

## 1. PUBLIC HEALTH STATEMENT

This Statement was prepared to give you information about acrolein and to emphasize the human health effects that may result from exposure to it. The Environmental Protection Agency (EPA) has identified 1177 sites on its National Priorities List (NPL). Acrolein (pronounced: acre lean) has been found at 7 of these sites. However, we do not know how many of the 1177 NPL sites have been evaluated for acrolein. As EPA evaluates more sites, the number of sites at which acrolein is found may change. The information is important for you because acrolein may cause harmful health effects and because these sites are potential or actual sources of human exposure to acrolein.

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 substance such as acrolein, 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, life style, and state of health.

### 1.1 WHAT IS ACROLEIN?

Acrolein is a clear or yellow liquid with a disagreeable odor. It burns easily. It changes into a vapor much faster than water does at normal temperatures. When heated to high temperatures, it can change into a vapor very quickly. Near hazardous waste sites in which acrolein is not properly stored, acrolein might be found in the air, water, or soil. Acrolein does not stay in the air or water for very long. Acrolein that enters the air as a vapor changes into other chemicals within days. Acrolein dissolves easily in water. Within days, some of the acrolein in water changes into a vapor and enters the air. The acrolein left in the water is changed into other chemicals, which are rapidly broken down. Acrolein that enters the soil is washed out in water and changes into a vapor, and it is oxidized; we do not know how long this takes.

Acrolein is used to make other chemicals and pesticides and is found in some livestock feeds and pesticides. Small amounts of acrolein can be formed and can enter the air when organic matter such as trees and other plants, including tobacco, are burned and also when fuels such as gasoline and oil are burned. Please refer to Chapters 3, 4, and 5 for more information.

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### 1.2 HOW MIGHT I BE EXPOSED TO ACROLEIN?

If you live near a hazardous waste site in which acrolein is not stored properly, you could be exposed to acrolein from breathing air or drinking water. Because acrolein easily changes into a vapor, you are more likely to be exposed from breathing air than from drinking water. A child playing in this hazardous waste site could be exposed by drinking water that contains small amounts of acrolein, by eating soil that contains acrolein, or by getting soil on his or her skin.

You could be exposed to acrolein in many other ways that have nothing to do with hazardous waste sites. Acrolein can be formed by the breakdown of many pollutants found in outdoor air. Burning tobacco and other plants forms acrolein, and you breathe acrolein when you smoke tobacco or are near someone who is smoking. You also breathe acrolein when you are near automobiles, because burning gasoline forms acrolein, which enters the air. If you live near an oil or coal power plant, you breathe small amounts of acrolein. Acrolein is formed when fats are heated. Small amounts of acrolein may also be found in foods such as fried foods, cooking oils, and roasted coffee. You could breathe acrolein if you work in an industry that uses acrolein to make other chemicals.

There is very little information on the levels of acrolein that are usually in outside air, but they are probably low. However, in several large cities acrolein has been measured at levels of 9 parts acrolein in one billion parts air (9 ppb). The levels in inside air can be much higher if you smoke tobacco. For example, in a car with three people smoking and the windows closed, you could breathe in 300 ppb.

Acrolein has not been found in drinking water and is not commonly found in surface waters such as lakes and streams. The background levels of acrolein in these waters or in soil are not known. Although we know acrolein is in certain foods, the amount that is in the foods that you eat is not known.

Please refer to Chapter 5 for more information on how you might be exposed to acrolein.

### 1.3 HOW CAN ACROLEIN ENTER AND LEAVE MY BODY?

If you breathed acrolein, most of it would enter your body within minutes. If you swallowed acrolein or spilled it on your skin, some of it would probably enter your body, but we do not know how much or how fast. Once in your body, acrolein changes into other chemicals called metabolites. This probably occurs within minutes or hours. Some of these metabolites leave your body in your urine. It is not known how long this takes. For further information on how acrolein can enter and leave your body, see Chapter 2.

