dislodgeable arsenic levels of CCA-treated wood structures on 8 CCA-treated wood decks and 12 CCA-wood playsets in the Washington, D.C. metropolitan area. These structures represented a variety of ages, wood treatments, and manufacturers. Through these studies using adult hands and surrogates for the hands, staff determined that polyester cloth can be reliably used as a substitute for bare hands. Staff estimated that the mean dislodgeable arsenic levels from decks and playsets was 7.7 μg and 7.6 μg, respectively.

Based on the assumptions used in the staff's risk assessment, the CPSC technical staff concluded that a young child who plays on CCA-treated wood playground structures in early childhood has an increased risk of 2 to 100 per million of developing lung or bladder cancer during his or her lifetime. This is an increased risk above the risk of cancer due to other factors during one's lifetime. Staff believes that increased risk exists despite the age of the wood and whether it has been manufactured specifically for playgrounds. The U.S. Environmental Protection Agency (EPA) is also conducting a risk assessment that will be completed in the summer of 2003.

There reportedly are several substitute chemicals available to pressure treat wood with efficacy almost equivalent to that of CCA that are less toxic to humans than CCA.

However, data on the toxicity of these chemicals and possible exposures during reasonably foreseeable use are limited or not available. Wood treated with at least two of these alternative chemicals, i.e., ammoniacal copper quaternary (ACQ) and copper boron azole (CBA), is already in the U.S. market. Other materials are available to manufacture playsets, including untreated wood (cedar or redwood) or non-wood alternatives (plastics, metals, and composite materials). Several companies that manufacture wood play structures, both commercial and residential, have begun using wood that is pressure-treated with alternative chemicals. The percentage of the industry using alternative treatments is unknown.

Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), which is administered by the EPA, it is mandatory that most pesticides, such as CCA, be registered with the EPA before they can be used in the United States. In February 2002, the EPA announced that the manufacturers of CCA had requested that registrations of CCA be either cancelled or amended to terminate essentially all residential uses of CCA, including use in playground equipment, effective December 31, 2003. After this date, if EPA takes the requested action, it will be illegal to use CCA to treat wood intended for most consumer uses, including playground equipment, picnic tables, and decks, although it will continue to be registered for several uses that are generally unavailable for consumers, including use of CCA to treat wood for use in salt water and in construction. EPA is expected to finalize its action, as proposed, in a Federal Register notice in early 2003. Wood treated with CCA prior to that date could continue to be sold to consumers until supplies are exhausted and any wood in consumers' possession could continue to be used. EPA expects that most of the wood treated for cancelled uses would be sold by mid-2004.

CPSC staff, in conjunction with EPA staff, will initiate studies to determine effective methods of mitigating the leaching of arsenic from existing structures made of CCA-treated wood. The application of stains and sealants to the wood will be evaluated.

CPSC staff recommends that the Commission defer action on the petition until EPA has completed its action to cancel the CCA pesticide registration and the staff has assessed its impact.

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

Date: FEB 4 2003

TO : The Commission
Todd A. Stevenson, Secretary

THROUGH: W.H. DuRoss, III, General Counsel
Patricia M. Semple, Executive Director

FROM : Jacqueline Elder, Acting Assistant Executive Director, Office of Hazard Identification and Reduction
Patricia M. Bittner, M.S., Project Manager for Chromated Copper Arsenate (CCA)-Treated Wood in Playground Equipment, Directorate for Health Sciences 301-504-7263

SUBJECT : HP 01-3, Petition to Ban the Use of CCA-Treated Wood in Playground Equipment

This briefing package presents information and options related to the use of chromated copper arsenate (CCA)-treated wood for playground equipment. The CPSC staff prepared this briefing package in response to a submission from the Environmental Working Group (EWG) and the Healthy Building Network (HBN) requesting a ban on the use of CCA-treated wood in playground equipment and a review of the safety of CCA-treated wood for general use. The request for a ban was docketed as Petition HP 01-3. The request for the safety review was not docketed because it does not require rulemaking to implement.

The briefing package contains information on potential toxicity, the results of CPSC staff's exposure studies, and an analysis of the estimated increased risk of lung or bladder cancer to children playing on CCA-treated wood playground equipment. The package also contains product and market information, information on CCA substitutes, and a summary of comments received in response to the Commission's July 2001 notice in the Federal Register. Finally, options for Commission consideration are presented.

NOTE: This document has not been reviewed or accepted by the Commission.
Initial ____ **Date** 2/4/03

CPSA 6 (b)(1) Cleared 2-4-03
No Mfrs/PrvtLblrs or
Products Identified
Excepted by Petition

I. BACKGROUND

A) Petition for Rulemaking

On May 22, 2001, the Environmental Working Group (EWG) and the Healthy Building Network (HBN) submitted a request to the Commission that it enact an immediate ban of CCA-treated wood for use in playground equipment and review the safety of CCA-treated wood for general use. The submission is found in Tab A.

The Office of the General Counsel (OGC) docketed the part of the submission that requested a ban on the use of CCA-treated wood in playground equipment as petition number HP 01-3 on June 20, 2001, under provisions of the Federal Hazardous Substances Act (FHSA) 15 U.S.C. 1261-78 (Martin 2001). The other part of the submission, to review the safety of CCA-treated wood for other uses, was not docketed as a petition because it would not require rulemaking to implement. The CPSC published a Federal Register notice on July 13, 2001, requesting public comments on the docketed portion of the submission (66 FR 36756) (Tab B). The public comment period ended on September 11, 2001.

In their submission, the EWG and the HBN asserted that a ban on CCA-treated wood playgrounds is necessary because "[r]ecent research has shown that arsenic is more carcinogenic than previously recognized, that arsenic is present at significant concentrations on CCA-treated wood and in underlying soil, that the health risks posed by this wood are greater than previously recognized, and that past risk assessments were incomplete." They urged the Commission to consider new information on arsenic, including a study by the National Research Council (NRC) of the National Academy of Sciences (NAS) concluding that arsenic is a more potent carcinogen than was previously recognized and that it causes bladder and lung cancer, which had not been previously accepted.

Furthermore, the petitioners noted that the risk to children from playground equipment represents only part of a child's contact with CCA-treated wood and that children may also touch decks, railings, picnic tables, docks, and fences made with CCA-treated wood, which would increase their exposure.

The petitioners pointed out that the previous CPSC risk assessment (Lee 1990) concluded that although the majority of playground equipment wood samples tested would not present an increased cancer risk to children, most of the playground wood tested in that study had been treated with a surface stain or other finish, which might diminish the amounts of dislodgeable arsenic available on the surface. The petitioners also noted that the CPSC (1990) study found that wood not specifically processed for playground use, i.e., CCA-treated lumber bought at retail stores for consumers' use in building their own playgrounds, could present an increased cancer risk, and that even higher levels of arsenic have been found in this type of wood according to other studies (CDHS 1987). They stated that comparable, less costly alternatives to CCA exist that have low toxicity.

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B) CCA-Treated Wood

If not treated with a preservative, most wood used in outdoor applications would be damaged by insects and fungi. Depending upon its use and the local environmental conditions, untreated wood will generally sustain damage within 3 to 5 years. This damage shortens the useful life of wood structures (e.g., playground equipment or decks), and may lead to physical safety hazards.

In almost all cases involving exterior residential applications, including playground equipment and decks, wood is preserved through a manufacturing process called "pressure treating." Pressure-treated wood is produced by placing the wood inside a cylinder and applying a vacuum. The vacuum removes air from the wood to make it easier for the chemical preservative to infiltrate the cellular structure of the wood. The preservative is then introduced into the cylinder and forced into the wood under high pressure. The wood is removed from the cylinder and tested to be sure that the preservative has adequately penetrated and that the wood is treated to the proper level. According to industry sources, pressure-treated wood lasts 10 to 20 times longer than untreated wood in the same application.[1]

CCA, which was introduced in the 1930's, has been the chemical formulation most commonly used for pressure treating wood. In current formulations, CCA is composed of chromic oxide, cupric oxide, and arsenic pentoxide (47.5 percent, 18.5 percent, and 34.0 percent, respectively). As recently as 2001, CCA was used in about 98 percent of the pressure-treated wood produced for residential uses.[2] However, other chemicals, including other arsenic-containing chemicals, also can be used as preservatives in pressure-treated wood.

The American Wood Preservers Association (AWPA)[3] sets standards for pressure treating wood with CCA. The standards are defined in terms of pounds per cubic foot (pcf) of the preservative retained in the wood at a specific depth ("retention"). Although the AWPA standards call for CCA retention levels of 0.25 pcf for wood used above ground, which would include most uses in decks and playground equipment (other than for posts that may be anchored in the ground), industry sources confirmed that very few retailers carry wood treated to the 0.25 retention level.[4] Most wood sold to consumers is treated to 0.40 pcf, which AWPA considers appropriate for wood used above and below ground.

C) Previous Commission Activity

In 1990, CPSC staff conducted a risk assessment of arsenic exposure to children from CCA-treated playground structures (Lee 1990) as part of an update for the *CPSC Handbook of Public Playground Safety*. For this limited study, the staff collected samples of wood from some playground manufacturers and tested the surface of this wood for arsenic using cloth wipes. The risk assessment considered ingestion of

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[1] American Wood Preservers Institute (AWPI) website, http://www.preservedwood.com/faqs/faqs44.html.
[2] Presentation by Scott Ramminger, President of AWPI, at CPSC, August 6, 2001.
[3] The AWPA is independent of the AWPI.
[4] Based on statements made at the public meeting between CPSC staff and the AWPI and Arsenicals Task Force of the American Chemistry Council (ACC) on August 6, 2001 (CPSC 2001a).

arsenic residue from a child's hands contaminated through contact with CCA-treated wood surfaces, and used skin cancer as the toxic endpoint, because at the time it was considered the most sensitive health effect. The study concluded that the majority of new playground equipment samples tested would not present an increased skin cancer risk to children. That study also found that wood that was not specifically processed for playground use by finishing (e.g., sealing the wood) could present a risk. At that time it was noted that consumers might use unfinished wood to build their own playground structures.

