



# PUBLIC HEALTH STATEMENT

## METHYLENE CHLORIDE

### CAS#: 75-09-2

Division of Toxicology

April 1993

This Public Health Statement is the summary chapter from the Toxicological Profile for Methylene Chloride. It is one in a series of Public Health Statements about hazardous substances and their health effects. A shorter version, the ToxFAQs™, is also available. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present. For more information, call the ATSDR Information Center at 1-888-422-8737.

This Statement was prepared to give you information about methylene chloride and to emphasize the human health effects that may result from exposure to it. The Environmental Protection Agency (EPA) has identified 1,300 sites on its National Priorities List (NPL). Methylene chloride has been found in at least 746 of these sites. However, we do not know how many of the 1,300 NPL sites have been evaluated for methylene chloride. As EPA evaluates more sites, the number of sites at which methylene chloride is found may change. This information is important for you to know because methylene chloride may cause harmful health effects and because these sites are potential or actual sources of human exposure to methylene chloride.

When a chemical is released from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment as a chemical emission. This emission, which is also called a release, does not always lead to exposure.

You can be exposed to a chemical only when you come into contact with the chemical. You may be exposed to it in the environment by breathing, eating, or drinking substances containing the chemical or from skin contact with it.

If you are exposed to a hazardous chemical such as methylene chloride, several factors will determine whether harmful health effects will occur and what the type and severity of those health effects will be. These factors include the dose (how much), the duration (how long), the route or pathway by which you are exposed (breathing, eating, drinking, or skin contact), the other chemicals to which you are exposed, and your individual characteristics such as age, sex, nutritional status, family traits, lifestyle, and state of health.

#### 1.1 WHAT IS METHYLENE CHLORIDE?

Methylene chloride, also known as dichloromethane, is a colorless liquid that has a mild sweet odor, evaporates easily, and does not easily burn. It is widely used as an industrial solvent and as a paint stripper. It can be found in certain aerosol and pesticide products and is used in the manufacture of photographic film. The chemical may be found in some spray paints, automotive cleaners and other household products. Methylene chloride does not appear to occur naturally in the environment. It is made from methane gas or wood alcohol. Most of the methylene chloride released to the environment results from its use as an end product by various industries and the use of aerosol products and paint removers in the home.

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### 1.2 WHAT HAPPENS TO METHYLENE CHLORIDE WHEN IT ENTERS THE ENVIRONMENT?

Methylene chloride is mainly released to the environment in air and to a lesser extent in water and soil, due to industrial and consumer uses. Many chemical waste sites, including NPL sites, contain methylene chloride and these might act as additional sources of environmental contamination through spills, leaks, or evaporation. Because methylene chloride evaporates readily, most of it is released into the air. In air, it is broken down by sunlight and by reaction with other chemicals present in the air. About half of the methylene chloride disappears from air in 53–127 days. Although methylene chloride does not dissolve easily in water, small amounts may be found in some drinking water. Methylene chloride that is present in water is broken down slowly by reactions with other chemicals or by bacteria. More than 90% of the methylene chloride in the environment changes to carbon dioxide (CO<sub>2</sub>), which is already present in air. It takes about 1 to 6 days for half the methylene chloride to break down in water. When methylene chloride is spilled on land, it attaches loosely to nearby surface soil particles. It moves from the soil into the air. Some may also move into groundwater. We do not know how long it remains in soil. We do not expect methylene chloride to build up in plants or animals.

### 1.3 HOW MIGHT I BE EXPOSED TO METHYLENE CHLORIDE?

You may be exposed to methylene chloride in air, water, food, or from consumer products. Because

methylene chloride evaporates easily, the greatest potential for exposure is when you breathe vapors of contaminated air. Background levels in air are usually at less than 1 part methylene chloride per billion parts (ppb) of air. Methylene chloride has been found in some urban air and at some hazardous waste sites at average concentrations of 11 ppb of air. The average daily intake of methylene chloride from outdoor air in three United States cities ranges from 33 to 309 micrograms per day (µg/day). Contact with consumer products such as paint strippers or aerosol cans that contain methylene chloride is another frequent source of exposure. Exposure occurs as a result of breathing the vapors given off by the product or from direct contact of the liquid material with the skin. The highest and most frequent exposures to methylene chloride usually occur in workplaces where the chemical is used. People who work in these places can breathe in the chemical or it may come in contact with their skin. In the past, concentrations ranging from 1 to 1,000 parts methylene chloride per million parts (ppm; 1 ppm is 1,000 times more than 1 ppb) of air have been detected in general work areas, while higher concentrations (1,400 ppm) have been detected in samples in the breathing zone of some workers. These exposure levels exceed the current recommended federal limits. The National Institute for Occupational Safety and Health (NIOSH) estimated that 1,000,000 workers may be exposed to methylene chloride. An average of 68 ppb of methylene chloride in surface water and 98 ppb methylene chloride in groundwater have been found at some hazardous waste sites. Less than 1 ppb has been found in most drinking water analyzed. We expect exposure from water and food

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to be low because very little methylene chloride has been detected in these sources.

