M E M O R A N D U M

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SUBJECT: ACUTE SYMPTOMOLOGY AND WORKER SAFETY ASSOCIATED WITH PESTICIDES DETECTED AT ILLEGAL CANNABIS OPERATIONS IN NORTHERN CALIFORNIA (REVISED)

The Office of the Secretary of the California Environmental Protection Agency (CalEPA) has requested that the Department of Pesticide Regulation (DPR) provide information on the health and safety concerns for pesticides recently found at illegal cannabis operations in Northern California. The information will be used to assist the Unified Cannabis Enforcement Taskforce (UCETF), a multi-agency enforcement taskforce working to increase enforcement coordination between state, local and federal partners in combatting illegal cannabis operations. CalEPA is one of many agencies represented in UCETF. The information requested in this memorandum is designed to assist UCETF and law enforcement in recognizing the symptoms of acute pesticide exposure and as baseline information for developing site specific entry, removal and remediation plans.

Pesticides in Illegal Cannabis Grows

The circumstances involved in illegal cannabis grows are distinct from California's legal cannabis program as described in the Medicinal and Adult Use Cannabis Regulation and Safety Act (Division 10, California Business Code, § 26000-26325, et seq.) and as regulated by the California Department of Cannabis Control. A pesticide product can legally be applied to cannabis under state law if the active ingredient found in the product is exempt from (federal) residue tolerance requirements and the product is either exempt from registration requirements or registered for a use that is broad enough to include cannabis. More information on DPR's Cannabis Program can be found at https://www.cdpr.ca.gov/docs/cannabis/index.htm. In contrast, illegal cannabis cultivators often misuse highly toxic and banned pesticides. Pesticides may not be easily identifiable and found in packaging that lacks required federal and state labeling. Often, pesticides found in these locations have been banned in the US because of their highly toxic nature.

Health and Safety Considerations within Cannabis Incident Response

Pesticides regulated by the US Environmental Protection Agency (US EPA) and DPR must contain label language that specifies the percent by volume of the active ingredient, instructions for use, information about possible harmful effects from short term exposure, and required personal protective equipment (PPE) (see https://www.cdpr.ca.gov/docs/dept/factshts/read2.pdf). Pesticides found at illegal grows are often not in the original container or are found in foreign packaging or in non-regulated containers. This makes it difficult or impossible for entry personnel to identify the pesticide or take the proper health and safety precautions to avoid unintentional exposure and acute or long-term symptomatology. Pesticides may be mixed with fertilizers, solvents, fuels, or other unknown chemical in unmarked and unregulated containers. These sites may also contain extensive water, soil and foliage contamination as well as contaminated wildlife fatalities. All illegal grow operations (indoor and outdoor) should be considered contaminated and a risk to personnel until completely remediated with confirmatory testing below appropriate environmental screening levels. For a guide to clearance levels, refer to US EPA's Regional Screening Levels at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

Dermal and inhalation exposure pose the highest concern for unintentional pesticide exposure. There is also a potential for incidental oral contact (hand-to-mouth exposure). The injection route, via punction wound from sharp objects that are contaminated, is rare but a possibility in an uncharacterized site. Because of the unknown nature of pesticide hazards at illegal grow sites, entry personnel should at a minimum don Level B PPE, including but not limited to a hooded chemical resistant outer suit (coveralls), outer chemical resistant boots with puncture-resistant soles, chemical resistant inner and outer gloves (with a recommendation of donning laminate gloves until the chemical agents are identified), fit tested full-face air purifying respirator (APR) or powered air purifying respirator (PAPR) with CBRN level cartridges. Where an enclosed space may be involved, respiratory protection should include self-contained breathing apparatus (SCBA).

Agency personnel should consult their health and safety officer for site specific health and safety plans, for respiratory protection plans, and any required medical monitoring and heat illness recognition/training. In addition, the site specific safety plan should include procedures for proper PPE donning and doffing, decontamination, proper PPE for decontamination personnel, identification of exclusion and support zones, and proper PPE wash/waste disposal. Area or personal monitoring can add an additional level of precaution for inhaled toxicants that have moderate to high vapor pressures (e.g., solvents, fuels, fumigants). Entry personnel at all stages of site identification, sampling, decontamination, and remediation should consider clothing and footwear (even Level C and D) to be contaminated and avoid cross-contaminating vehicles, other work locations, living quarters or residences. The health and safety officer may also consider having emergency medical system (EMS) personnel available with any antidotes to specific pesticides listed below.

