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

OFFICE OF CHEMICAL SAFETY
AND POLLUTION PREVENTION

MEMORANDUM

Date: March 16, 2021

Subject: **Chlormequat Chloride.** Occupational and Residential Exposure Assessment for Registration Review.

PC Code: 018101
Decision No.: 562196

Petition No.: NA
Risk Assessment Type: Occupational/Residential Exposure Assessment
TXR No.: NA
MRID No.: NA

DP Barcode: D461319
Registration No.: 35935-62, 62097-20, 288-688, 62097-21, 241-74, 241-256
Regulatory Action: Registration Review
Case No.: 7069

CAS No.: 999-81-5
40 CFR: 180.698

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Introduction

As part of Registration Review, the Pesticide Re-evaluation (PRD) of the Office of Pesticide Programs (OPP) has requested that HED conduct an occupational and residential exposure assessment, as needed, to estimate the risk to human health that will result from the currently registered uses of chlormequat chloride. This memorandum serves as HED's Occupational and Residential Exposure section of the draft human health risk assessment; and aggregate risk from the registered uses of chlormequat chloride. The most recent quantitative human health risk assessment was performed in 2019 for the experimental use permit (EUP) use on cereal grains (D450378, S. Shelat, 09/09/2019) and in 2018 for the new uses on cereal grains (D435551, E. Craig, 02/27/2018).

It is HED policy to use the best available data to assess exposure. Several sources of generic data were used in this assessment as surrogate data in the absence of chemical-specific data, including Pesticide Handlers Exposure Database Version 1.1 (PHED 1.1); the Agricultural Handler Exposure Task Force (AHETF) database; and two proprietary studies (MRIDs 44339801 and 49602401). Some of these data are proprietary, and subject to the data protection provisions of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

Note: This memorandum was reviewed by the Exposure Science Advisory Committee (ExpoSAC) on October 15th, 2020.

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1.0 Executive Summary

Chlormequat chloride [2-chloro-N,N,N-trimethylethanaminium chloride] is a plant growth regulator (PGR) that belongs to the quaternary ammonium class of chemicals. Chlormequat chloride works through inhibition of gibberellin hormones. Chlormequat chloride is currently registered in the United States (U.S.) for use on ornamental plants grown in greenhouses, nurseries, and shadehouses. Outdoor uses are allowed, but restricted to containerized ornamentals. Chlormequat chloride also has established tolerances without U.S. registrations for residues in wheat, barley, and oats. There are no residential uses for chlormequat chloride.

Use Profile

Chlormequat chloride is currently registered for use on a wide variety of ornamental plants grown in greenhouses, shadehouses, and nurseries. The registered crops include herbaceous and woody annual and perennial plants such as begonias, vincas, azaleas, and poinsettias. The outdoor use of chlormequat chloride is restricted to containerized ornamentals. Chlormequat chloride can be applied with several types of application equipment including manually-pressurized handwand, backpack sprayer, and mechanically-pressurized handgun equipment. Motorized groundboom and chemigation application is prohibited on all labels. There are no anticipated residential uses for chlormequat chloride. Chlormequat chloride is marketed as a soluble concentrate liquid. The proposed single maximum application rate for chlormequat chloride is 0.034 lb ai/gallon solution. The chlormequat chloride product labels direct applicators and other handlers to wear baseline attire (i.e., long-sleeved shirt, long pants, shoes and socks), no respirator, and label-specified personal protective equipment (PPE) consisting of chemical resistant gloves. The currently registered labels require a 12-hour restricted entry interval (REI). The registrant has agreed to voluntary cancellation of the product (EPA Reg. No. 241-74), so the need to assess the uses associated with this label was not required including the application rates of 0.0254 lb ai/ gal, and 0.017 lb ai/ gal for greenhouses and nurseries, respectively (EPA–HQ–OPP–2021–0015; FRL–10019–59).