#### 1.4 HOW CAN METHYLENE CHLORIDE ENTER AND LEAVE MY BODY?

Methylene chloride may enter your body when you breathe vapors of contaminated air. It may also enter your body if you drink water from contaminated wells, or it may enter if your skin comes in contact with it. Since methylene chloride evaporates into air rapidly, exposure by breathing is the most likely source of exposure at hazardous waste sites, in the home, and in the workplace. When you breathe in methylene chloride, over 70% of it enters your bloodstream and quickly spreads throughout your body, with most of it going to the liver, kidney, brain, lungs, and fatty tissue. Increased physical activity or an increased amount of body fat tend to increase the amount of methylene chloride that remains or accumulates in your body tissue. About half of the methylene chloride in the blood leaves within 40 minutes. Some of the methylene chloride is broken down into other chemicals, including carbon monoxide (CO) a normal substance in the body from the breakdown of hemoglobin. Unchanged methylene chloride and its breakdown products are removed from your body mainly in the air you breathe out. Small amounts leave in your urine. This usually occurs within 48 hours after exposure. Although the rate of uptake through the stomach has not been measured, uptake is likely to be fast. Skin absorption is usually small. Trapping the chemical against the skin with clothing or gloves can lead to greater absorption.

#### 1.5 HOW CAN METHYLENE CHLORIDE AFFECT MY HEALTH?

If you breathe methylene chloride (300 ppm) or greater for short periods of time (e.g., 3–4 hours), you may not be able to hear faint sounds and your vision may be slightly impaired. If you breathe large amounts (800 ppm) you may not be able to react fast, remain steady, or perform tasks requiring precise hand movements. You may experience dizziness, nausea, tingling or numbness of the fingers and toes, and drunkenness if you breathe methylene chloride for a longer time. In most cases, effects disappear shortly after exposure ends. Studies in animals suggest that exposure to higher concentrations (8,000–20,000 ppm) can lead to unconsciousness and death.

Breathing methylene chloride also causes changes in the liver and kidney in animals, but similar effects have not been observed in humans. Studies in animals suggest that breathing methylene chloride does not cause birth defects or affect reproduction, even at high concentrations. Animal studies indicate that should you be exposed to high levels of vapors of methylene chloride in air, the vapors may irritate your eyes and affect your cornea. One study reported these effects at concentrations of 490 ppm; however the effects usually disappeared within a few days.

In humans, direct skin contact with methylene chloride causes intense burning and mild redness of the skin. No information was found regarding the effects of methylene chloride in humans after direct

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contact with the eyes. In rabbits, effects were observed on the eyes (e.g., cornea), but they were reversible within a few days.

People can smell methylene chloride at about 200 ppm in air. Because people differ in their ability to smell various chemicals, odors may not be helpful in avoiding over-exposure.

Methylene chloride has not been shown to cause cancer in humans exposed to vapors in the workplace. However, breathing high concentrations of methylene chloride for long periods of time did increase the incidence of cancer in mice. No information was found regarding the carcinogenic effects of methylene chloride in humans after oral exposure. The Department of Health and Human Services (DHHS) has determined that methylene chloride may reasonably be anticipated to be a carcinogen. The International Agency for Research on Cancer (IARC) has classified methylene chloride in Group 2B, possibly carcinogenic to humans. The EPA has determined that methylene chloride is a probable human carcinogen.

#### **1.6 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO METHYLENE CHLORIDE?**

Several tests exist for determining whether you had measurable exposure to methylene chloride. The most direct method measures methylene chloride in the air you breathe out. Your blood can also be analyzed to determine if methylene chloride is present. However, these tests are only useful for detecting exposures which have occurred within a few days, because methylene chloride remains in the blood for only a very short time. Some absorbed

methylene chloride is stored in fat and slowly returns to blood. A test to measure CO-Hb, a chemical formed in blood as methylene chloride breaks down in the body, can also be used as an indicator of exposure. However, this test is not specific, since smoking and exposure to other chemicals may also increase CO-Hb levels. Your urine can also be tested for methylene chloride itself or for other chemicals (such as formic acid) that are produced as methylene chloride breaks down in the body. These tests are not routinely available in a doctor's office; they require special equipment. The tests may be useful to determine exposure to methylene chloride, but do not by themselves measure or predict health effects.

#### **1.7 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?**

The EPA requires that releases of methylene chloride of 1,000 pounds or more be reported to the federal government. The EPA has provided guidelines on how much methylene chloride you may be exposed to for certain amounts of time without causing risk to human health. It recommends that exposure of children to methylene chloride in drinking water should not exceed 13.3 ppm for 1 day or 1.5 ppm for 10 days.

The Food and Drug Administration (FDA) has established limits on the amounts of methylene chloride that can remain in spice, hops extract, and decaffeinated coffee.

The Occupational Safety and Health Administration (OSHA) proposes to reduce the current

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occupational exposure limits from 500 ppm to 25 ppm for an 8-hour workday and from 2,000 to 125 ppm as a short-term exposure limit for 15-minute durations for persons who work with methylene chloride.

NIOSH currently recommends a permissible limit of 75 ppm of methylene chloride over a 10-hour workday in the presence of carbon monoxide concentrations less than or equal to 9.9 ppm. Because methylene chloride increases tumors in some animals, NIOSH currently considers it a possible cancer-causing substance in the workplace and recommends that exposure be lowered to the lowest reasonable limit.

### **1.8 WHERE CAN I GET MORE INFORMATION?**

If you have any more questions or concerns, please contact your community or state health or environmental quality department or:

Agency for Toxic Substances and Disease Registry  
Division of Toxicology  
1600 Clifton Road NE, Mailstop F-32  
Atlanta, GA 30333

#### **Information line and technical assistance:**

Phone: 888-422-8737  
FAX: (770)-488-4178

ATSDR can also tell you the location of occupational and environmental health clinics.

These clinics specialize in recognizing, evaluating, and treating illnesses resulting from exposure to hazardous substances.

#### **To order toxicological profiles, contact:**

National Technical Information Service  
5285 Port Royal Road  
Springfield, VA 22161  
Phone: 800-553-6847 or 703-605-6000

#### **Reference**

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. Toxicological profile for methylene chloride. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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