The CPSC staff's (1990) findings have been reassessed in a new staff risk assessment (see Section II). This reassessment was conducted due to new data on CCA-treated wood developed by CPSC staff and in light of new published toxicity data indicating the development of lung and bladder cancer after ingestion of arsenic in drinking water (NRC 1999, 2001).

D) Report to Congress (February 15, 2002)

In its Conference Report accompanying the FY 2002 VA/HUD/Independent Agencies appropriations bill, *HR Conf. Rep. No. 107-272, at 122 (2001)*, Congress directed the CPSC to report to the House and Senate Committees on Appropriations on its work on CCA-treated wood. It directed the agency to report "...the steps being taken to identify whether there are significant health and safety risks to children playing on and around CCA-treated wood playground equipment," as well as "...the actions CPSC is taking to keep state and local governments, as well as consumers, informed about their findings on the health effects associated with CCA-treated wood playground equipment."

The CPSC responded with "The U.S. Consumer Product Safety Commission Status Report On CCA Pressure-Treated Wood In Playground Equipment," which was delivered to the Congressional Committees on Appropriations on February 15, 2002. A copy of the report is found in Tab C and provides a summary of CPSC activities on CCA-treated wood through January 2002.

E) EPA Activities

Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), which is administered by EPA, it is mandatory that most pesticides, such as CCA, be registered with the EPA before they can be used in the United States. The registration includes the uses for which the pesticide is approved. In February 2002, the EPA announced that the manufacturers of CCA had requested that registrations of CCA be either cancelled or amended to terminate essentially all registrations of CCA to treat wood for residential uses, including for use in playground equipment, effective December 31, 2003. A copy of EPA's Federal Register notice announcing this proposed action is found in Tab D. As described in the Federal Register notice, it will be illegal to use CCA to treat wood intended for most, but not all, consumer uses on and after December 31, 2003.

As of December 31, 2003, CCA will continue to be registered for several uses that are generally unavailable for consumers, which include use in salt water and construction.

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However, 6" x 6" posts, which are typically used for above ground/second story deck support and landscaping, could still be processed or manufactured with CCA and might remain available for consumer purchase through home improvement or landscape supply outlets.

EPA is expected to finalize its action, as proposed, in a Federal Register notice in early 2003 (personal communication with J. Housenger, Acting Associate Director, Antimicrobial Division, EPA, 2003). Thus, the production of CCA-treated wood for essentially all consumer purposes, including playground equipment, picnic tables, and decks, will end on December 30, 2003. Wood treated with CCA prior to that date could continue to be sold to consumers until supplies are exhausted and any wood in consumers' possession could continue to be used (Franklin 2003; Whitfield 2003). Lumber and playground equipment wood made with CCA will probably still be available for retail sale on and after December 31, 2003, although the quantity of CCA-treated products in the retail distribution chain will be substantially less than in 2001 and earlier years (Franklin 2003; personal communication with J. Housenger 2003). EPA expects that most of the wood treated for uses that are to be cancelled would be sold by the end of June 2004. EPA also has indicated that the process used by the wood treaters to convert their equipment from using CCA to using alternative chemical wood preservatives would preclude or minimize stockpiling of CCA-treated wood (personal communication with J. Housenger 2003).

Until supplies are depleted, all CCA-treated lumber sold to consumers is expected to continue to be labeled according to a voluntary agreement reached between EPA and the American Wood Preservers Institute (AWPI) in 2001. Among other things, this agreement requires that labels be attached to individual pieces of CCA-treated lumber and that information tags be posted in areas where the lumber is sold. The individual labels provide information to the consumer stating that the wood has been treated with inorganic arsenic, which may present certain hazards. The label also states that arsenic may dislodge from the wood surface to the skin and can migrate into the soil over time.

F) Voluntary Standards

The staff has reviewed the existing playground safety and wood treatment standards (Whitfield 2003). This review is found in Tab E. The staff is unaware of any U.S. mandatory standards on playground safety pertaining to CCA-treated wood. Voluntary standards have been developed under the auspices of ASTM International for both home (ASTM F1148-00) and public (ASTM F1487-01) playground equipment. The standards, called the *Standard Consumer Safety Performance Specification for Home* (or *Public) Playground Equipment*, are intended to minimize the likelihood of life-threatening or debilitating injuries by setting safety and performance requirements for various types of playground equipment.

As the ASTM playground equipment standards are currently written, there is no specific reference to CCA-treated wood. The general language indicates that wood used on the playground shall be naturally rot- and insect-resistant or treated to avoid such deterioration. In the ASTM standards, the phrase "surface coatings that contain pesticides shall not be used for playground equipment" is stated for both the home and public playground standards. However, CCA is not considered a surface coating, even though it may be accessible at the wood surface.

There is other language in the voluntary standards that indirectly addresses the use of CCA-treated wood playground equipment. The ASTM playground equipment standards for both home and public use state that "[r]egardless of the material or the treatment process, the manufacturer shall ensure that the users of the playground equipment cannot ingest, inhale, or absorb any potential[ly] hazardous amounts of substances through body surfaces as a result of contact with the equipment."

Consumers who design their own playground structures can build their home playgrounds using CCA-treated lumber purchased from retail stores or lumberyards. The two voluntary standards would not apply to playground equipment constructed in this manner.

The ASTM subcommittees for both home and public playground equipment have indicated to staff that they are awaiting the results of the CPSC staff studies and/or CPSC recommendations before determining whether revisions to the existing standards will be needed to reflect CPSC staff findings or Commission action on Petition HP 01-3.

The AWPA has developed voluntary standards for the wood preserving industry. The AWPA standards describe the various types of preservatives, categories of lumber appropriate for treating, conditioning requirements, and the treatment processes appropriate for preserving wood. Changes to the existing AWPA standards have been proposed to address the recent changes in the registration of CCA with the EPA as a pesticide for use in treating wood under various AWPA standard processes. These changes are described in Section E above and more fully in Whitfield (2003) (Tab E).

G) International Activities

There are actions underway internationally with regard to CCA-treated wood. The Canadian Pest Management Regulatory Agency (PMRA) has reached a voluntary agreement with the CCA chemical manufacturers to voluntarily phase out the use of CCA to treat wood for the non-industrial market (PMRA 2002). This agreement is similar to that which was reached with EPA. As part of the Canadian agreement, wood can no longer be treated with CCA for individual uses such as playgrounds, decks, picnic tables, and residential fencing on and after December 31, 2003. Remaining stocks of wood treated prior to that date can still be sold in stores and can be used for residential construction in Canada. Previously built structures are not affected.

The European Commission (EC) is currently considering a proposal to ban the sale of arsenic treated wood and arsenic wood paints (personal communication from T. Daskaleros 2002). There may be exemptions for certain applications of CCA-treated wood. It is anticipated that this regulatory process will take several months (personal communication from T. Daskaleros 2002).

H) Other Commission Staff Activities

Public Meetings

The CPSC staff met with representatives of the American Chemistry Council (ACC) and the American Wood Preservers Institute (AWPI), who represent the CCA chemical and wood treatment industries, respectively, in a public meeting on August 6, 2001 (CPSC 2001a). At this meeting, information about CCA-treated wood was conveyed to CPSC staff by the ACC and information on treatment processes and the amount of CCA-treated wood that is produced in the U.S. was presented by AWPI.

On October 3, 2001, representatives of the petitioners, the EWG and the HBN, made public presentations to CPSC staff on risk assessment issues and reiterated their concern about the safety of CCA-treated wood (CPSC 2001b).

In August 2002, CPSC staff provided representatives of the CCA chemical manufacturers with written comments on the manufacturers' proposed protocol for testing CCA-treated wood structures. In October 2002, the CCA chemical manufacturers met with CPSC staff and presented their plans for these studies, which are currently underway, and are expected to be completed sometime in the summer of 2003 (CPSC 2002a). Logs from these meetings are available from the CPSC Office of the Secretary.

Collaboration with EPA

CPSC staff began meeting with EPA staff in July 2001, to share data and to develop testing protocols for a field study of CCA-treated wood playgrounds in the U.S., should one be needed. This collaboration resulted in the development of two study protocols to assess the release of arsenic, chromium, and copper in CCA-treated wood playground equipment and in nearby soil and buffering materials used under playground equipment (e.g., wood chips). A joint CPSC-EPA Federal Register notice was published on September 20, 2001 (66 FR 48428), announcing the availability of the two protocols for public comment. The comment period ended on October 22, 2001. The protocols also were sent for external peer review to a group of independent scientists. In October 2001, the EPA convened a Scientific Advisory Panel (SAP), consisting of a panel of independent scientific experts, to review some hazard and exposure parameters for a preliminary EPA risk assessment of arsenic and chromium in CCA-treated wood. The final report and recommendations of this panel were completed in December 2001. CPSC staff attended the public meetings of this panel and found that although the SAP was not asked specifically to comment on the joint CPSC-EPA protocols, the panel did provide some informal comments in the course of its deliberations.

Scientists from CPSC and EPA jointly reviewed all public and external peer review comments and the SAP report. These comments were taken into account in the development of the CPSC staff studies and the risk assessment presented in this briefing package (Cobb 2003; Cobb and Davis 2003; Hatlelid 2003b; Levenson 2003a,b,c; Thomas 2003).

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Other ongoing collaborative efforts between the CPSC staff and EPA staff are described in Section VII.

II. HAZARD AND RISK ASSESSMENTS

This section presents the CPSC technical staff's assessment of the hazard and risk to children posed by the use of CCA-treated wood playground equipment.