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### 1.4 HOW CAN ACROLEIN AFFECT MY HEALTH?

How a chemical affects your health depends on how much you are exposed to and for how long. As the level and length of your exposure increase, the effects are likely to become more severe. If you breathed low levels of acrolein for a short time, your eyes might water and your nose and throat might become sore. These effects disappear within minutes after the exposure stops. However, if you were exposed to higher levels, your lungs might be affected more severely and for a longer time. Breathing very high levels of acrolein might affect your lungs so severely that you might die. We do not know if eating food or drinking water containing acrolein affects your health. No one knows if breathing or eating acrolein or spilling it on your skin causes birth defects, affects fertility, or causes cancer. For further information on the health effects of acrolein in animals and humans, see Chapter 2.

### 1.5 WHAT LEVELS OF EXPOSURE HAVE RESULTED IN HARMFUL HEALTH EFFECTS?

The levels of acrolein in air, drinking water, and food associated with known human and animal health effects other than cancer are summarized in Tables 1-1 through 1-4. As shown in Table 1-1, acrolein irritates your eyes, nose and throat as the exposure level increases from 0.17 parts acrolein in one million parts air (0.17 ppm = 170 ppb) to 0.43 ppm. As shown in Table 1-2, exposure to higher levels of acrolein can cause death in animals. If the animal does not die, severe changes in the lungs and lower airways will occur. Lung effects also occur in animals exposed to low levels of acrolein. You can smell acrolein at levels above 0.16 ppm. So, you would probably smell acrolein and notice eye, nose, and throat irritation before it harms your lungs. Minimal Risk Levels (MRLs) are also included in Tables 1-1 and 1-3. These MRLs were derived from human and animal data for both short-term and long-term exposure, as described in Chapter 2 and in Tables 2-1 and 2-2. The MRLs provide a basis for comparison to levels that people might encounter in air or in food or drinking water. If a person is exposed to acrolein at an amount below the MRL, it is not expected that harmful (noncancer) health effects will occur. Since these levels are based on information currently available, there is always some uncertainty associated with them. Also, since the method for deriving MRLs does not use any information about cancer, an MRL does not imply anything about the presence, absence, or levels of risk of cancer. Tables 1-3 and 1-4 show how little we know about how acrolein in water or food affects your health. Further information on levels of acrolein associated with effects is in Chapter 2.

### 1.6 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO ACROLEIN?

We know of no test to determine whether you have been exposed to acrolein. For more detailed information, see Chapters 2 and 6.

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TABLE 1-1. Human Health Effects from Breathing Acrolein\*

Short-term Exposure (less than or equal to 14 days)		
<u>Levels in Air (ppm)</u>	<u>Length of Exposure</u>	<u>Description of Effects**</u>
0.00005		Minimal Risk Level (see Section 1.5 for discussion).
0.17	40 minutes	Eye irritation.
0.26	40 minutes	Nose irritation.
0.43	40 minutes	Throat irritation.
Long-term Exposure (greater than 14 days)		
<u>Levels in Air (ppm)</u>	<u>Length of Exposure</u>	<u>Description of Effects</u>
0.000009		Minimal Risk Level (based on animal studies; see Section 1.5 for discussion).
		The health effects of long-term exposure of humans to air containing specific levels of acrolein are not known.

\*See Section 1.2 for a discussion of exposures encountered in daily life.

\*\*These effects are listed at the lowest level at which they were first observed. They may also be seen at higher levels.