Exposure Profile

The anticipated use patterns and current labeling indicate several occupational exposure scenarios based on the types of equipment and techniques that can potentially be used for chlormequat chloride applications. Short- and intermediate-term occupational handler exposure is associated with handler activities (i.e., mixing, loading, and applying). There are no registered residential uses for chlormequat chloride. Therefore, residential exposures/risks were not assessed. Exposure via spray drift is not expected given the use profile.

Hazard Characterization

The toxicity database for chlormequat chloride is complete. Technical grade chlormequat chloride has high acute toxicity via oral and dermal routes of exposure (Toxicity Category II) and low acute toxicity via inhalation routes of exposure (Toxicity Category IV). It is a slight irritant to the eye (Toxicity Category III) and mildly irritating to the skin (Toxicity Category IV). Chlormequat chloride is not a dermal sensitizer.

The adult oral, incidental oral and inhalation endpoints were selected from the prenatal developmental toxicity study in rats. The no observed adverse effect level (NOAEL) is 30 mg/kg/day. The lowest observed adverse effect level (LOAEL) is 90 mg/kg/day, based on decreased body weight gain (38-112%-GD 6-9; 21-67% GD 6-12) and food consumption and greater incidences of increased salivation and chromorrhinorrhea. The point of departure (POD) is 30 mg/kg/day based on the NOAEL. No dermal endpoint was selected because there were no systemic effects reported in the dermal study in rats up to the limit dose and there is no evidence of offspring susceptibility in the chlormequat chloride database; therefore, quantification of dermal risks is not required.

Chlormequat chloride is classified as "Not Likely to be a Carcinogen to Humans" based on lack of evidence of carcinogenicity in rat and mouse studies. No evidence of mutagenicity or immunotoxicity was reported in the chlormequat database. A cancer risk assessment is not required.

Residential Handler and Post-application Exposure and Risk

There are no registered residential uses for chlormequat chloride. Therefore, residential exposures/risks were not assessed.

Occupational Handler Exposure and Risk

Based on the registered use sites, there is the potential for occupational exposures. Short- and intermediate-term occupational handler exposure is associated with handler activities (i.e., mixing, loading, and applying). The short- and intermediate-term inhalation risk estimates for the occupational handlers are greater than HED's LOC (i.e., MOEs ≥ 100) at baseline attire (i.e., no respirator) with MOEs ranging from 900 to 430,000. Occupational handler dermal exposures were not assessed since a dermal endpoint was not selected for chlormequat chloride.

Occupational Post-application Exposure and Risk

Occupational post-application dermal exposure was not quantitatively assessed since a dermal POD was not selected for chlormequat chloride.

Based on the Agency's current practices, a quantitative non-cancer occupational post-application inhalation exposure assessment was not performed for chlormequat chloride at this time. If new policies or procedures are put into place, the Agency may revisit the need for a quantitative occupational post-application inhalation exposure assessment for chlormequat chloride.

Restricted Entry Interval

Chlormequat chloride is classified as Toxicity Category II for acute dermal and oral, Toxicity Category IV for acute inhalation. It is a slight irritant to the eye (Toxicity Category III) and mildly irritating to the skin (Toxicity Category IV) and is not a dermal sensitizer. In accordance with the Worker Protection Standard (WPS), acute Toxicity Category II chemicals require a 24-

hour REI. The current registered labels require a 12-hour REI which is not adequate to protect agricultural workers from post-application exposures to chlormequat chloride.

Human Studies Review: This risk assessment relies in part on data from studies in which adult human subjects were intentionally exposed to a pesticide or other chemical. These data, which include studies from PHED 1.1 and two proprietary studies (MRIDs 44339801 and 49602401) are (1) subject to ethics review pursuant to 40 CFR 26, (2) have received that review, and (3) are compliant with applicable ethics requirements. For certain studies, the ethics review may have included review by the Human Studies Review Board. Descriptions of data sources, as well as guidance on their use, can be found at the Agency Website[1].

