UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

November 20, 2006

MEMORANDUM

SUBJECT: Revised Occupational and Residential/Bystander Assessment of the Antimicrobial Use (Remedial Wood Treatment) of Chloropicrin for the Reregistration Eligibility Decision (RED) Document (Phase 3 Comment Period). PC Code 081501, DP Barcode D314388.

FROM: Tim Leighton, Environmental Scientist
Antimicrobials Division

TO: Nathan Mottl, Chemical Review Manager
Special Review and Reregistration Division

This memorandum provides a revised review of the occupational applicator and residential bystander assessment for the antimicrobial remedial wood treatment use of chloropicrin to support the Reregistration Eligibility Decision (RED) document. Revisions are based on the Phase I registrant "error only" correction review comments. This assessment utilized the toxicological endpoints reviewed by the Human Studies Research Board (HSRB) and selected by the Health Effects Division (HED). Readers are referred to USEPA (2006a) for a compete discussion of the HSRB ethical and scientific review.

EXECUTIVE SUMMARY

The Antimicrobials Division (AD) assessed the occupational and potential bystander risks to the remedial wood treatment uses of chloropicrin (e.g., poles, timbers, etc.). This risk assessment is based on a qualitative assessment of the uses. Although the exposures are expected to be minimal, the inhalation toxicological endpoints selected for chloropicrin are in parts per billion (ppb). To mitigate potential dermal and inhalation exposure as well as eye irritation, PPE has been recommended. Use direction recommendations for the label are also provided to mitigate the potential for residential bystander exposure. Revisions to the original review (USEPA 2006b) include characterization of the chloropicrin-specific uses based on the Phase I "error only" correction comments. No changes have been made by AD to the toxicological endpoints or uncertainty factors as suggested in the Phase I comments. HED will review these comments as appropriate (the Phase I comments have been forwarded to HED).

1.0 Introduction

The Special Review and Registration Division (SRRD) requested that the Antimicrobials Division (AD) conduct a human health risk assessment for the remedial wood treatment use of chloropicrin. The Health Effects Division (HED) has the lead to develop the risk assessment for chloropicrin RED document (i.e., trichloronitromethane, CAS # 76-06-2), including the selection of the toxicological endpoint for use in the risk assessment.

2.0 Toxicological Endpoints of Concern

Table 1 presents the acute toxicity categories as outlined in the HED risk assessment (USEPA 2006a).

Table 1. Acute Toxicity Categories for Chloropicrin

Study Type	Toxicity Category[a]
Acute Oral Toxicity	I
Acute Dermal Toxicity	I
Acute Inhalation Toxicity	II
Primary Eye Irritation	I
Primary Dermal Irritation	I
Dermal Sensitization	Not tested (corrosive)

Table 2 presents the inhalation endpoints selected by HED for the risk assessment of chloropicrin (USEPA 2006a).

Table 2. Summary of Toxicological Dose and Endpoints for Use in Chloropicrin Human Health Inhalation Risk Assessment

Risk Assessment		Study	NOAEL/LOAEL	Endpoint	HED HC or HEC
Acute Inhalation	Non-occupational	Human Irritation Study	$BMCL_{10}$= 0.073 ppm	Eye irritation, ↑ nasal nitric oxide & change in air flow	HC = 0.073 ppm UF = 10
	Occupational	Human Irritation Study	$BMCL_{10}$= 0.073 ppm	Eye irritation, ↑ nasal nitric oxide & change in air flow	HC = 0.073 ppm UF = 10
Short- and Intermediate-Inhalation Term (1-6 months exposure)	Non-occupational	13-Week Inhalation Study in Mice	NOAEL = 0.3 ppm LOAEL = 1.0 ppm	Nasal and lung damage, increased lung weights	HEC = 0.008 ppm UF = 30
	Occupational	13-Week Inhalation Study in Mice	NOAEL = 0.3 ppm LOAEL = 1.0 ppm	Nasal and lung damage, increased lung weights	HEC = 0.035 ppm UF = 30
Long-term Inhalation(> 6 months)	Non-occupational	78-Week Cancer Study in Mice	NOAEL = 0.1 ppm LOAEL = 0.5 ppm	Nasal discharge, nasal and lung damage, increased lung weights, body weight	HEC = 0.004 ppm UF = 30

				loss	
	Occupational	78-Week Cancer Study in Mice	NOAEL = 0.1 ppm LOAEL = 0.5 ppm	Nasal discharge, nasal and lung damage, increased lung weights, body weight loss	HEC = 0.015 ppm UF = 30
Cancer	Chloropicrin is currently not considered a carcinogen.				