As mentioned previously, CCA is composed of a mixture of chromium, copper, and arsenic compounds. CPSC staff believes that arsenic is the most potent of these three chemicals. In addition, although arsenic causes both cancer and non-cancer health effects, the CPSC staff considers cancer to be the most sensitive endpoint (Hatlelid 2003b).

The principal exposure to arsenic from CCA-treated wood in playground equipment occurs through transfer of wood surface residues to a child's hands and subsequent hand-to-mouth transfer that can occur from directly putting hands or fingers in the mouth, and also from indirect transfer to food or toys, which are then placed in the mouth (Hatlelid 2003b). In addition to oral exposure, arsenic residues transferred from the wood to the skin (*e.g.*, hands, arms, legs) could be absorbed through the skin, contributing to exposure. Limited data on dermal absorption of arsenic compounds suggests that some uptake by the dermal route can occur (Hatlelid, 2003a). Further, arsenic from CCA-treated wood may leach or wash off the wood onto the surface below the play structure (Stilwell and Gorny, 1997). Children playing near or beneath the play structure could contact the playground surfacing materials, soil, or ground cover. As with arsenic residues transferred directly from the wood surface, arsenic in the contaminated ground materials could be ingested through hand-to-mouth contact, or could be absorbed through the skin. Other avenues of exposure to CCA residues are possible, such as through contact with residential decks, porches, picnic tables, or fences, direct mouthing of handrails or other surfaces, or other activities. To respond to the petition's request concerning playgrounds, staff focused on playground equipment exposures. Any potential risks from other sources of exposure would add to the final estimate of risk that might result from the exposure under investigation.

Results from the CPSC staff studies have been used to quantitatively estimate the increased lifetime lung or bladder cancer risk from exposure to arsenic for the individual who plays on CCA-treated wood structures during early childhood. It does not consider individuals who have access to all kinds of play structures, with only some of them (or none at all) being constructed of CCA-treated wood. Staff also conducted reviews of the scientific literature and other available information and considered the following questions in conducting its risk assessment. The letters in parentheses correspond to the sections that describe this work.

(1) What is the Federal Hazardous Substances Act (FHSA) definition of "hazardous substance?" (A)

(2) What is the toxicity of CCA-treated wood? (B)

(3) How do children get exposed to arsenic from playground equipment? (C)

- How do they interact with the equipment?
- How often do they play on playgrounds and for what period of time?

(4) What do the CPSC laboratory and field studies of CCA-treated wood show about the amount of arsenic that comes off the wood when it is touched? (D)
  - What methods were developed to determine the amount of arsenic that comes off the wood after it is rubbed?
  - What methods were used to estimate the amount of arsenic that might be transferred to the hand of a child on playground structures?

(5) What findings from laboratory and field studies and what other parameters were used in the calculation of exposure and risk? (E)

(6) What is the CPSC staff estimate of increased cancer risk from the use of CCA-treated wood playground equipment and how do changes to the key input values to the risk calculation alter this risk? (F)

(7) How does the CPSC staff risk assessment on CCA-treated wood in playground equipment compare to other risk assessments of CCA-treated wood playground equipment? (G)

A) The FHSA Definition of Hazardous Substance

The Federal Hazardous Substances Act (FHSA) requires that consumer products that meet the statutory definition of "hazardous substance" bear cautionary labeling for the safe use and handling of those products. The FHSA defines a substance as a "hazardous substance" if it satisfies both parts of a two-part definition.[5] To be a hazardous substance, a substance or mixture of substances must first be toxic, corrosive, flammable, combustible, an irritant, a strong sensitizer, or generate pressure through decomposition, heat, or other means. Second, that substance or mixture of substances must be found to have the potential to cause substantial personal injury or substantial illness during or as a proximate result of any customary or reasonably foreseeable handling or use, including reasonably foreseeable ingestion by children. Under section 2(q)(1)(A)[6] of the FHSA, a children's product which is a hazardous substance or bears or contains a hazardous substance in such manner as to be susceptible of access by a child to whom such article is entrusted is automatically banned.

CCA is a pesticide subject to the Federal Insecticide, Fungicide, and Rodenticide Act "FIFRA". FIFRA is administered by the EPA. Section 2(f)(2) of the FHSA excludes such pesticides from the scope of the statutory "hazardous substance" definition. However, the exclusionary clause goes on to state that the exclusion does not apply to "any article which is not itself a pesticide within the meaning of [FIFRA] but which is a hazardous substance ... by reason of bearing or containing such pesticide. " The CCA-treated wood as used in construction of the playground equipment product, therefore, is not exempt from regulation under the FHSA. Thus, any hazardous substance

[5] 15 U.S.C. § 1261 (f)(1)(A).
[6] 15 U.S.C. § 1261(q)(1)(A).

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determination would be made for the playground equipment wood treated with CCA, not the CCA contained in the wood used to construct it.

To address the petition, the staff has limited its evaluation to the extent of availability of arsenic on the surface of the wood and the potential for uptake of that arsenic by children from playground equipment made with CCA-treated wood. Other exposure and uptake issues would need to be addressed if uses of this wood beyond that in playground equipment were to be considered.

B) Toxicity of CCA Components

When the petition was docketed, CPSC staff reviewed toxicity data (Ferrante 2003; Hatlelid 2003a; Osterhout 2003) found in the peer reviewed scientific literature, in reports provided to CPSC, and in previous risk assessments. The staff determined that there were insufficient data available on the exposure to arsenic from CCA-treated wood on which to base a recommendation to the Commission regarding the risk to children. Previous studies that measured the amount of arsenic on the surface of the wood have not been adequate to assess risk because of small sample sizes, or protocols that used methods that were not shown to correlate with the human hand or were subject to bias. Thus, CPSC staff addressed the inadequacies of existing data by designing and performing new studies. Further, staff believed that updated reviews of data on the toxicity of the chemical constituents of CCA also were needed.

CCA is a mixture of chromic oxide, cupric oxide, and arsenic pentoxide. CPSC staff therefore reviewed the toxicity of all three metallic constituents of these chemicals, i.e., chromium, copper, and arsenic (Ferrante 2003; Osterhout 2003; Hatlelid 2003a, respectively) (Tab F). CPSC staff considers that arsenic is the most potent of the three (Hatlelid 2003b). Arsenic causes cancer and non-cancer health effects, but the CPSC staff considers carcinogenicity to be the most sensitive endpoint for human health effects. Thus, at this time, the staff has calculated the increased lifetime risk of lung or bladder cancer associated with the exposure to arsenic from CCA-treated wood used for playground equipment. As will be discussed later in this section, there is evidence that arsenic exposure also causes skin cancer. Any increased risk for skin cancer from arsenic exposure would be in addition to the calculated risk for lung or bladder cancer. Any non-cancer health risks from arsenic or potential health risks associated with the other compounds are not included in the increased lung or bladder cancer risk from arsenic calculated by CPSC staff.

Arsenic occurs naturally in the environment in soil, water, and air. The Agency for Toxic Substances and Disease Registry (ATSDR) reports that human activities (including mining, pesticide application, combustion of coal and wood, and waste incineration) are a much larger source of environmental arsenic in areas where these activities take place (ATSDR 2000). Arsenic concentrations in surface, ground, and finished drinking water and in soil vary greatly across the U.S. and worldwide. Mean U.S. arsenic levels in water are about 1-2 micrograms of arsenic per liter of water (1-2 µg/L or 1-2 parts per billion [ppb]), and most values are less than 10 µg/L (ATSDR 2000). Arsenic levels in groundwater have approached 50,000 µg/L in western U.S. mining areas (Welch *et al.*, 1988). A survey of U.S. drinking water sources found less than five percent of finished surface and ground water exceeded 10 µg/L (Frey and Edwards 1997). Background soil arsenic levels range from about 1 to 40 µg/g (parts per million [ppm]), with a mean of about 5 µg/g. The naturally occurring presence of arsenic in food generally accounts for the largest source of daily exposure to inorganic arsenic and total arsenic, followed by soil (for infants and children), water, and air. The total average daily intake of inorganic arsenic is estimated to be 0.1-2.6 µg/kg-body weight[7] (about 2-46 µg per day for a young child) (ATSDR 2000).

About 90 percent of the arsenic in the U.S. is used for CCA treatment of wood (ATSDR 2000). Few data are available on the chemical and physical characteristics of arsenic compounds that result after treatment of wood with CCA. Prior studies have shown, however, that arsenic compounds may leach out of treated wood, and may be removed from the surface of the wood by wiping or rubbing (CDHS 1987; Lee 1990; Lebow 1996). Several studies have measured arsenic soil levels near CCA-treated wood structures (reviewed by Lebow 1996). A study by Stilwell and Gorny (1997) found that soil beneath residential decks constructed from CCA-treated wood contained an average 76 µg/g, compared to nearby control samples (background) averaging 3.7 µg/g. Another study showed that soil arsenic levels near wooden highway traffic sound barriers averaged 67 µg/g with background levels of 1.4 µg/g (Stilwell and Graetz 2001).

The chemical CCA contains arsenic pentoxide (oxidation state As^{+5} or As [V]). Inorganic arsenic species in the As^{+3} and As^{+5} oxidation states are environmentally stable and are the most commonly detected in the environment. These two forms may interconvert both in the human body and the environment (Hatlelid 2003a). Although the chemical forms of arsenic that exist in CCA-treated wood after treatment are not known with certainty, several inorganic forms of arsenic are relatively similar in toxicity (Hatlelid 2003b). The International Agency for Research on Cancer (IARC) classifies arsenic and arsenic compounds as Group 1, carcinogenic to humans (IARC 1987). The National Toxicology Program Report on Carcinogens (NTP 2002) classifies arsenic and arsenic compounds as "known to be" human carcinogens. In addition, most health effects studies in humans such as the drinking water studies discussed below, do not distinguish between the possible forms. Thus, for the purpose of the CPSC staff risk assessment, the arsenic that is available on the surface of the wood is assumed to be inorganic arsenic. Because the most common inorganic forms can interconvert in the body, the total amount of arsenic that is available on the surface of the wood is considered in assessing exposure and risk, regardless of the oxidation state.