2.0 Risk Assessment Conclusions and Recommendations

2.1 Summary of Risk Estimates

There are no registered residential uses at this time, so a residential risk assessment was not completed.

There are no occupational handler inhalation risks of concern with MOEs ranging from 900 to 430,000 (LOC=100). Occupational post-application dermal exposure was not quantitatively assessed since a dermal POD was not selected for chlormequat chloride.

2.2 Label Recommendations and Data Deficiencies and Requirements

HED recommends that PRD ensure that the proper REIs are listed on the registered labels considering the acute toxicity of chlormequat chloride. In accordance with the WPS, acute Toxicity Category II chemicals require a 24-hour REI. The currently registered labels have REIs of 12 hours.

Additionally, an inconsistency in the cycocel label (EPA Reg. No. 241-74) was identified regarding which application rate to use within nurseries. The highest application rate that could be calculated for nursery use was 0.0254 lb ai/ gal. However, the label stipulates that for spray applications in shadehouses and container nursery production, the application rate should not exceed 3.7 lbs ai/A (0.017 lb ai/gal) for single applications. HED also identified that the maximum application rate for nursey use needed to be updated. However, the registrant has agreed to voluntary cancellation of the product, so the need to assess these scenarios did not arise and label updates for this product are no longer needed (EPA–HQ–OPP–2021–0015; FRL–10019–59).

3.0 Hazard Characterization

[1] https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/occupational-pesticide-handler-exposure-data and https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/occupational-pesticide-post-application-exposure

Acute Toxicity

The acute toxicity for chlormequat chloride is summarized in Table 3.1. Technical grade chlormequat chloride has high acute toxicity via oral, and dermal routes of exposure (Toxicity Category II) and low acute toxicity via inhalation routes of exposure (Toxicity Category IV). It is a slight irritant to the eye (Toxicity Category III) and mildly irritating to the skin (Toxicity Category IV). Chlormequat chloride is not a dermal sensitizer.

Table 3.1 Acute Toxicity Profile: Chlormequat Chloride

Guideline No.	Study Type	MRID(s)	Results	Toxicity Category
870.1100	Acute Oral (rat)	41721604	LD_{50} = 487 mg/kg (M) LD_{50} = 560 mg/kg (F) LD_{50} = 522 mg/kg (C)	II
870.1200	Acute Dermal (rat)	41721605	LD_{50} = 964 mg/kg (M) LD_{50} = 1621 mg/kg (F) LD_{50} = 1250 mg/kg (C)	II
870.1300	Acute Inhalation (rat)	41721606	$LC_{50} \geq$ 4.57 mg/L (M & F)	IV
870.2400	Primary Eye Irritation (rabbit)	41721607	Slightly irritating	III
870.2500	Primary Skin Irritation (rabbit)	41721608	Mildly irritating	IV
870.2600	Dermal Sensitization (guinea pig)	41721609	Not a sensitizer (Buehler)	N/A

Toxicological PODs Used for Risk Assessment

The short- and intermediate-term (non-cancer) inhalation risk assessment for chlormequat chloride is based on a NOAEL of 30 mg/kg/day from an oral developmental toxicity study in rats. The Hazard and Science Policy Council (HASPOC) recommended that a subchronic inhalation study be waived; therefore, an additional database uncertainty factor (UF) is not required (TXR 0058027, J. Pittman, 4/15/2020) for the lack of a subchronic inhalation toxicity study. The LOAEL is 90 mg/kg/day, based on decreased body weight gain (38-112%-GD 6-9; 21-67% GD 6-12) and food consumption and greater incidences of increased salivation and chromorrhinorrhea. Long-term exposures to chlormequat chloride (i.e., greater than 6 months) are not expected for current registered uses. Absorption *via* the inhalation route is presumed to be equivalent to oral absorption; therefore, a default inhalation factor of 100% was applied to inhalation exposures.