NOTE: The list of pesticides below was specified in a request by the CalEPA Office of the Secretary in response to investigations initiated at an illegal grow operation in Siskiyou County in June 2023. The pesticides described below do not represent all pesticides detected in illegal cannabis operations in California. For detailed information on pesticide poisoning symptomology, medical management, and antidote treatment refer to US EPA's Recognition and Management of Pesticide Poisoning, available at https://www.epa.gov/sites/default/files/2015-01/documents/rmpp_6thed_final_lowresopt.pdf. For locations with unstable connectivity, a hard copy of the above resource would be recommended for entry teams and supporting EMS. For additional information, refer to DPR's Pocket Guide to Pesticides Found in Illegal Cannabis Grow Operations, available at https://www.cdpr.ca.gov/docs/cannabis/law_enforcement.htm.

Acute Toxicity and Poisoning Information for Selected Pesticides			
CAS No.	**Active Ingredient***	**Description****	**Safety and Hazard Information*****
ORGANOPHOSPHATES***			
21923-23-9	Chlorthiophos	**Not registered for use in the US** LD 50 = 7.8 mg/kg (Tox Cat I). Yellow-brown liquid with a tendency to crystallize below 25C. European Chemicals Agency (ECHA) reg. no. 60238-56-4.	All organophosphates (OPs) share a common mechanism of cholinesterase inhibition and can cause similar symptoms, although there are some differences within the class. OPs are efficiently absorbed by inhalation and ingestion. Dermal reactions and uptake and systemic absorption vary by active ingredient. Because of the common mechanism, exposure to the same OP through multiple routes, or multiple OPs through a single route may lead to additive toxicity. Symptoms of acute OP poisoning can develop within minutes to hours of exposure, with the most rapid onset following inhalation. Early symptoms include headache, nausea, dizziness and hypersecretion (sweating, excess salivation, lacrimation and rhinorrhea), potentially worsening to include muscle twitching, weakness, tremor, incoordination, vomiting, abdominal cramps and diarrhea. Patients may exhibit anxiety, restlessness, and confusion. Pulmonary edema may develop 12–48 hrs after exposure, warranting close patient observation following poisoning. High exposures may be life-threatening, signified by loss of consciousness, incontinence, seizures and respiratory depression. The primary cause of death is respiratory failure with a secondary cardiovascular component. Because of the wide range of acute toxicity among the OPs, identification of the specific active ingredient is important for medical management. Administration of atropine and/or pralidoxime may be warranted following confirmation of OP poisoning. However extreme caution is warranted for antidote use when carbamate exposure is suspected or when barbiturates were administrated for convulsions, as the latter are potentiated by anticholinesterases.
62-73-7	Dichlorvos, DDVP	LD50 = 56–80 mg/kg. (Tox Cat II). Colorless to amber liquid with an aromatic odor. May emit chloride fumes and phosgene when heated to high temperatures.	
98886-44-3	Fosthiazate	LD50 = 51–73 mg/kg (Tox Cat II). Nematicide. Light gold liquid with high boiling point and low vapor pressure.	
52-68-6	Metrifonate (Trichlorfon)	LD50 = 450–650 mg/kg (Tox Cat II–III). White crystalline solid and a wettable powder. Irreversibly inhibits acetylcholinesterase.	
300-76-5	Naled	LD50 = 91–430 mg/kg (Tox Cat II). White solid that may be dissolved in a liquid organic carrier with a pungent odor.	
41198-08-7	Profenofos	LD50 = 492 mg/kg (Tox Cat II). Pale yellow liquid with garlic-like odor. Broad spectrum insecticide.	