The low-level exposures to arsenic that most consumers will encounter from using structures made from CCA-treated wood are not expected to result in immediate or acute effects. Exposure to arsenic at higher levels, such as those an individual not exercising proper precaution might encounter in a work setting, may include vomiting, diarrhea, abdominal pain, and hemorrhage as well as adverse health effects in multiple organs, especially the liver and kidney. Neurological effects, including peripheral neuropathy and central nervous system effects, such as seizures and coma, may occur

[7] While exposure to arsenic from background sources could be much higher than the exposure from playgrounds for some children, exposure to arsenic from CCA-treated wood playgrounds could be a significant source of arsenic for some children on those days that include a playground visit.

at these higher doses and death has been reported from one-time higher level exposures. There have been reports of non-workplace related acute toxicity in individuals who have worked with CCA-treated wood in construction projects without using protective equipment or in individuals who have burned the wood (personal communication with Jonathan Chen, EPA, 2002).

Health effects from long-term or chronic human exposure to arsenic may include: gastrointestinal, hematological, cardiovascular, hepatic, and neurological effects, weight loss, and death (reviewed in Hatlelid 2003a). Dermal effects, such as hyperpigmentation[8] and hyperkeratosis[9], are characteristic of long-term exposures to arsenic. Epidemiological data indicate that arsenic exposure through drinking water may increase the incidence of diabetes and hypertension. Limited *in vitro* data suggest that arsenic may affect glucose metabolism. Reproductive and developmental effects, such as spontaneous abortion, stillbirth, preterm birth, and infant mortality, are suggested by epidemiological studies of populations exposed to arsenic in drinking water.

Although arsenic causes both cancer and non-cancer health effects, the CPSC staff considers carcinogenicity to be the most sensitive endpoint. Arsenic-related cancers have been observed from environmental, occupational, and medicinal exposure. In humans, arsenic causes characteristic skin lesions, including skin cancer. Strong evidence also links arsenic exposure to other cancers, including lung, bladder, liver, kidney, and prostate. Key epidemiological data on skin cancer and drinking water in southwestern Taiwan are found in Tseng *et al.* (1968) and Tseng (1977). The association between lung and bladder cancer and drinking water in southwest Taiwan is described in numerous studies (Chen *et al.* 1985; Chen *et al.* 1986; Chen *et al.* 1988; Wu *et al.* 1989; Chen and Wang 1990; and Chen *et al.* 1992). Studies in other populations (*e.g.*, Chile, Argentina, northeast Taiwan) support the association between arsenic ingestion and skin and internal cancers (Hopenhayn-Rich *et al.* 1998; Ferreccio *et al.* 2000; Chiou *et al.* 2001). Further discussion of these studies can be found in Section II.E below and in Tab I.

Exposure is the second component in the determination of risk. Studies were undertaken in 2002 by CPSC staff to provide reliable and quantitative data to estimate a child's possible exposure to arsenic while playing on CCA-treated wood playground equipment during early childhood. The data were used to mathematically estimate the likelihood that a child might develop lung or bladder cancer over his or her lifetime as a result of regular contact with CCA-treated wood playground equipment.

C) Children's Use of Playground Equipment

To assess the risk to children from playing on CCA-treated wood playground equipment, CPSC technical staff considered information about children's behavior related to playground use. Children contact the equipment in various ways while playing and may grasp, wipe, and push off the equipment. CPSC staff estimated the types of hand contact children have with playground structures during normal use and

[8]Hyperpigmentation: darkened patches on the skin
[9]Hyperkeratosis: thickening of the outer layer of the skin

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the amount of area that they touch (Midgett 2003a) (Tab G). Staff determined that the hand rubbing of wood, which was later used in the CPSC staff studies, is an action that serves as a reasonable aggregation of the various manual contacts that young children have with the playground wood (Midgett 2003a; Thomas 2003).

Consistent with common developmental milestones in children's play, playgrounds are of key interest for children aged 2 to 12 years. Data exist to show that as young children develop, they mouth objects, including their hands (Midgett 2003a). Since the children most likely to exhibit hand-to-mouth behavior (i.e., ingest CCA-wood residues from hand-to-mouth contact) are younger than 7 years of age, children aged 2 to 6 years are considered the most "at-risk" group in the risk assessment as described in Section II.E. below.

CPSC technical staff estimated that children visit playgrounds 156 times/year, which is an average of 3 visits/week, while acknowledging that there may be a large range of regional variation, from as little as 104 visits/year to as many as 230 visits/year, depending on the area of the country in which one lives (Midgett 2003b) (Tab G). Children in school and in daycare have more scheduled access to playgrounds, usually at least once a day during those periods when they are in attendance, although this scheduled access to playgrounds is affected by weather.

D) CPSC Staff Laboratory and Field Studies

The purpose of the staff laboratory and field studies was to obtain exposure data to assess the health risk to children from the use of CCA-treated wood in playground equipment. As noted earlier in this report, hand-to-mouth contact (either direct, in which young children collect arsenic on their hands and then place their hands into their mouths, or indirect, in which children touch toys, food, or other objects and then place these in their mouths) is the principal route for exposure to arsenic from CCA-treated wood in playground equipment. Therefore, staff conducted a series of experiments to:

- create a standard protocol that could be used to quantify arsenic transfer from CCA-treated wood, and
- estimate the amount of arsenic that might be transferred to a child's hand during normal play activities on playground structures.

To study the amount of dislodgeable arsenic on CCA-treated wood, staff tested CCA-treated wood from both playground structures and decks. Since many playground structures are constructed using the same CCA-treated lumber that is used to build decks, and playground structures and decks in a given geographical area are exposed to the same weather conditions, both decks and playground structures were used in the study.

While estimating the amount of arsenic available for exposure through hand contact with playground structures is best determined by measuring the amount of arsenic on human hands that have been in direct contact with CCA-treated wood, it is not always feasible to use human volunteers to rub wood surfaces. Furthermore, an improbably large number of human volunteers would be needed to sample a large number of wood structures. Therefore, a methodology was developed to identify a surrogate cloth material that could be used to sample wood for arsenic residues to predict arsenic hand values after wood contact. Tab H contains the staff memos that include the detailed description, results, and analyses of the series of laboratory and field studies that were performed (Cobb 2003; Cobb and Davis 2003; Levenson 2003a,b,c; Thomas 2003).

1) Laboratory Studies

Preliminary studies were conducted in the CPSC laboratory to characterize the properties of CCA-treated wood and to explore parameters that might have an impact on arsenic migration to hands and surrogate materials. These parameters included: the amount of surface area rubbed; the pressure of the hand or surrogate material that is applied during rubbing; the number of strokes; and the rinsing procedure for efficient removal of arsenic from the volunteers' hands. Studies using adult volunteers were also undertaken to examine the way in which the hand loads dislodgeable arsenic residue. These preliminary studies were all completed using CCA-treated boards. Results of these studies (Cobb 2003) are detailed in Tab H. Based on the results of the preliminary studies, two field investigations were performed that involved sampling boards on decks and playgrounds with bare hands and/or surrogate materials (Cobb and Davis 2003) (Tab H).

2) Field Studies

Decks made of CCA-treated wood were used in the first field study, to examine the amount of arsenic that might be reasonably expected to be picked up by the hand on horizontal surfaces, and to establish a correlation between the amount of arsenic picked up by a hand and the amount picked up by a suitable surrogate material for the hand. The surrogate procedure also allows for vertical sampling, whereas the hand procedure does not. Test structures for the first study included a convenience sample of 8 residential decks at homes in the Washington, D.C. metropolitan area. The structures sampled ranged in age from 0-18 years and had a variety of use patterns and surface treatments, and had been exposed to the elements typical of the conditions that the wood is likely to experience during consumer use in this particular geographical area.

Deck boards were rubbed with adult volunteers' hands and a surrogate material (dry polyester cloth) in order to establish a correlation between the results of the two methods. Deck wood was used to establish this correlation because decks provide large flat surfaces for "paired sampling" of cloth and volunteers' hands and enough surface area to enable replicates to be run.

Eight adult human subjects each rubbed a hand over a predefined area of wood for a predetermined number of times. The rubbing procedure was specified so that the volunteer would have sufficient contact with the wood to approach an equilibrium level or "maximum hand load" after which point the hand would not continue to pick up significantly greater amounts of arsenic (Thomas 2003). The surface area of the wood that needed to be rubbed to approach this equilibrium was established in previous CPSC staff laboratory studies (Cobb 2003). The surface area touched by the volunteers was within the limits of what a child playing on a playground structure might reasonably be expected to touch (Midgett 2003a; Thomas 2003). The hand was then repeatedly rinsed and wiped to ensure that most of the arsenic picked up by the hand was measured, and the rinses and cloth wipes were chemically analyzed to determine the amount of arsenic present.

A weighted surrogate cloth (dry polyester) was rubbed over a predefined area of a sample of wood for a predefined number of times. The surrogate cloth was then chemically analyzed for the amount of arsenic.

The results of the deck study provided a correlation between the amount of arsenic found on the dry polyester cloth surrogate and human hands after rubbing CCA-treated wood. Establishing a sound correlation between the results of the hand and the dry polyester cloth surrogate wipes enabled staff investigators to further examine the generally smaller horizontal surface areas on a variety of playground structures without the need for human volunteers. Other risk assessments of CCA-treated wood generally have used polyester fabric surrogates without establishing such a correlation (EWG/HBN 2001; Lee 1990; Gradient 2001; Roberts and Ochoa 2001).