Decreases in body weight and signs of neurotoxicity (e.g. ataxia, salivation, decreased body temperature) were consistently observed in the available oral repeat dosing studies in rats, mice, and dogs. Dogs appear to be the most sensitive species with clinical signs of toxicity (salivation, vomiting, and diarrhea) at 10 mg/kg/day in the chronic dog study. Decreased body weights and/or decreased food consumption were the only effects observed in the 90-day dietary rat study (190 mg/kg/day), and in the chronic toxicity and carcinogenicity studies in rats (125 mg/kg/day) and mice (363 mg/kg/day). The prenatal developmental rat study (gavage), however, produced clinical signs such as salivation and chromorhinorrhea, as well as decreased food consumption at 90 mg/kg/day. One or more of these clinical signs were observed in the dams typically within one hour after the single oral dose on gestational day six (GD6). In the prenatal developmental toxicity study in rabbits, there were no adverse effects noted up to the highest dose tested (12

mg/kg/day). In the rat two-generation reproduction study, reproductive and offspring effects occurred at doses higher than those causing parental toxicity.

There was no quantitative or qualitative susceptibility observed in the offspring compared to the adult animals in the rat and rabbit developmental studies and the rat two-generation reproduction study.

No systemic toxicity was observed in the 21-day dermal study in rabbits when tested up to the limit dose. Dermal irritation and histopathological lesions of the treated skin (acanthosis, subacute inflammation and edema) was observed at 345 mg/kg/day in female rabbits only. No immunotoxicity study was available; however, no evidence of immunotoxicity was observed in the chlormequat chloride database.

Carcinogenicity studies in mice and rats did not demonstrate potential signs of carcinogenicity and chlormequat chloride was non-mutagenic in four genotoxicity studies. Therefore, chlormequat chloride is classified as "Not Likely to be a Carcinogen to Human" based on the lack of evidence of carcinogenicity. Table 3.2 below summarizes the toxicity profile for chlormequat chloride.

Table 3.2 Toxicological Doses and Endpoints for Chlormequat Chloride for use in Occupational Exposure Assessment

Exposure/ Scenario	Point of Departure	Uncertainty Factors	Level of Concern for Risk Assessment	Study and Toxicological Effects
Dermal	No endpoint selected. There were no systemic effects reported in the dermal study in rats up to the limit dose and there is no evidence of offspring susceptibility in the chlormequat chloride database.			
Inhalation (short-term, intermediate-term)	NOAEL = 30 mg/kg/day 100% absorption	UF_A = 10X UF_H = 10X	Occupational LOC for MOE = 100	Developmental toxicity study- rat (MRID 42246604) LOAEL=90 mg/kg/day, based on decreased body weight gains (38-112%-GD 6-9; 21-67% GD 6-12) and food consumption and greater incidences of increased salivation and chromorhinorrhea.
Cancer (oral, dermal, inhalation)	Classification: "Not Likely to be Carcinogenic to Humans" based on the lack of carcinogenic potential in the available studies.			

Point of Departure (POD) = A data point or an estimated point that is derived from observed dose-response data and used to mark the beginning of extrapolation to determine risk associated with lower environmentally relevant human exposures. NOAEL = no observed adverse effect level. LOAEL = lowest observed adverse effect level. UF = uncertainty factor. UF_A = extrapolation from animal to human (interspecies). UF_H = potential variation in sensitivity among members of the human population (intraspecies). LOC = level of concern.

Absorption

No dermal endpoints were selected due to a lack of hazard in the available dermal toxicity study. Since no inhalation absorption data are available, toxicity by the inhalation route is considered to be equivalent to the estimated toxicity by the oral route of exposure.

Body Weight

The standard body weight for the general population (80 kg) was used for all exposure scenarios covered in this risk assessment since the endpoints selected were not female-specific, developmental and/or fetal effects.