Acute Toxicity and Poisoning Information for Selected Pesticides			
CAS No.	**Active Ingredient***	**Description****	**Safety and Hazard Information*****
CARBAMATES***			
3766-81-2	Fenobucarb, BPMC	**Not registered for use in the US** LD50 = 350 mg/kg (Tox Cat II). A pale yellow or pale red liquid, insoluble in water.	As with OP insecticides, carbamate poisoning can cause a cholinergic crisis characterized by severe nausea, vomiting, diarrhea, salivation, sweating, lacrimation, urination, bradycardia, hypotension and convulsions. Increasing skeletal muscle weakness, fatigue, cramping, and paralysis can occur. Nicotinic overstimulation in the CNS may result in anxiety, headache, convulsions, ataxia, depression of respiration and circulation, tremor, general weakness, and potentially coma. Muscarinic overstimulation may result in visual disturbances, chest tightness, and bronchoconstriction. Unlike the OPs, carbamates inhibition of cholinesterase is reversible, so poisoning episodes may be shorter in duration and/or less severe. Smaller doses of atropine than used for OPs may be sufficient to antagonize the effects of excessive acetylcholine.
2631-40-5	Isoprocarb, MIPC	**Not registered for use in the US** LD50 = 450 mg/kg (Tox Cat II). Colorless crystalline solid.	
16752-77-5	Methomyl (1-naphthyl-N-methylcarbamate)	LD50 = 25–40 mg/kg (Tox Cat I). White crystalline solid with slight sulfurous smell. Methomyl has high oral toxicity, with a probable oral lethal dose in humans between 7 drops and 1 teaspoon for a 150 pound adult. Death is due to respiratory arrest.	

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CAS No.	**Active Ingredient***	**Description****	**Safety and Hazard Information*****
ORGANOCHLORINES			
82-68-8	Pentachloronitrobenzene, PCNB	LD50 = 1100 mg/kg (Tox Cat III). Crystalline pale yellow to white solid or powder with a musty moth ball odor. Fungicide. Thermal decomposition may release toxic fumes of chlorine, carbon monoxide, carbon dioxide, hydrogen chlorine and phosgene.	Exposure to organochlorines (OC) insecticides can cause CNS stimulation, vomiting, diarrhea, excitement, giddiness, fatigue, tremors, convulsions, coma, pulmonary edema, hypothermia and liver, kidney and myocardial toxicity. Respiration may be initially accelerated and then later depressed. Early symptoms of poisoning can include unusual sensations of the face and inability to control extremities. More severe poisoning can include myoclonic jerking movements followed by generalized tonic-clonic convulsions. Coma and respiratory depression may follow the seizures. In cases where the patient also presents with cholinergic symptoms, the symptoms of OC poisoning may go unnoticed. Medical providers should be alert to pesticide co-exposures and manage appropriately.
96489-71-3	Pyridaben	LD50 = 4690 mg/kg (Tox Cat III). White odorless solid.	

Acute Toxicity and Poisoning Information for Selected Pesticides			
CAS No.	**Active Ingredient***	**Description****	**Safety and Hazard Information*****
PYRETHROIDS			
52315-07-8	Cypermethrin	LD50 = 187–500 mg/kg (Tox Cat II). Mixture of 8 isomers may present as yellow viscous liquid/paste with characteristic odor. Pure isomers are colorless crystals.	Pyrethroids have been divided into two types based on clinical findings. Type II pyrethroids generally contain a cyano group while Type I do not. Type I pyrethroid poisoning is characterized by fine tremor and reflex hyperexcitability. Type II exposures are generally more severe and may result in profuse salivation, pulmonary edema, clonic seizures, and opisthotonos (spasm of the muscles causing backward arching of the head, neck, and spine). Initial symptoms following ingestion include gastrointestinal events (i.e., abdominal pain, vomiting and diarrhea) generally within 10 to 60 minutes. A large ingestion (200 to 500 mL) of concentrated formulations may cause coma and seizures within 20 minutes. Dermal exposure can cause significant discomfort characteristic of pyrethroid poisoning, including rapid onset of numbness, itching, burning, stinging, tingling, or warmth that may last hours. The skin of the face is most commonly affected, but the hands, forearms and neck can be involved. Dermal symptoms are more common with Type II pyrethroids.
39515-41-8	Fenpropathrin	LD50 = 48–54 mg/kg (Tox Cat I–II). Yellowish to brown liquid or solid, depending on purity and temperature.	
91465-08-6	Lambda-cyhalothrin	LD50 = 56–79 mg/kg (Tox Cat II). Colorless to beige solid with a mild odor in pure form.	
52918-63-5	Deltamethrin	LD50 = 31–139 mg/kg (Tox Cat I–II). Odorless, colorless to white or slightly beige crystalline solid.	