A playground study then was performed that tested 12 CCA-treated wood and 3 non-CCA wood home playground structures in the Washington, D.C. metropolitan area (Cobb and Davis 2003; Levenson 2003c; Thomas 2003). These playgrounds represented a variety of ages (0.5-18 years), wood treatments, and manufacturers. They were also in use by their owners, which provided the same advantages as the deck structures tested in the first field study.

The CPSC laboratory and field deck and playground studies led to the following conclusions:

- The amount of arsenic that can be "loaded" onto a hand appears to approach equilibrium ("maximum hand load" values) when rubbing CCA-treated boards. (Further description is found on page 20 of this memo.) This "maximum" hand load is reached relatively quickly, i.e., after rubbing the hands just a few times over the test area.

- In the first field study (8 CCA-treated decks), there was a significant difference ($p<0.001$) in arsenic levels picked up by the hand among the various decks tested. The levels of arsenic transferred to a human hand ranged from 1.0 μg to 20.9 μg among the 8 decks sampled, with a mean value of 7.7 μg and a median value of 4.8 μg.

- In the first field (deck) study, there was a significant correlation ($p<0.01$) between the results from rubs performed with the dry polyester cloth surrogate and results from rubs performed with the hand. The results from the hand and the cloth rubbings are highly correlated ($r=0.91$), meaning that there is a consistent relationship between the amount picked up by the hand and the cloth. The dry polyester cloth picks up approximately 5 times the amount of arsenic that the hand picks up, when tested according to the described protocol. Thus, a conversion factor of 0.20 can be used to estimate the amount of arsenic on the hand from the dry polyester cloth data collected under conditions of this study.

- In the second field study (12 CCA-treated playgrounds) using the dry polyester cloth to rub the wood, the mean dislodgeable arsenic level was 7.6 µg and the median arsenic level was 3.5 µg, with a range of 0.32 to 33.7 µg (expressed as converted "hand" values, not dry cloth values).

- The average amount of arsenic removed from the 8 deck samples (mean=7.7 µg; actual value from bare test hand) or using surrogate materials extrapolated to bare hands (mean=8.3 µg) was comparable to the amount removed from playsets when the surrogate results are extrapolated to bare hands n factor (mean=7.6 µg). Thus, the mean dislodgeable arsenic values in the first field study involving decks and the second study involving playgrounds are remarkably similar given the differences in manufacturer, treatment, and age.

Staff believes the current study represents one of the most comprehensive exposure studies performed to date. The staff does not maintain that this sampling represents all of the different climatic conditions in the U.S., but the region sampled includes temperature and precipitation conditions similar to other areas of the U.S. with large populations. It is not clear what effect different weathering conditions might have on the amount of dislodgeable arsenic, but it likely involves several factors and complex mechanisms. Staff believes the mean level of dislodgeable arsenic from the 20 CCA-treated wood structures in the Washington, D.C. metropolitan area provides a reasonable characterization of the exposure that may result from decks and playsets in this area.

E) Exposure and Risk Assessments for Children's Use of CCA-Treated Wood Playground Equipment

The risk assessment performed by CPSC technical staff is based only on the cancer risk from the arsenic present in CCA-treated wood playground equipment and does not aggregate other risks, such as the possible increased cancer risk from chromium VI exposure or exposure to other sources of arsenic (e.g., soil). The staff risk assessment (Hatlelid 2003b) (Tab I) estimates the increased cancer risk for the individual who plays primarily on CCA-treated wood playground structures during early childhood. This increased risk is above the background risk of developing cancer over one's lifetime due to other factors.

In general, CPSC and other federal regulatory agencies assume that for non-cancer health effects, there is a level (i.e., a threshold or virtually safe level) at or below which the risk of adverse effects is negligible (CPSC 1992). Cancer risk is assumed to be proportional to the exposure without any "threshold" level. An increased risk of one case per million (i.e., a probability that one case of cancer per million exposed individuals will occur) is the risk level that is generally considered by federal agencies as relevant for regulatory consideration (CPSC 1992). The use of one case per million has most precedent in actions taken by the Commission and other agencies for evaluating the risk from carcinogens.

There are two general approaches to risk assessment modeling: deterministic and probabilistic. These are both valid mathematical approaches for estimating risk and can be expected to produce similar results for the mean risk value. The key difference between these approaches is that deterministic modeling estimates the average risk, while probabilistic modeling estimates the distribution of risk in a population, based on variability in exposure. The probabilistic approach provides a benefit only when there are sufficient data on the distributions of the key input parameters. Currently, only limited data are available for some of the key input parameters for this risk assessment. Because of this, it is questionable whether probabilistic modeling would provide more reliable and realistic estimates of the upper and lower bounds of risk than a deterministic assessment with a separate uncertainty analysis. Therefore, the CPSC staff concluded that a deterministic risk assessment is appropriate in the present case and performed an analysis in which each of several critical input parameters was individually changed to its upper and lower bounds to approximate reasonable "best" and "worst" case estimates of risk.

The general approach in a cancer risk assessment is to estimate exposure in terms of daily dose per unit body weight (in this risk assessment, µg/kg/day) over a lifetime, and then to relate that dose to a lifetime risk. Each input into the model represents a point estimate of the parameter[10]. The current assessment predominantly relies on the mean values (i.e., average) for each variable. The use of lower or upper bound values for these variables would result in more extreme, and staff believes, less realistic exposure and risk estimates.

The key parameters and assumptions used to assess the risk to children from arsenic in CCA-treated wood playground equipment are:

1) Concentration of arsenic on the hands

The amount of dislodgeable arsenic residue transferred from the wood surface to both hands or the "handload" concentration was estimated from wipe studies of playground wood and hand and wipe studies of deck and playground wood conducted by CPSC staff (Cobb and Davis 2003; Levenson 2003b,c; Thomas 2003). Based on the staff analysis of the results of the dry polyester wipe surrogate studies conducted using decks and playgrounds combined (Levenson 2003b,c), the mean arsenic handload for one adult hand was estimated to be about 7.9 µg. For playgrounds alone, the mean amount of arsenic removed when the surrogate results are extrapolated to a bare adult hand using the 0.20 conversion factor was 7.6 µg. This value was used in the risk assessment. Since the size of an adult hand is roughly equal in size to two hands of a child, the amount of arsenic on a single adult hand is considered equivalent to both hands of a child (Hatlelid 2003b). Therefore, the mean arsenic handload for a single adult hand was used directly.

[10] With the exception of the unit risk parameter, which is a range; this is discussed in the following section.

Based on the series of initial experiments, the rubbing procedure allowed the volunteer to have sufficient contact with the wood to approach an equilibrium level (Cobb 2003; Thomas 2003). In other words, the amount of residue on the hand would approach a "maximum". This equilibrium level is reached relatively quickly, i.e., by rubbing a small area of wood a few times. In addition, the specified wood surface area for the sampling was considered reasonable for contact by children during play on wood playground structures (Midgett 2003a).

2) Amount of arsenic that is transferred from the hands into the mouth

No data exist concerning children's ingestion of playground CCA residue from their hands. Data from studies of soil ingestion and soil handloading were used to estimate the proportion of the residue on the hands that might be transferred to the mouth (Finley et al. 1994; Stanek and Calabrese 1995). The CPSC staff approach assumes that during play, children's hands pick up dirt and arsenic-containing residue. During subsequent activity, either on the playground, or later during the day, a certain amount of these residues from the hands is transferred to the mouth. Staff estimates that an average of about 43 percent of the arsenic residue on children's hands is transferred to their mouths during the day (Hatlelid 2003b). This transfer to the mouth includes incidental and indirect contact (food, toys, etc), as well as direct mouthing from the hand (Hatlelid 2003b).

3) Frequency of playground use

The frequency of children's contact with CCA-treated playground equipment is influenced by season and geographic region, based on suitability for outdoor play, and was assumed to be 156 days per year as a central tendency (Midgett 2003b) (Tab G). Some risk assessments also take into account the amount of time per day that a child plays on the playground. The method used by CPSC staff for estimating the amount of arsenic residue that a child might ingest does not depend on the amount of time per day (hours/day) the child spends on the playground. Rather, the assumption is made that a child spends sufficient time in contact with the CCA-treated wood play structure during the day to "load" the hands, and that a proportion of what gets on the hands is transferred into the mouth while the child is either on the playground or elsewhere. The amount of wood area rubbed or touched on playgrounds may vary considerably. However, the area rubbed by volunteers in the investigation was within the range that a child is expected to rub during a "typical" play episode on playground equipment (Midgett 2003a).

4) Duration of playground use

Children aged 2-6 years, inclusive, are likely to have the most extensive contact with playground equipment and to have significant hand-to-mouth contact. Although children generally use playground equipment beyond age 6, hand-to-mouth activity diminishes significantly after this age. Therefore, the duration of exposure used in this analysis is 5 years, which staff believes captures the highest "at-risk" population (Midgett 2003a) (Tab G).

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5) **Relative bioavailability**

Bioavailability is a term used to indicate the extent to which a substance is absorbed by the body. The bioavailable dose can be different from the dose available for exposure (such as the amount ingested or deposited on the skin). In the present case, it is appropriate to consider "relative bioavailability." Relative bioavailability is the bioavailability from the exposure of interest, surface residues of CCA-treated wood, in comparison to the bioavailability in the dose-response study, which in this case is the epidemiological study of arsenic exposure from drinking water[11].

The CPSC staff believes that there are insufficient scientific data to address the bioavailability of arsenic from CCA-treated wood surface residues. Therefore, the staff used the default assumption of one (100 percent) for bioavailability from the ingestion of arsenic-containing surface residue, relative to the bioavailability from water. Thus, the bioavailability of arsenic from CCA-treated wood residue is considered to be the same as the bioavailability of arsenic in drinking water studies[12].