4.0 Use Profile

Chlormequat chloride is currently registered for use on a wide variety of ornamental plants grown in greenhouses, shadehouses, and nurseries. The registered crops include herbaceous and woody annual and perennial plants such as begonias, vincas, azaleas, and poinsettias. The outdoor use of chlormequat chloride is restricted to containerized ornamentals. Chlormequat chloride can be applied with several types of application equipment including manually-pressurized handwand, backpack sprayer, and mechanically-pressurized handgun equipment. Motorized groundboom and chemigation application is prohibited on all labels. There are no anticipated residential uses for chlormequat chloride. Chlormequat chloride is marketed as a soluble concentrate liquid containing 1 lb active ingredient per gallon of product. The proposed single maximum application rate for chlormequat chloride is 0.034 lb ai/gallon solution. The chlormequat chloride product labels direct applicators and other handlers to wear baseline attire (i.e., long-sleeved shirt, long pants, shoes and socks), no respirator, and varying levels of label-specified personal protective equipment (PPE) consisting of chemical resistant gloves and chemical resistant footwear. The currently registered labels require a 12-hour restricted entry interval (REI).

Table 4.1 below summarizes the registered use patterns for chlormequat chloride.

Table 4.1 Chlormequat chloride Use Profile.

Application Equipment	Formulation Product Name [EPA Reg. No.]	Maximum Single Application Rate lb ai/gal or lb ai/A	REI	Use Directions and Limitations[1]
Greenhouses / Shadehouses / Nurseries				
Mechanically-pressurized handgun, Manually-Pressurized handwand, backpack sprayer	Chlormequat SPC Plant Growth Regulator [228-688]	0.034 lb ai/gal (at 4,000 ppm)	12 hr	Do not apply through irrigation equipment. Motorized ground boom in outdoor sites is prohibited. 1 gallon of product contains 1 pound of ai. For best results, time application so irrigation or rain does not occur for 6 hours after application. Do not apply to field-grown ornamentals.
Mechanically-pressurized handgun, Manually-Pressurized handwand, backpack sprayer	CITADEL [62097-21]	0.034 lb ai/gal (at 4,000 ppm)		

1 The registrant has agreed to voluntary cancellation of the (EPA Reg. No 241-74) product which has application rates ranging from 0.017 lb ai/gal to 0.0254 lb ai/gal (EPA–HQ–OPP–2021–0015; FRL–10019–59).

5.0 Residential Exposure and Risk Estimates

There are no residential uses for chlormequat chloride. Therefore, residential exposures/risks were not assessed.

5.1 Residential Risk Estimates for Use in Aggregate Assessment

There are no registered residential uses, therefore, HED has assumed that the only relevant pathway of exposure to chlormequat chloride is dietary (food and drinking water) exposure.

6.0 Non-Occupational Spray Drift Exposure and Risk Estimates

The registered uses are not applied in a manner which could result in the potential for spray drift. Applicators are directed to apply chlormequat chloride using only handheld equipment. Additionally, outside use is restricted to containerized ornamentals only. Therefore, spray drift exposure assessments were not conducted.

7.0 Non-Occupational Bystander Post-Application Inhalation Exposure and Risk Estimates

Volatilization of pesticides may be a source of post-application inhalation exposure to individuals nearby pesticide applications. The agency sought expert advice and input on issues related to volatilization of pesticides from its Federal Insecticide, Fungicide, and Rodenticide Act Scientific Advisory Panel (SAP) in December 2009, and received the SAP's final report on March 2, 2010 (http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2009-0687-0037). The agency has evaluated the SAP report and has developed a Volatilization Screening Tool and a subsequent Volatilization Screening Analysis (http://www.regulations.gov/#!docketDetail;D=EPA-HQ-OPP-2014-0219). During Registration Review, the agency will utilize this analysis to determine if data (i.e., flux studies, route-specific inhalation toxicological studies) or further analysis is required for chlormequat chloride.