3.0 Remedial Wood Treatment (Occupational)

Chloropicrin is used to control internal wood decay caused by fungi and insects in wood timbers, poles, pilings, and glue-laminated beams (e.g., bridge timbers). There are currently 7 registered labels for remedial wood treatment by several different companies, each product containing approximately 99 percent chloropicrin as a liquid. Although packaged as a liquid, chloropicrin has a high vapor pressure of 23.8 mmHG at 25C, and therefore, there is the potential exposure to the vapor phase.

Specific label use directions indicate that chloropicrin is a restricted use pesticide that is either poured or injected into pre-drilled holes. One label describes the application technique as "*using special Osmose equipment and prescribed techniques*". However, no other information is provided on this specialized equipment. Label directions also indicate that the amount of chloropicrin used per pole is based on the size of the pole (or cubic foot of laminated beams). Pole applications range from 3 ounces of product for small poles (e.g., distribution poles) up to 2 pints of product for large poles (e.g., transmission poles). Chloropicrin is poured or injected into pre-drilled holes which are drilled at 45 degrees downward. The holes are placed approximately 6 to 8 inches apart at 90 degrees. After application, each hole is capped with a plastic or treated wooden plug. Some labels (e.g., EPA Reg. No. 66330-47) indicate that "*a vapor barrier wrap may be needed to confine chemical vapor*". Some labels have more specific application instructions then others. Only a brief application description is provided here. More details on applications techniques are available (Wilhelm 2006) and it is suggested that all of the 7 registered products provide a complete description of product application.

The personal protective equipment (PPE) listed on the labels include long pants, long sleeved shirts, chemical resistant footwear, and chemical resistant gloves. Most of the labels include a statement "*Do NOT wear goggles*" in the general description of PPE. However, some of the labels with this statement also indicate under the heading of the wood preservative use that the applicator needs to wear safety goggles when capping the hole to avoid splashing. These contradictory requirements need to be rectified on some of the labels. The label warning statements not to wear goggles is because chloropicrin is a lachrymator (i.e., tear producing eye irritant) and experience may have shown goggles to be problematic. According to Wilhelm (2006), "*utilities require the use of full-face respirators*…". Therefore, in lieu of goggles listed on some labels, face shields should be the preferable option. Finally, respiratory protection is also listed on labels. Respiratory requirements are indicated if chloropicrin air concentrations exceed 0.1 ppm (Note: EPA Reg. Nos. 75340-1 and 75341-3 list an air concentration of 0.3 ppm as the cutoff for respiratory protection). The 0.1 ppm label criterion is not listed as a time weighted average (TWA) but rather "not to exceed". To determine the air concentration of chloropicrin, various detectors are listed on the labels such as Bendix Gastec Precision Gas

Detector and Matheson-Kitagawa detector. The 0.1 ppm concentration referenced on some of the labels is the OSHA Permissible Exposure Limit (PEL). The PEL is based on a TWA, not a ceiling. A Short Term Exposure Limit (STEL) has not been set for chloropicrin. The revised Immediately Dangerous to Life or Health Concentration (IDLH) is 2 ppm.

There is the potential for occupational dermal and inhalation exposure to the applicator during open pouring or injection of chloropicrin into pre-drilled holes prior to plugging. To determine the appropriate exposure duration (i.e., short-, intermediate-, or long-term) for endpoint selection, the frequency of chloropicrin-specific applications to poles has been revised based on Phase I comments (Wilhelm 2006). Wilhelm (2006) indicates the following use information for chloropicrin treatments:

- Distribution Poles - the smaller diameter wooden distribution poles (~140 million distribution poles in service) are treated at a high end rate of 42 per day with an annual average daily treatment range from 0 to 30 poles per day. Workers treat these types of poles as their main work function, treating 4 days per week, on a yearly basis (i.e., 175 days/year).