6) **Unit cancer risk**

The unit cancer risk, also called the cancer slope factor or cancer potency, is an estimate of cancer risk per unit of daily exposure. The cancer "unit risk" means the chance that an individual will contract cancer at any time during his/her lifetime from exposure to a given substance. This number is used in risk assessment to estimate the cancer risk from a given exposure intensity (or dose) and duration.

There are several analyses in which unit risk values for arsenic have been derived: EPA's Integrated Risk Information System (IRIS) (EPA 1998), CPSC (1990), EPA's Office of Water (2001), and the National Research Council Subcommittee on Arsenic in Drinking Water (NRC 1999, 2001). These unit risk values were based on epidemiological studies of Taiwanese residents exposed to arsenic in drinking water. The precise chemical forms of inorganic arsenic in these studies is not known; assessments of exposure and related effects for these studies consider the total exposure to arsenic (Hatlelid 2003b).

The unit risk value developed for use by the EPA for its Integrated Risk Information System (IRIS) (EPA 1998) and the unit risk value used in the 1990 CPSC staff risk assessment were based on the risk of skin cancer. The IRIS unit risk value (EPA 1998) was based on the summarized skin cancer and well-water data published by Tseng and coworkers (Tseng *et al.* 1968; Tseng 1977). EPA modeled the dose-response based on the summary data, and extrapolated to the U.S. based on assumptions about U.S. and Taiwan body weights and rates of

[11]There are no human studies measuring the bioavailability of arsenic in the surface residue from CCA-treated wood. There are a few studies measuring bioavailability in experimental animals dosed with CCA-treated wood sawdust or with soil contaminated with arsenic, but there are no studies on the bioavailability of CCA-treated wood surface residue.

[12]EPA's Scientific Advisory Panel (SAP) on CCA-treated wood also recommended that 100% bioavailability be used in risk assessment until appropriate research is conducted (SAP 2001).

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drinking water consumption. The unit risk for skin cancer was estimated to be 0.0015 (µg/kg/day)$^{-1}$.

The unit risk for the original CPSC staff assessment (Lee 1990) was also derived from the skin cancer data from Tseng and coworkers (Tseng *et al.* 1968; Tseng 1977). At 0.00048 (µg/kg/day)$^{-1}$, the unit risk estimated by CPSC staff was approximately one-third of the EPA value, due to differences in the methodology used by the EPA and CPSC staff (Hatlelid 2003b).

The NRC, in its 1999 report on arsenic in drinking water, provided an extensive discussion of the relevant studies and important statistical modeling issues. The report cautions that risk assessment should consider the choice of model, the choice of comparison population (*e.g.*, internal population in the study area, the southwest Taiwan region, or all of Taiwan), and the shape of the low-dose extrapolation curve (*e.g.*, linear or threshold), as well as factors that could affect the arsenic-cancer relationship, such as diet and genetics. The NRC recommended using the data on internal cancers to conduct risk assessment, but advised that the choice of model is important.

The EPA's Office of Water (2001) based its risk analysis of arsenic in drinking water on the bladder and lung cancer data of Chen and coworkers (Chen *et al.* 1988; Wu *et al.* 1989) with consideration of the recommendations from NRC (1999), an EPA Science Advisory Board Report (EPA 2000), and statistical analyses by Morales *et al.* (2000). EPA used a multiplicative Poisson model with an internal comparison group and linear extrapolation. EPA staff assumed two different levels of background arsenic exposure for the Taiwanese population, as well as two levels of drinking water intake, which results in "low" and "high" risk estimates. From the published information and additional information provided by the EPA staff (Reding 2002), the CPSC staff calculated an EPA staff unit risk of about 0.00041 to 0.0037 (µg/kg/day)$^{-1}$ for bladder or lung cancer for males and females combined.

The NRC (2001) published an update of its 1999 report that included a critique of the EPA Office of Water approach, and a discussion of recent studies. NRC used the data from Chen *et al.* (Chen *et al.* 1985; Chen *et al.* 1988, Wu *et al.* 1989, and Chen *et al.* 1992) and the analysis of Morales *et al.* (2000). NRC chose an additive Poisson model with an external comparison group (overall southwestern Taiwan region) and linear extrapolation. They used an approach developed in the analysis of lung cancer from radon exposure to extrapolate from the studied Taiwan population to the U.S. using the relative risk (NRC 1988). Although the NRC did not publish the unit risk that resulted from their analysis, the CPSC staff derived a unit cancer risk calculated from the reported U.S. lung or bladder cancer for males and females combined (Hatlelid 2003b). CPSC staff calculated a unit cancer risk of 0.023 (µg/kg/day)$^{-1}$ (calculated from the theoretical maximum likelihood risk for drinking water containing arsenic at 10 µg/L, assuming 70 kg body weight and ingestion of 1 L drinking water/day in the U.S.).

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Thus, the unit risks (0.00041-0.0037 [μg/kg/day]$^{-1}$) for bladder or lung cancer for males and females combined used by the EPA Office of Water staff is about six to 56 times lower than that used by the NRC (0.023 [μg/kg/day]$^{-1}$), due to differences in model choice, comparison population, and adjustment for arsenic in water and food.

The CPSC staff believes that significant variability and uncertainty exist in the available data, statistical modeling, and extrapolation and that several reasonable approaches could be taken that would result in estimates of cancer risks that differ by an order of magnitude or more. The CPSC staff believes that the quantitative assessments by NRC (2001) and EPA (2001) are reasonable and appropriate, despite the shortcomings of the available data. Therefore, the CPSC staff risk assessment described below is based on the range of estimates for these two analyses for lung or bladder cancer risk, for males and females combined, in the U.S. (0.00041 to 0.023 per μg/kg/day) (Hatlelid 2003b).

F) CPSC Staff Estimate of Risk and Uncertainty Analysis

The CPSC technical staff estimates an increased lifetime lung or bladder cancer risk of 2×10^{-6} to 1.0×10^{-4}, i.e., two per one million to 100 per one million (or one per 10,000), for a person who plays on CCA-treated wood playground structures for 156 days/year during early childhood. This is an increased risk of developing lung or bladder cancer above the risk due to other factors during one's lifetime. The estimated increased risk exceeds one per million (1×10^{-6}), which is the risk level that is generally considered by CPSC and other federal agencies as relevant for regulatory considerations (CPSC, 1992). The CPSC technical staff considers that this risk assessment model results from a reasonable estimate of exposure for children who have regular, repeated contact with CCA-treated wood play structures from ages 2 through 6 years[13], and who engage in behaviors typical of young children, such as frequent hand-to-mouth contact.

Other reasonable estimates of cancer risk could be developed by modifying the values of one or more model inputs (e.g., number of days/year spent playing on playgrounds, amount of arsenic on the hands, etc.). In order to explore the effect of uncertainty and variability on the staff's risk estimate, the staff performed a sensitivity analysis in which each of the input variables was individually changed to its upper or lower bound, as shown in Table 1. This approach gives an approximation of reasonable "worst" and "best" cases of risk. The range of risk estimates from this analysis is about 2×10^{-7} (0.2 per million or 2 per ten million) to approximately 5×10^{-3} (5,000 per million or 5 per thousand).

Staff acknowledges the large variability among individuals in both activities and behavior, and in susceptibility to disease. Thus, it would be inaccurate to suggest that the range of risk estimates will precisely describe the actual risk for any individual in a population and the true risk for an individual could be higher or lower than the risk estimated by the CPSC staff. The risk assessment conducted by the CPSC staff is focused on arsenic exposure from CCA-treated wood through transfer of wood surface

[13] 156 days/year for 5 years

residues to a child's hands and subsequent hand-to-mouth transfer because this transfer is considered to be the primary mechanism for exposure to playground equipment wood (Lee 1990; Hatlelid 2003b). The risk assessment does not address possible exposure through direct mouthing of the wood by very young children, direct dermal uptake, or exposure to arsenic-contaminated soil under playgrounds that might subsequently contaminate food, clothing, or other articles handled by the child or further contaminate the child's skin. If contaminated wood surface residues or soil become airborne, inhalation of the arsenic also could occur. The risk assessment also does not address the possible increased risk from dislodgeable chromium VI, another component of the chemical CCA, or from skin cancer after exposure to arsenic. Thus, average overall increased risk to children from playing on or near CCA-treated wood playground structures is likely to be higher than that estimated in this analysis because of potential arsenic exposures other than through hand contact and subsequent hand-to-mouth transfer of arsenic-containing residues from CCA-treated wood playground equipment.

The CPSC staff memoranda on the statistical analyses of the laboratory and field data (Levenson 2003a,b,c), exposure assessment (Thomas 2003), and risk assessment (Hatlelid 2003b) have undergone peer review µg [14] by independent scientists and statisticians with expertise in relevant fields. The peer reviewers commented on study sampling issues (decks and playground structures), bioavailability, unit risk, use of probabilistic versus deterministic approaches to risk assessment, inclusion of other routes of exposure, exposure frequency, and hand-to-mouth transfer rates. The staff considered and addressed comments from these reviewers in the memos attached as Tabs in this briefing package.

Table I. Effect of parameter uncertainty and variability for selected parameters on the cancer risk estimate (Hatlelid 2003b).

Parameter	Base Staff Estimate*	Reasonable Lower Bound	Reasonable Upper Bound	Factor Between Lower And Upper Bounds	Alternative Risk Estimate (R)*	
					Lower Bound	Upper bound
Concentration of arsenic on the hands (C)	7.6 µg/handload	1	300	300	$3x10^{-7}$	**$5x10^{-3}$**
Hand-to-mouth transfer (HT)	0.43	0.03	7	230	**$2x10^{-7}$**	$2x10^{-3}$
Exposure frequency (EF)	156 days/year	50	350	7	$7x10^{-7}$	$3x10^{-4}$
Bioavailability (B)	1	0.2	1	5	$4x10^{-7}$	$1x10^{-4}$

*The staff estimate for excess cancer risk (R) is $2x10^{-6}$ to $1x10^{-4}$.
BOLD indicates upper and lower bound limits of analysis.