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TABLE 1-2. Animal Health Effects from Breathing Acrolein

Short-term Exposure (less than or equal to 14 days)		
<u>Levels in Air (ppm)</u>	<u>Length of Exposure</u>	<u>Description of Effects*</u>
0.1	5 days	Increased risk of infection in mice.
1.7	5 days	Changes in the appearance of the lower airway in mice.
3.7	9 days	Death in monkeys.
4.0	10 days	Death in male rats.
Long-term Exposure (greater than 14 days)		
<u>Levels in Air (ppm)</u>	<u>Length of Exposure</u>	<u>Description of Effects*</u>
0.4	13 weeks	Changes in the appearance of the upper airway in rats.
0.7	6 weeks	Changes in the lungs of guinea pigs.
0.7	6 weeks	Changes in the lungs of monkeys.
4.0	9 weeks	Severe changes in the lower airway of rats.

\*These effects are listed at the lowest level at which they were first observed. They may also be seen at higher levels.

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TABLE 1-3. Human Health Effects from Eating or Drinking Acrolein\*

Short-term Exposure (less than or equal to 14 days)		
<u>Levels in Food</u>	<u>Length of Exposure</u>	<u>Description of Effects</u>
		The health effects of short-term exposure of humans to food containing acrolein are not known.
<u>Levels in Water</u>		The health effects of short-term exposure of humans to water containing acrolein are not known.
Long-term Exposure (greater than 14 days)		
<u>Levels in Food</u>	<u>Length of Exposure</u>	<u>Description of Effects</u>
		The health effects of long-term exposure of humans to food containing acrolein are not known.
<u>Levels in Water (ppm)</u> 0.02		Minimal Risk Level (based on animal studies; see Section 1.5 for discussion).

\*See Section 1.2 for a discussion of exposures encountered in daily life.

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TABLE 1-4. Animal Health Effects from Eating or Drinking Acrolein

Short-term Exposure (less than or equal to 14 days)		
<u>Levels in Food</u>	<u>Length of Exposure</u>	<u>Description of Effects*</u>
The health effects of short-term exposure of animals to food containing acrolein are not known.		
<u>Levels in Water (ppm)</u>		
80	3 days	Death in rats.
9	13 days	Miscarriages in rabbits.
36	13 days	Stomach ulcers in rabbits.
72	13 days	Birth defects in rats.
Long-term Exposure (greater than 14 days)		
<u>Levels in Food</u>	<u>Length of Exposure</u>	<u>Description of Effects</u>
The health effects of long-term exposure of animals to food containing acrolein are not known.		
<u>Levels in Water (ppm)</u>		
4	24 months	Decreased number of blood cells in rats.
24	18 months	Death in mice.

\*These effects are listed at the lowest level at which they were first observed. They may also be seen at higher levels.

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

The Environmental Protection Agency (EPA) recommends that the level of acrolein in lakes and streams be limited to 0.32 parts of acrolein per million parts of water for the prevention of possible human health effects from drinking water or eating fish or shellfish contaminated with acrolein. The EPA has restricted the use of all pesticides containing acrolein and has also identified acrolein as a toxic waste. The EPA requires that companies that make, transport, treat, store, or dispose of acrolein comply with the regulations of a federal hazardous waste management program. The EPA has also proposed standards that limit the amount of acrolein put into publicly owned wastewater treatment plants. EPA requires that releases or spills of 1 pound or more be reported to the National Response Center. The Food and Drug Administration (FDA) has determined that levels of acrolein used to prepare modified food starch must not be more than 0.6%.

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.1 ppm acrolein in workroom air to protect workers during an 8-hour shift over a 40-hour workweek. The National Institute for Occupational Safety and Health (NIOSH) recommends that the concentration in workroom air be limited to 0.1 ppm averaged over an 8-hour shift.

### 1.8 WHERE CAN I GET MORE INFORMATION?

If you have any more questions or concerns not covered here, please contact your State Health or Environmental Department or:

Agency for Toxic Substances and Disease Registry  
Division of Toxicology  
1600 Clifton Road, E-29  
Atlanta, Georgia 30333

This agency can also give you information on the location of the nearest occupational and environmental health clinics. Such clinics specialize in the recognizing, evaluating, and treating illnesses that result from exposure to hazardous substances.