8.0 Occupational Exposure and Risk Estimates

8.1 Occupational Handler Exposure/Risk Estimates

HED uses the term handlers to describe those individuals who are involved in the pesticide application process. HED believes that there are distinct job functions or tasks related to applications and exposures can vary depending on the specifics of each task. Job requirements (amount of chemical used in each application), the kinds of equipment used, the target being treated, and the level of protection used by a handler can cause exposure levels to differ in a manner specific to each application event.

Based on the anticipated use patterns and current labeling, types of equipment and techniques that can potentially be used, occupational handler exposure is expected from the proposed uses. The quantitative exposure/risk assessment developed for occupational handlers is based on the following scenarios:

- Mixing/Loading/Applying Liquid Formulation for mechanically-pressurized handgun.
- Mixing/Loading/Applying Liquid Formulation for manually-pressurized handwand.
- Mixing/Loading/Applying Liquid Formulation for backpack sprayer.

Occupational Handler Exposure Data and Assumptions

A series of assumptions and exposure factors served as the basis for completing the occupational handler risk assessments. Each assumption and factor is detailed below on an individual basis.

Application Rate:

The maximum application rate is 0.034 lbs ai/gallon solution, as detailed in Table 4.1.

The assumptions, parameters and factors used for the exposure calculations include:

- Application rates for these commercial products were based on the registered labels and information provided by the registrants, BASF Corporation, NuFarm, and Fine AgroChemicals Ltd. All applications were assessed at the maximum of 4,000 ppm, as the worst-case scenario.

- The application rates for backpack sprayer, manually pressurized handwand, and mechanically pressurized handgun were adjusted to pounds of active ingredient per gallon. The application rate at 4,000 ppm for is 0.034 lb ai/gal, using the following equation:

  (1 lb ai/gal) (128 mL/gal soln) (1 gal /3785 mL) = 0.034 lb ai/gal

Unit Exposures: It is the policy of HED to use the best available data to assess handler exposure. Sources of generic handler data, used as surrogate data in the absence of chemical-specific data, include PHED 1.1, the AHETF database, the Outdoor Residential Exposure Task Force (ORETF) database, or other registrant-submitted occupational exposure studies. Some of these data are proprietary (e.g., AHETF data), and subject to the data protection provisions of FIFRA. The standard values recommended for use in predicting handler exposure that are used in this assessment, known as "unit exposures", are outlined in the "Occupational Pesticide Handler Unit Exposure Surrogate Reference Table[2]", which, along with additional information on HED policy

[2] Available: https://www.epa.gov/sites/production/files/2020-03/documents/opp-hed-pesticide-handler-surrogate-unit-exposure-table-march-2020.pdf

on use of surrogate data, including descriptions of the various sources, can be found at the Agency website[3].

Area Treated: The area treated/amount handled are based on ExpoSAC Policy 9.1. Refer to Table 8.1. for these assumptions for each scenario.

Exposure Duration:

HED classifies exposures from 1 to 30 days as short-term and exposures 30 days to six months as intermediate-term. Exposure duration is determined by many things, including the exposed population, the use site, the pest pressure triggering the use of the pesticide, and the cultural practices surrounding that use site. For most agricultural uses, it is reasonable to believe that occupational handlers will not apply the same chemical every day for more than a one-month time frame; however, there may be a large agribusiness and/or commercial applicators who may apply a product over a period of weeks (e.g., completing multiple applications for multiple clients within a region). For chlormequat chloride, based on the number of seasonal applications indicated on the proposed product labels, and information provided by the registrant, occupational exposures are expected to be short- and intermediate-term in duration for all ornamental and nursery plants.