[14] The peer reviewers were Paul Mushak, Ph.D., PB Associates; George Casella, Ph.D., University of Florida; Mark Toraason, Ph.D., National Institute of Occupational Safety and Health (NIOSH), and several EPA scientists from the Office of Pesticide Programs and the Office of Water.

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G) Other Risk Assessments

The previous CPSC staff (Lee 1990) assessment on CCA-treated wood playground equipment presented separate risk estimates for subsets of the experimental data. These risk estimates ranged from less than $1x10^{-6}$ for some samples of CCA-treated wood obtained from playground equipment manufacturers, to $3\text{-}4x10^{-6}$ for other playground equipment samples, to $9x10^{-6}$ for a sample of CCA-treated wood purchased from a local retail outlet. The CPSC staff re-analyzed the 1990 data by combining the data for all the wood samples and calculating a single estimate of risk.

The differences in the risk estimates from the previous CPSC staff assessment (Lee 1990) and the risks calculated in the current re-assessment include updated wood sampling results, as well as updated inputs for several parameters in the risk assessment model. However, the primary reason for the difference in the risk estimates is due to the change in the unit cancer risk, which previously had been based upon skin cancer data, but is currently based on lung and bladder cancer data. Since the upper end of the range of unit risks in the current assessment is higher than that of the unit risk used in the previous assessment, the corresponding upper end of the updated risk range estimated for children who regularly play on CCA-treated wood playground structures is higher. Applying the unit cancer risks from EPA (2001) and NRC (2001) to the original risk assessment model (Lee 1990) would yield a range of cancer risks of $2x10^{-6}$ to $1x10^{-4}$, which, at the upper end of the range, is more than 50 times greater than the risk estimated in the original (1990) analysis ($2x10^{-6}$). This updated estimate is similar to the risk range estimated in the current CPSC staff assessment. A review of the previous CPSC assessment (Lee 1990) and other risk assessments discussed below can be found in Appendix B of Hatlelid (2003b) (Tab I).

Recently, several other groups have released risk assessments for children and other consumers who might have contact with CCA-treated wood structures. These assessments have been produced by Gradient Corporation, under contract with two producers of CCA-wood treatments (Gradient 2001); the Environmental Working Group (EWG) and the Healthy Building Network (HBN) (EWG/HBN 2001); and the University of Florida Center for Environmental and Human Toxicology (Roberts and Ochoa 2001).

These risk assessments estimate increased lifetime cancer risks for people who have contact with CCA-treated wood playground structures. The risk estimates range from $3x10^{-3}$ (3,000 per million) for skin cancer in the Roberts/Ochoa scenario to $4x10^{-8}$ (0.04 per million) for skin cancer in the Gradient model. The current CPSC staff estimate for increased lifetime risk of bladder or lung cancer is $2x10^{-6}$ to $1x10^{-4}$ (2 per million to 100 per million).

There are several significant differences among these assessments, which are responsible for the different risk values calculated. These differences include the estimates for the amount of dislodgeable arsenic that may be transferred from the wood surface to the hands, sometimes generated with surrogate materials without proper correlation with human hands or with protocols that may be subject to bias. For some assessments, there are differences in the choice of unit risk used to relate the estimated exposure to cancer risk. The current CPSC staff exposure and risk assessments also differ from these previous assessments in that they use new exposure data on arsenic residue levels from controlled CPSC lab studies, define a correlation between wipe data from human hands and cloth surrogates, and calculate a risk based on a range of unit cancer risk.

III. REGULATORY CONSIDERATIONS

For purposes of the FHSA, toxicity is defined as "... the capacity to produce personal injury or illness to man through ingestion, inhalation, or absorption through any body surface..." (15 U.S.C.§1261(g)). Based on the available scientific data, which associate both acute and chronic effects, including cancer, with arsenic exposure, it is the CPSC technical staff's opinion that arsenic compounds may be considered "toxic" under the FHSA.

The CPSC technical staff believes that staff estimates of playground contact and playground use represent "reasonably foreseeable use" of playground equipment for purposes of the FHSA (Tab G).

IV. ECONOMIC INFORMATION

The CPSC staff analysis of economic information on CCA-treated wood playground equipment is found in Tab J (Franklin 2003).

A) Product Information

Although wood has been used in playground equipment for at least 50 years, its use in playground equipment became more common in the 1970's and 1980's. Until recently, CCA-treated wood had been the most common type of wood used in playground equipment. Some playground equipment manufacturers use CCA-treated lumber for load-bearing or structural components, such as posts, beams, and joists, but use other materials, such as redwood, cedar, plastic, or composite lumber, for other components, such as decking, hand rails, and roofs.

Even before EPA announced its intention to grant the requests to terminate the use of CCA in residential applications (February 2002), several playground equipment manufacturers had already switched to using wood treated with non-arsenical preservatives or had begun offering these as alternatives to CCA-treated wood. This action was undertaken in response to an increase in consumer demand for alternatives to CCA-treated wood that resulted from the publicity about possible health concerns regarding its use.

About 7 billion board feet of pressure-treated wood are produced annually in the United States[15] and the largest application is for outdoor decks. Thirty-two percent of CCA-treated wood is used for outdoor decks. Other residential uses include such things as landscaping, marine applications, house framing, permanent wood foundations (as alternative to concrete or block foundations), and fencing. Only about one percent of CCA-treated wood is used in playground equipment.

[15] A board-foot is a unit of measure one foot long, one foot wide, and one inch thick, or its equivalent.

Some manufacturers of the high-end playground equipment may assemble the equipment for the consumer on site. However, much home equipment is sold in ready-to-assemble kits that contain everything needed to build the playset, including swings and slides, the hardware, fasteners, and lumber. Some manufacturers sell kits that contain the accessories and hardware required for the playset, but without the required lumber. Kits that do not supply the wood are generally sold where the consumers can conveniently purchase the required wood at the same time they purchase the kit, such as retail building supply centers, lumber yards, and hardware stores. There are other companies that sell only the designs and instructions for building playground equipment; the consumer buys the design and instructions and constructs the playgrounds using materials obtained separately. Finally, some consumers build their own structures using their own designs and purchasing their own wood.

According to the 1997 Economic Census, there were 27 manufacturers of home playground equipment with shipments of $100,000 or more and 38 manufacturers of public, commercial or institutional equipment with shipments of $100,000 or more. This number includes manufacturers of metal and plastic equipment as well as wooden equipment. With some exceptions, most manufacturers of wooden equipment would be considered to be small businesses according to the size standards established by the Small Business Administration.

B) Market Information

Home playground equipment is sold through a variety of retail channels, including toy stores, department stores, and retail building supply and lumber stores. Home playground equipment is also sold by some specialty stores such as those that sell pools, spas, patios, and hearth products or outdoor structures such as storage buildings and gazebos. Home playground equipment may also be sold by landscape companies and designers and specialty playground retail outlets.

<u>Sales and Number in Use</u>

Approximately 1 million home playsets were sold annually in the 1990's. The staff estimates that 30 to 40 percent of the home playground equipment market at that time was wood. This estimate includes wood equipment made out of CCA-treated wood, as well as cedar and redwood equipment.

The expected useful life of home wooden playground equipment is probably limited more by the ages of the children in a household than by the failure of the equipment. Although properly maintained playground equipment constructed with CCA-treated wood may last for 20 or more years, children are likely to play on the equipment only between the ages of about 2 to 12. Households whose children have outgrown the playground equipment may not maintain the equipment and may even dismantle it.

Commercial wood playground equipment is likely to have a longer useful life than that of home equipment. The population of children in the community that would be expected to play on commercial equipment is more stable. Therefore, public parks, schools, childcare centers, apartment complexes, and other institutions that have commercial

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equipment have a greater incentive to maintain the equipment. It has been estimated that commercial equipment may last for 20 years or more, if properly maintained. Staff has not found any reliable estimates on the number of these playgrounds made from CCA-treated wood.

Staff has estimated that the population of home playground equipment that contains CCA-treated wood will be significantly reduced within 20 to 30 years of the phase-out of CCA. Since the useful life of public or institutional playground equipment is probably longer than for home or backyard equipment, the proportion of public or institutional playground equipment that contains CCA-treated wood in use today that is still in use 30 years or more years from now may be greater than the proportion of home or backyard equipment still in use.

Availability of CCA-Treated Wood on and after December 31, 2003

When EPA cancels the registration of CCA effective December 31, 2003, as anticipated, wood treated with CCA prior to that date can continue to be sold for consumer uses, including playground equipment. CCA-treated lumber and playground equipment will probably still be available for retail sale on and after December 31, 2003, although the quantity of CCA-treated products in the retail distribution chain will be substantially less than in 2001 and earlier years (personal communication with J. Housenger 2003). For example, when the phase-out of CCA was announced, the EPA stated that the manufacturers of CCA expected a decline in production of CCA for residential uses of up to 25 percent in 2002 and up to 70 percent in 2003.[16] EPA expected that most of the wood treated for uses that are to be cancelled would be sold by the end of June, 2004. Moreover, as noted earlier, several playground equipment manufacturers have already stopped using CCA-treated wood. In addition, according to published sources, spokespersons for two of the largest retailers of CCA-treated lumber have indicated that they are already in the process of phasing out CCA-treated wood. Published sources also indicate that some large wood treaters are in the process of converting from CCA to non-arsenical preservatives.[17]

V. ALTERNATIVES TO CCA

There are several possible substitutes for CCA-treated wood: wood treated with other chemicals; naturally resistant wood (e.g., cedar and redwood); plastic; and composite lumber. A number of potential chemical substitutes for CCA are currently in use and expected to replace CCA as common wood preservatives (Franklin 2003) (Tab J).

