1,3-DICHLOROPROPENE (TELONE®): PROTECTING BYSTANDER & WORKER HEALTH

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The object of this presentation is to describe in general terms how the California Department of Pesticide Regulation (CDPR) evaluates worker and bystander exposure to the methyl bromide alternative: 1,3-dichloropropene (1,3-D also known commercially as Telone®). 1,3-D is a volatile organic compound (VOC) that has been registered for use as a pesticide to control symphylans, wire worms and all major types of nematodes since 1954. In 1990, California suspended all use because unacceptably high levels of 1,3-D were detected in its air monitoring program. 1,3-D use in California was reinstated in 1995 following label changes and mitigation measures aimed at reducing exposures of workers and bystanders.

In California reports of illness and injury associated with pesticide products are maintained in the Pesticide Illness Surveillance Program (PISP) at CDPR. This database plus animal studies and the medical literature provide information on the nature of pesticide exposure and subsequent illness or injury. These sources indicate that exposure to 1,3-D vapor and liquid leads to irreversible eye damage. Inhalation causes severe irritation of the nasopharynx and lungs and may lead to central nervous system depression, loss of consciousness, and convulsions. Skin contact causes dermatitis and necrosis and leads to persistent sensitization. 1,3-D causes tumors in animals. This illness information, coupled with the physical and chemical properties of 1,3D, is used to develop criteria for personal protective equipment and other mitigation measures designed to be health protective.

California requires reporting of all agricultural pesticides applied by licensed applicators. These data are collected in the Pesticide Use Report (PUR) database (http://www.cdpr.ca.gov/docs/pur/purmain.htm). 1,3-D containing pesticides are California Restricted Materials and may be applied only by certified applicators. The PUR database contains a wealth of information concerning 1,3-D and provides a summary of changes in use patterns. For example, the PUR database shows that beginning with the reinstatement, the use of 1,3-D in terms of pounds of AI applied increased 21-fold between 1995 and 2006 (the latest year for which data are available). Along with this increase, there was also a 12-fold increase in the number of acres treated per year, and an increase in the average number of pounds of 1,3-D applied per acre. In 2006 in California, 167 million pounds of pesticide active ingredients (AIs) were used for agricultural production. Of that, 1,3-D accounted for 8.6 million pounds or 5.1%.

For the purposes of exposure assessment, available data from the most recent 5 years (2002 to 2006, currently) are averaged to minimize yearly variations. This averaged data is then analyzed to determine monthly use by county. For 1,3-D the high-use season (defined as those months in which the pounds used are equal to or exceed 5% of the total annual county use) varies from 5 to 8 months for the top use counties of: Fresno, Kern, Merced, Monterey, Tulare, Stanislaus, Ventura, and Imperial. Although several counties show similar patterns of high use, others like Merced and Ventura show non-overlapping periods of high use. This analysis also provides information about the monthly application rate in terms of pounds 1,3-D applied per acre during high use periods. In some high use counties, this rate is close to the maximum (332 pounds per acre) allowed by the label. Monthly application rates and patterns are used for developing exposure scenarios for both handlers and bystanders.

Because maximum application rates and methods vary depending on the crop, site data from the PUR database are also useful in developing exposure scenarios. During the period of 2002 to 2006 the sites with the highest average total pounds of 1,3-D applied were (in declining order): tree crops, strawberries, carrots, grapes, and sweet potatoes. These same crops, albeit in a different order, accounted for the highest average number of acres cultivated (in declining order: strawberries, carrots, tree crops, sweet potatoes, and grapes).

The application methods allowed for 1,3-D include: broadcast shank (shallow or deep and tarped or non-tarped), bedded shank (tarped or non-tarped), prebed application with tarping, surface drip with tarp, buried drip (non-tarped), and tree replant wanding. For each of these distinct application methods, the different types of handler activities (mixer/applicator, tractor driver, copilot, soil sealer/shoveler, tarp cutter/remover, pipe layer, supervisor, etc.) and bystander activities are considered. Air monitoring studies (often coupled with computer modeling of air monitoring data) are used to define off gassing rates and patterns and to generate exposure estimates. Scientific data for these calculations are provided by registrant studies and the open scientific literature. In addition, CDPR in collaboration with growers and applicators may undertake studies to generate needed data for specific application methods (Wofford *et al.*, 2005).

Thus, data from many sources are used to develop exposure assessments for fumigants like 1,3-dichloropropene.

Reference

Wofford, P., Levine, J., Lee, P., White, J., Hsu, J., Woroniecka, T., and Matsumoto, S. 2005. Monitoring a 1,3-dichloropropene/metam sodium application in Del Norte County. EH05-04. Sacramento, CA: Department of Pesticide Regulation, California Environmental Protection Agency. June 2005. http://www.cdpr.ca.gov/docs/emon/pubs/tac/tacpdfs/mitctelonedelnorte/mtdelnortrpt.pdf.