- Transmission Poles - the larger wooden transmission poles are treated at a high end rate of 32 per day with an annual average daily treatment range from 0 to 22 poles per day. Workers treat these types of poles as their main work function, treating 4 days per week, on a yearly basis (i.e., 175 days/year).

Based on these estimates, applicator exposure duration for both distribution and transmission poles are both considered long-term.

Dermal Exposure and Risks:

The potential for dermal exposure from application of chloropicrin may occur during the injection or pouring up to 2 pints per pole of the undiluted product directly into the pre-drilled holes or by filling vials to be placed into holes in timber. Potential dermal exposure may also occur during the process of pouring chloropicrin from original packaging containers into smaller containers prior to injecting or pouring into the pre-drilled holes. No postapplication dermal exposure is expected (i.e., treated holes are capped/plugged and contact with treated poles occurs infrequently).

The risks associated with dermal applicator exposure are not quantified. PPE such as long pants, long sleeved shirts, and chemical resistant gloves are recommended to mitigate skin irritation effects resulting from potential dermal exposure to chloropicrin. The following discussion of dermal exposure/risk, excerpted from the HED's toxicological endpoint selection, also applies to the remedial wood treatment applications:

"Chloropicrin is classified as category I (corrosive) for skin irritation potential (rabbit) and acute dermal toxicity (rat). Based on the effects shown in the acute dermal toxicity and corrosivity studies, HED is not currently requiring a subchronic dermal toxicity study. Dermal exposure to chloropicrin of any significance is not expected based on the delivery systems used

(e.g., soil injection or drip irrigation) and emission reduction technologies (e.g., tarping). The physiochemical properties of chloropicrin also make significant dermal exposure unlikely and quantifying any potential low level exposures very difficult. Therefore, a quantitative dermal exposure assessment has not been completed. Since HED does not have adequate data to quantify dermal risk, PPE for dermal protection should be based on the acute toxicity of the end-use product as described in the Worker Protection Standard and mitigation measures for dermal exposure described in PR Notice 93-7."

Note: PR Notice 93-7 was issued for chloropicrin and chloropicrin/methyl bromide products when the WPS was implemented in 1993. Products containing chloropicrin alone (Supplement 4A to PR Notice 93-7) required long sleeve shirt, long pants, chemical-resistant gloves (when handling the liquid), chemical-resistant apron (when handling the liquid), chemical-resistant footwear plus socks, and protective eyewear.

Inhalation Exposure and Risks:

As with the dermal exposure above, the potential for inhalation exposure to chloropicrin vapor may occur during the transfer from original packaging into smaller application containers or vials and during the injection or pouring of up to 2 pints per pole of the undiluted product directly into the pre-drilled holes. Exposure during the placement of prefilled vials into drilled holes should not occur unless the vials are accidentally damaged. Negligible postapplication occupational inhalation exposure is expected (i.e., workers remaining in the vicinity of treated poles would occur infrequently).

Inhalation toxicological endpoints selected include acute, short-, intermediate-, and long-term exposure durations. Workers applying chloropicrin as a remedial wood treatment are expected to be exposed up to a long-term duration. Workers are expected to be exposed to various concentrations of chloropicrin throughout the work day with peak concentrations occurring during open pouring of the products. Applications are performed outdoors and the product is capped into pre-drilled holes, thereby reducing the potential for off gassing immediately after the application. No air concentration measurements are available for these types of applications.

Based on the use pattern (i.e., intermittent exposures throughout the work shift), the acute inhalation endpoint selected for chloropicrin is a good indicator of the need for respiratory and eye protection. The acute inhalation toxicological endpoint for chloropicrin, based on an increase in nasal nitric oxide and change in air flow derived from a human irritation study, is 0.073 ppm with a 10x uncertainty factor (UF). This endpoint also represents the eye irritation level-of-concern (LOC) for chloropicrin (i.e., LOC = 0.073 ppm/10x UF = 0.0073 ppm). In this human study, irritation to the eyes, nose, and/or throat were observed after 1 hour exposures repeated over 4 consecutive days. This LOC, 0.0073 ppm, is lower then the current level listed on the product labels (i.e., OSHA PEL of 0.1 ppm) used to determine if respiratory protection is needed.