Personal Protective Equipment: Estimates of inhalation exposure are presented for "baseline," defined as a single layer of clothing consisting of a long sleeved shirt, long pants, shoes plus socks, no protective gloves, and no respirator, as well as baseline with various levels of PPE as necessary (e.g., gloves, respirator, etc.). The chlormequat chloride product labels direct mixers, loaders, applicators and other handlers to wear "baseline" attire and varying levels of label-specified PPE (depending on the label) consisting of chemical resistant gloves and chemical resistant footwear.

Summary of Occupational Handler Non-Cancer Exposure and Risk Estimate Equations

The algorithms used to estimate non-cancer exposure and dose for occupational handlers can be found in Appendix A.

Summary of Occupational Handler Non-Cancer Exposure and Risk Estimates

The summary of the occupational handler exposure and risk estimates are provided in Table 8.1 below. The short- and intermediate-term inhalation risk estimates for the occupational handlers are greater than HED's LOC (i.e., MOEs ≥ 100) at baseline attire (i.e., single layer clothing and no respirator). The MOEs range from 900 to 430,000.

[3] Available: https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/occupational-pesticide-handler-exposure-data

Table 8.1. Occupational Handler Non-Cancer Exposure and Risk Estimates for Chlormequat chloride.

Exposure Scenario	Crop or Target[1]	Inhalation Unit Exposure (µg/lb ai)	Level of PPE or Engineering control[2]	Maximum Application Rate[3]	App Rate Unit	Area Treated or Amount Handled Daily[4]	Area Treated/Amount Handled Unit	Inhalation	
								Dose[5] (mg/kg/day)	MOE[6]
Mixer/Loader/Applicator									
Liquid, Backpack, Broadcast	Greenhouse (ornamentals, roses, cut flowers, container stock, vegetables)	140	No-R	0.034	lb ai/gallon solution	7	gallons solution	0.000416	72000
Liquid, Manually-pressurized Handwand, Broadcast	Greenhouse (ornamentals, roses, cut flowers, container stock, vegetables)	23 6	No-R	0.034	lb ai/gallon solution	7	gallons solution	0.0000703	430000
Liquid, Mechanically-pressurized Handgun, Broadcast	Greenhouse (ornamentals, roses, cut flowers, container stock, vegetables)	448	No-R	0.034	lb ai/gallon solution	175	gallons solution	0.0334	900
Liquid, Mechanically-pressurized Handgun, Drench/Soil-/Ground-directed	Greenhouse (ornamentals, roses, cut flowers, container stock, vegetables)	448	No-R	0.034	lb ai/gallon solution	175	gallons solution	0.0334	900

1 "Greenhouse" include ornamentals.
2 Based on the "Occupational Pesticide Handler Unit Exposure Surrogate Reference Table" (March 2020); Level of mitigation: No-R = No Respirator.
3 Based on registered labels (See Table 4.1).
4 Exposure Science Advisory Council Policy #9.1.
5 Inhalation Dose = Inhalation Unit Exposure (mg/lb ai) x Application Rate (lb ai/A or gallon) x Area treated or Amount Handled (A/day or gallons/day) / Body Weight (80 kg).
6 Inhalation MOE = Inhalation NOAEL (30 mg/kg/day)/Inhalation Dose (mg/kg/day).

8.2 Occupational Post-application Exposure/Risk Estimates

Occupational post-application dermal exposure was not quantitatively assessed since a dermal POD was not selected for chlormequat chloride.

Dislodgeable Foliar Residue (DFR): In accordance with the updated Part 158 data requirements (2007), one or more DFR studies are required when a pesticide has residential or occupational uses that could result in post-application dermal exposure. Since a dermal POD was not selected, a non-cancer dermal post-application risk assessment was not performed for chlormequat chloride. Therefore, DFR studies are not needed for chlormequat chloride at this time. If the PODs change, the need for DFR studies may be reevaluated in the future to refine the post-application assessment.