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CAS No.	**Active Ingredient***	**Description****	**Safety and Hazard Information*****
ORGANOSULFUR COMPOUNDS			
556-61-6	Methyl isothiocyanate, MITC	1-hr LC50 633 ppm; 4-hr LC50 180 ppm (Tox Cat II). MITC gas has a pungent, horseradish-like odor. Main degradation compound of dithiocarbonate salts which are generally colorless solids at 25C.	Extremely irritating to the eyes and respiratory mucous membranes, including the lower respiratory tract/lungs. Respiratory symptoms include burning or irritation of the nose and throat, cough, laryngitis, chest pain, and asthmatic syndrome (chemical bronchitis with severe bronchospasm). Inhalation may cause pulmonary edema, manifesting with severe respiratory distress and coughing of bloody, frothy sputum. Onset may be delayed, so suggested observation of patient is recommended for 12–48 hrs after exposure. Headache, vomiting, abdominal pain, insomnia, and anxiety neurosis with depression, or paranoid tendencies may be observed. May cause second or third degree burns after brief skin contact.

Acute Toxicity and Poisoning Information for Selected Pesticides			
CAS No.	**Active Ingredient***	**Description****	**Safety and Hazard Information*****
PYRROLES			
122453-73-0	Chlorfenapyr	LD50 = 441 mg/kg (Tox Cat II) Light tan or light yellow powdered solid. A compound of cyanide derived from a class of microbially produced halogenated pyrroles. Pyrrole insecticide.	Moderate eye irritant. Exposure to high levels of cyanide based compounds for a short duration can result in rapid, deep breathing and shortness of breath, general weakness, giddiness, headaches, vertigo, confusion, convulsions/seizures and eventually loss of consciousness. Other poisoning symptoms include apnea and cardiac arrest. Antidotes to cyanide poisoning include hydroxocobalamin and sodium nitrite. Oxygen therapy may be warranted for inhalation exposure.

Acute Toxicity and Poisoning Information for Selected Pesticides			
CAS No.	**Active Ingredient***	**Description****	**Safety and Hazard Information*****
HALOBENZENE DERIVATIVES			
1897-45-6	Chlorothalonil	LD50 > 10,000 mg/kg (Tox Cat IV). Colorless crystals or granules, or light gray powder. Technical grade has a slightly pungent odor. Dinitrile fungicide.	Can result in irritation of the skin and mucous membranes of the eye and respiratory tract on contact. Inhalation of high concentrations can result in reversible bronchoconstriction. May result in acute dermatitis and skin photosensitivity. Antidotes include hydroxocobalamin and sodium nitrite. Oxygen therapy may be warranted for inhalation exposure.

Acute Toxicity and Poisoning Information for Selected Pesticides			
CAS No.	**Active Ingredient***	**Description****	**Safety and Hazard Information*****
FUNGICIDES (MISC.)			
32809-16-8	Procymidone	**Not registered for use in the US** LD50 = 6800 mg/kg (Tox Cat IV). Dichlorophenyl dicarboximide fungicide. Colorless crystalline powered solid at 25C.	Low acute toxicity
107534-96-3	Tebuconazole	LD50 = 1700 mg/kg (Tox Cat III). Triazole fungicide. Colorless crystals; can emit hydrogen chloride and other toxic vapors under thermal decomposition.	Low acute toxicity. Ingestion of very high doses may result in general depressed activity and ataxia.
81412-43-3	Tridemorph	**Not registered for use in the US** LD50 = 480–650 mg/kg (Tox Cat II–III). Oxazinane fungicide. Oily liquid with slight amine odor.	Low acute toxicity

* Parent compound listed rather than metabolite, degradate, or thermal decomposition product that may have been detected during laboratory analysis of Siskiyou County illegal grow operation samples

** LD50/LC50 values (median lethal dose or concentration that is expected to kill 50% of a test animal population); Acute oral toxicity of technical grade compound in rats unless otherwise indicated. Toxicity Category as defined by US EPA Label Review Manual Chapter 7: Precautionary Statements. US Environmental Protection Agency, Office of Pesticide Programs, Registration Division. Revised March 2018. https://www.epa.gov/sites/production/files/2018-04/documents/chap-07-mar-2018.pdf

*** Toxicity, hazard and safety statements from PubChem, an open chemistry database at the National Institutes of Health (NIH) managed by the National Center for Biotechnology Information. Available at https://pubchem.ncbi.nlm.nih.gov/. For specific information regarding confirmation of poisoning, treatment and dosages of antidotes, refer to Recognition and Management of Pesticide Poisonings, Sixth Edition. US Environmental Protection Agency, Office of Pesticide Programs, Washington DC, 2013. EPA 735-K-13-001. https://www.epa.gov/sites/default/files/2015-01/documents/rmpp_6thed_final_lowresopt.pdf