In those applications for which the use of CCA is being phased out, the two most likely replacements for CCA are ammoniacal copper quaternary (ACQ) or copper boron azole (CBA). ACQ is similar to CCA in durability, range of use, and mechanical properties. While these alternatives do not contain arsenic, there are insufficient data available on the toxicity and exposure of these alternative chemicals to make a reasonable

[16] Environmental Protection Agency, Headquarters Press Release, "Whitman Announces Transition from Consumer Use of Treated Wood Containing Arsenic," February 12, 2002 (more information available at http://www.epa.gov/pesticides/citizens/1file.htm).
[17] Published sources include: R. Michelle Breyer, Home Channel News, 1 October 2002, v.28, N. 18 p. 3(2) and Eileen White Read, The Wall Street Journal, "The Deck Dilemma — Homeowners Scramble as EPA Ends Sales of Treated Wood; Billing Pricey Cedar as Safe," May 10, 2002, p. W.10. and Coatings World, "Rockwood expands wood preservative production" (brief article), June 2002, vol. 7, no. 6, p. 60(1).

assessment of their potential for risk. The staff cannot verify, at this time, claims that these chemical alternatives present a decreased health risk to consumers compared to that of CCA.

According to the Directorate for Economic Analysis (Tab J), the non-arsenical preservatives are expected to cost wood treaters 3 to 5 times more than CCA. This increased cost is expected to increase the price of pressure-treated wood by 10 to 20 percent. The retail prices of products manufactured from pressure-treated wood (e.g., playground equipment) will also increase due to this increased cost. However, because pressure-treated wood is only part of the cost of the final playground equipment product, the percentage increase in the final product will be less than the percentage increase in the cost of the pressure-treated wood.

In addition to chemical substitutes for CCA, some types of wood, notably redwood and cedar, are naturally resistant to termites and fungi and do not need to be treated with preservatives. Redwood and cedar are significantly more expensive than pressure-treated southern yellow pine, the most common wood that is pressure-treated. Because this price differential will be narrowed as the use of CCA is eliminated, there may be some increase in the use of redwood and cedar. However, because wood preserved with non-arsenical preservatives is still expected to be lower in cost than redwood or cedar, any shift to redwood or cedar due to the phase out of CCA will probably be small.

Other substitutes for CCA-treated lumber include various types of plastic or composite lumber, which are relatively new classes of products. Some of the attributes of plastic and composite lumber differ from those of wood lumber and they may not have the same performance. Some of these products are not suitable for use as primary load-bearing members, such as posts, beams, and joists. Because of the variety of plastic and composite wood products available, and because they are still an evolving technology, it is difficult to obtain information on comparative prices between plastic or composite lumber and pressure-treated lumber. Available information suggests that using some forms of composite lumber may increase the initial cost of a deck by 10 to 30 percent over the cost of using CCA-treated lumber. Thus, since the phase-out of CCA is expected to reduce the price differential between plastic or composite wood products and pressure-treated lumber (due to the use of the more costly non-arsenical preservatives), the use of plastic or composite lumber is likely to increase in some applications. The competitiveness of plastic or composite lumber with pressure-treated wood may be enhanced if the cost to maintain structures made of plastic and composite lumber proves lower than the cost to maintain structures made of pressure-treated wood, as some manufacturers suggest.

VI. RESPONSE TO PUBLIC COMMENTS

The Commission published a Federal Register notice on July 13, 2001 requesting public comments on the docketed petition (66 FR 36756). There were a total of 28 comments from various sources including the wood industry, environmental groups, trade associations, consumers, and state and local governments. The public commenters discussed toxicity issues, health risks from exposure to CCA-treated wood, CCA-treated wood as a possible hazard under the FHSA, the levels of dislodgeable arsenic present

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on the wood, the bioavailability of arsenic, exposure to arsenic in soil and ground cover, jurisdictional issues, disposal issues, and whether the type of wood influences arsenic leaching. The CPSC staff carefully considered these comments, many of which have been addressed in the staff's studies and analyses.

The staff report outlining the public comments and the staff's response to these comments is found in the Response to Public Comment memorandum (Bittner and Ferrante 2003), which is found in Tab K. A complete listing of public commenters is found in Appendix A of that memorandum. The jurisdictional issue is addressed in a separate, restricted memorandum from the Office of the General Counsel (OGC) to the Commissioners.

VII. MITIGATION

Various trade and consumer groups, some state governments, and a Scientific Advisory Panel (SAP) convened by the EPA's Office of Pesticide Programs (OPP) have made suggestions concerning surface coating of CCA-treated wood to reduce potential exposure to chemicals found in this wood. Based on the limited available data, these groups have suggested that applying certain penetrating coatings (for example, oil-based semi-transparent stains) on a regular basis (for example, once a year or every other year depending upon wear and weathering) may reduce the migration of chemicals in the wood preservative from CCA-treated wood. However, in selecting a finish, in some cases, "film-forming" or non-penetrating stains (latex semi-transparent, latex opaque, and oil-based opaque stains) on outdoor surfaces such as decks and fences are not recommended as subsequent peeling and flaking may ultimately have an impact on durability, as well as exposure to the preservatives in the wood.

In August 2002, one of the petitioners (EWG) released the results of a study that examined arsenic levels obtained by consumers wiping CCA-treated wood structures (decks, playgrounds, etc.) with cloths found in arsenic test kits. They reported that dislodgeable arsenic is available on the surface of CCA-treated wood structures that have been treated with stains or sealants as soon as 6 months after coating. CPSC staff has not reviewed the validity of these results or the data on which they are based. Staff plans to review the results of the study within the next few months, with particular consideration of how the study was conducted, the reliability and sensitivity of the test kits, and the reliability and comparability of sampling obtained by the consumers.

CPSC staff is working with staff in EPA's OPP and Office of Research and Development (ORD) to study possible mitigation measures (treating the wood with stains or sealants) to decrease the amount of dislodgeable arsenic on the surface of CCA-treated wood, as CPSC studies have confirmed that dislodgeable arsenic is available on the wood surface over a period of years.

VIII. OPTIONS

Option 1. Grant the petition.

If the Commission concludes that a FHSA section 3(a) rulemaking may be reasonably necessary to resolve uncertainty as to whether wood treated with CCA, as used in playground equipment, constitutes a "hazardous substance" for purposes of the FHSA, it could grant the petition and begin a rulemaking proceeding that could result in a declaration that CCA-treated wood as used in playground equipment is a "hazardous substance." A final section 3(a) rule to this effect would result in the playground equipment being banned by operation of law. Such a rule could apply to new and possibly existing playground equipment.

Option 2. Defer the petition.

If the Commission wishes to evaluate the final scope of EPA's cancellation of the CCA pesticide registration before deciding what action to take with respect to the petition, the Commission could defer action on it until EPA has completed its action and the staff has assessed its impact. EPA's action is expected to occur early in 2003.

Option 3. Deny the petition.

If the Commission concludes that rulemaking is not reasonably necessary to eliminate or adequately reduce the risk described in the petition, it could deny the petition. Denial could be based on an assessment that cancellation of the CCA registration is likely and that this action by EPA would remove most consumer uses of new CCA-treated wood from the market in a reasonable period of time thereafter.

IX. STAFF CONCLUSIONS AND RECOMMENDATION

The CPSC technical staff conclusions are listed below.

a) There is an increased lifetime lung or bladder cancer risk of approximately two per one million to one hundred per million (one per 10,000) for a person who plays on CCA-treated wood playground structures during early childhood, based on the assumptions used in the staff risk assessment. This is an increased risk of developing lung or bladder cancer above the risk of developing lung or bladder cancer due to other factors during one's lifetime. Staff believes that increased risk exists despite the age of the wood and whether it has been manufactured specifically for playgrounds. The estimated increased risk exceeds one per million ($1x10^{-6}$), which is the risk level that is generally considered by CPSC and other federal agencies as relevant for regulatory considerations (CPSC 1992). The use of one per million has the most precedent in actions taken by the Commission and other agencies for evaluating the risk from carcinogens.

b) The petition requests that CCA-treated wood be banned from use in playground equipment. The holders of CCA pesticide registrations have requested that EPA cancel their pesticide registrations for most consumer uses of treated wood effective December 31, 2003. This means, in effect, that CCA-treated wood will not be available for most consumer uses, including the manufacture of playground equipment. Although it is predicted that the conversion of many wood treatment plants may be completed well in advance of December 2003, this wood may not be completely out of the market pipeline until mid-2004 (personal communication with J. Housenger, EPA, 2003).

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c) There reportedly are several substitute chemicals available to pressure treat wood with efficacy almost equivalent to that of CCA. These alternatives are reportedly less toxic than CCA to humans. However, data on the toxicity of these chemicals and possible exposures during reasonably foreseeable use are limited or not available. Wood treated with at least two of these alternative chemicals, i.e., ammoniacal copper quaternary (ACQ) and copper boron azole (CBA), is already in the U.S. market. There is also a variety of other materials that are available to manufacture playsets (cedar or redwood, plastics, metal, composites, etc.).

d) Some companies that manufacture wood play structures, both commercial and residential, have begun using pressure-treated wood that is treated with alternative chemicals. The percentage of the industry using alternative treatments is unknown.

e) There may be methods of mitigating the leaching of arsenic from existing structures made of CCA-treated wood through the application of stains or sealants. Although the staff has not yet determined if these methods are effective, CPSC staff, in conjunction with EPA staff, has begun developing mitigation studies to ascertain their effectiveness.

The CPSC staff recommends that the Commission defer action on the petition until EPA has completed its action to cancel the CCA pesticide registration and the staff has assessed its impact.

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