8.2.1 Occupational Post-application Inhalation Exposure/Risk Estimates

There are multiple potential sources of post-application inhalation exposure to individuals performing post-application activities in previously treated fields. These potential sources include volatilization of pesticides and resuspension of dusts and/or particulates that contain pesticides. The agency sought expert advice and input on issues related to volatilization of pesticides from its Federal Insecticide, Fungicide, and Rodenticide Act Scientific Advisory Panel (SAP) in December 2009, and received the SAP's final report on March 2, 2010 (http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2009-0687-0037). The agency has evaluated the SAP report and has developed a Volatilization Screening Tool and a subsequent Volatilization Screening Analysis (https://www.regulations.gov/#!docketDetail;D=EPA-HQ-OPP-2014-0219). During Registration Review, the agency will utilize this analysis to determine if data (i.e., flux studies, route-specific inhalation toxicological studies) or further analysis is required for chlormequat chloride.

In addition, the Agency is continuing to evaluate the available post-application inhalation exposure data generated by the Agricultural Reentry Task Force. Given these two efforts, the Agency will continue to identify the need for and, subsequently, the way to incorporate occupational post-application inhalation exposure into the agency's risk assessments. Although a quantitative occupational post-application inhalation exposure assessment was not performed, an inhalation exposure assessment was performed for occupational/commercial handlers. Handler exposure resulting from application of pesticides outdoors is likely to result in higher exposure than post-application exposure. Therefore, it is expected that these handler inhalation exposure estimates would be protective of most occupational post-application inhalation exposure scenarios.

The Worker Protection Standard for Agricultural Pesticides contains requirements for protecting workers from inhalation exposures during and after greenhouse applications through the use of ventilation requirements [40 CFR 170.110, (3) (Restrictions associated with pesticide applications)].

Restricted Entry Interval

Technical grade chlormequat chloride has high acute toxicity via oral and dermal routes of exposure (Toxicity Category II) and low acute toxicity via inhalation routes of exposure (Toxicity Category IV). Chlormequat chloride is a slight irritant to the eye (Toxicity Category III) and mildly irritating to the skin (Toxicity Category IV). Acute ingredients classified as Category II are assigned a 24-hour REI. The current registered labels require a 12-hour REI. Chlormequat chloride is not a dermal sensitizer. In accordance with the requirements for the WPS, the REI is based on the acute toxicity of the active ingredient. The current registered labels require a 12-hour REI which is not adequate to protect agricultural workers from post-application exposures to chlormequat chloride. HED requests that PRD review the REI on currently registered labels for ornamental plants grown in containers in greenhouses, nurseries, and shadehouses.

Appendix A. Summary of Occupational and Residential Non-cancer Algorithms

Occupational Non-cancer Handler Algorithms

Potential daily exposures for occupational handlers are calculated using the following formulas:

$$E=UE * AR * A * 0.001 \text{ mg/ug}$$

where:

E=exposure (mg ai/day),
UE=unit exposure (µg ai/lb ai),
AR=maximum application rate according to proposed label (lb ai A or lb ai/gal), and
A=area treated or amount handled (e.g., A/day, gal/day).

The daily doses are calculated using the following formula:

$$ADD= E * AF / BW$$

where:

ADD= average daily dose absorbed in a given scenario (mg ai/kg/day),
E=exposure (mg ai/day),
AF=absorption factor (dermal and/or inhalation), and
BW = body weight (kg).

Margin of Exposure: Non-cancer risk estimates for each application handler scenario are calculated using a Margin of Exposure (MOE), which is a ratio of the toxicological endpoint to the daily dose of concern. The daily dermal and inhalation dose received by occupational handlers are compared to the appropriate POD (i.e., NOAEL) to assess the risk to occupational handlers for each exposure route. All MOE values are calculated using the following formula:

$$MOE= POD/ADD$$

where:

MOE=margin of exposure: value used by HED to represent risk estimates (unitless),
POD=point of departure (mg/kg/day), and
ADD=average daily dose absorbed in a given scenario (mg ai/kg/day).