In addition to the acute assessment, a long-term exposure duration is also of relevance. Although the intermittent nature of the chloropicrin inhalation exposure throughout the work day

in ambient conditions would presumably result in a minimal concentration as a time weighted average (TWA), the long-term inhalation endpoint is very sensitive (i.e., level of concern (LOC) = 0.015 ppm / 30x uncertainty factor = 0.0005 ppm), and therefore, may be of concern. Moreover, the long-term LOC selected for chloropicrin would most likely be below the limits of detection for detector tubes that could reasonably be used in the field. Therefore, a quantified risk assessment is not possible at this time.

4.0 Bystander/Residential Exposure and Risks

In general, remedial wood treatment for poles and beams on bridges do not occur in high traffic areas for bystanders. However, distribution poles are numerous and often located in people's front yards. Therefore, any potential bystander exposure would be best represented by the acute duration. There is no air monitoring data available to determine if chloropicrin vapor is released in the vicinity of treated poles. To minimize the escape of the chloropicrin gas from treated poles, specific use directions should be listed on all of the labels (some labels already list these directions, but not all). The types of use directions that will minimize the potential for vapors to be released to be available for bystander exposure include:

- plug the pre-drilled holes immediately after chloropicrin applications;
- use a barrier wrap on treated wood, where needed, to confine the vapor;
- do not treat drilled holes if they intersect internal rot pockets or splits; and
- do not treat structures/beams indoors.

Note: USEPA (2004b) indicated a poisoning incident (incident #5358-1) resulting from a pole treatment near an uncapped riser/open conduit allowing chloropicrin fumes to enter a post office located 75 to 80 feet away. According to Wilhelm (2006), application procedures have been modified to avoid these circumstances in the future.

5.0 Conclusions

To mitigate the potential applicator dermal exposure to the irritant effects of chloropicrin, PPE such as long pants, long sleeved-shirts, and chemical resistant gloves are required. In addition, some type of eye protection is also required but the label requirement for goggles listed on some of the products should be modified to face shields (see discussion above). To mitigate the potential inhalation risks to applicators, respiratory protection is recommended that during the actual pouring of chloropicrin between containers and/or vials and during pouring/injecting into the pre-drilled holes. This recommendation is based on the need to protect applicators when air concentrations are above the acute level-of-concern of 0.0073 ppm and the TWA of 0.0005 ppm. The minimum type of respiratory protection to require is difficult to determine because the actual air concentration in the vicinity of the applicator is unknown. Therefore, the specific type of respirator (e.g., SCBA) is a decision for the regulatory manager and should be made in consultation with the registrants to determine what is feasible for applicators to wear while climbing poles.

To minimize the potential for bystander exposure from the off gassing of chloropicrin treatments, specific label use directions are proposed. These directions currently exist on some of the labels but should be recommended for all of the labels.

6.0 References

USEPA. 2004a. Metam Sodium: Occupational and Residential Exposure Assessment of Antimicrobial Uses for the Reregistration Eligibility Decision Document. PC Code 039003 (Metam Sodium) and 068103 (MITC). Memorandum Dated August 19, 2004.

USEPA. 2004b. Review of Chloropicrin Incident Reports. DP Barcode D306838. Memorandum Dated August 24, 2004.

USEPA. 2006a. Chloropicrin: Revised HED Human Health Risk Assessment for Phase 3; DP Barcode: D314380, PC Code: 081501.

USEPA. 2006b. Occupational and Residential/Bystander Assessment of the Antimicrobial Use (Remedial Wood Treatment) of Chloropicrin for the Reregistration Eligibility Decision (RED) Document. PC Code 081501, DP Barcode D314388. Memorandum from Tim Leighton (USEPA) to Nathan Mottl (USEPA) dated September, 28, 2006.

Wilhelm S. 2006. Phase I "Error Only" Comments. Letter from Wilhelm, Chairman of Chloropicrin Manufacturers' Task Force to Kelly Sherman, USEPA, dated November 13, 2006.