



# PUBLIC HEALTH STATEMENT

**Phenol**  
CAS # 108-95-2

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**Division of Toxicology and Environmental Medicine**

**September 2008**

This Public Health Statement is the summary chapter from the Toxicological Profile for Phenol. 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 1-800-232-4636.

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This public health statement tells you about phenol and the effects of exposure to it.

The Environmental Protection Agency (EPA) identifies the most serious hazardous waste sites in the nation. These sites are then placed on the National Priorities List (NPL) and are targeted for long-term federal clean-up activities. Phenol has been found in at least 595 of the 1,678 current or former NPL sites. Although the total number of NPL sites evaluated for this substance is not known, the possibility exists that the number of sites at which phenol is found may increase in the future as more sites are evaluated. This information is important because these sites may be sources of exposure, and exposure to this substance may be harmful.

When a substance is released either from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment. Such a release does not always lead to exposure. You can be exposed to a substance only when you come in contact with it. You may be exposed by breathing, eating, or drinking the substance, or by skin contact.

If you are exposed to phenol, many factors will determine whether you will be harmed. These factors include the dose (how much), the duration (how long), and how you come in contact with it. You must also consider any other chemicals you are exposed to and your age, sex, diet, family traits, lifestyle, and state of health.

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### 1.1 WHAT IS PHENOL?

<b>Description</b>	Phenol is a colorless-to-white solid when pure. Commercial phenol is a liquid that evaporates more slowly than water.  Phenol has a distinct odor that is sickeningly sweet and tarry.
<b>Uses</b> <ul style="list-style-type: none"><li>• <b>Manufacturing</b></li><li>• <b>Consumer products</b></li></ul>	Phenol is both a manufactured chemical and produced naturally. Large amounts of phenol are produced in the United States.  Phenol is used to make plastics. Phenol is also used as a disinfectant in household cleaning products and in consumer products such as: <ul style="list-style-type: none"><li>• mouthwashes</li><li>• gargles</li><li>• throat sprays</li></ul>

### 1.2 WHAT HAPPENS TO PHENOL WHEN IT ENTERS THE ENVIRONMENT?

<b>Sources</b>	Phenol can be found in air and water after release from the manufacture, use, and disposal of products containing phenol. Phenol in soil is likely to move to groundwater.
<b>Break down</b> <ul style="list-style-type: none"><li>• <b>Air</b></li><li>• <b>Water</b></li><li>• <b>Soil</b></li></ul>	Phenol is quickly broken down in the air, usually within 1–2 days.  Phenol may persist in water for a week or more.  Phenol that remains in soil may be broken down by bacteria or other microorganisms.

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### 1.3 HOW MIGHT I BE EXPOSED TO PHENOL?

<b>Air</b>	<p>The primary way you can be exposed to phenol is by breathing air containing it. Releases of phenol into the air occur from:</p> <ul style="list-style-type: none"><li>• industries using or manufacturing phenol</li><li>• automobile exhaust</li><li>• cigarette smoke, and</li><li>• wood burning</li></ul> <p>Recent data on levels of phenol in air are lacking.</p>
<b>Water and soil</b>	<p>Phenol has been detected in surface waters, rainwater, sediments, drinking water, groundwater, industrial and urban runoff, and at hazardous waste sites. Phenol in soil is likely to move to groundwater.</p>
<b>Workplace</b>	<p>Workers in the following industries may be exposed to phenol:</p> <ul style="list-style-type: none"><li>• petroleum industry</li><li>• manufacture of nylon, epoxy resins and polycarbonates, herbicides, wood preservatives, hydraulic fluids, heavy-duty surfactants, lube-oil additives, tank linings and coatings, and intermediates for plasticizers and other specialty chemicals</li></ul> <p>Exposure occurs through breathing and dermal contact with contaminated air or by skin contact with products containing phenol.</p>
<b>Food</b>	<p>Low levels of phenol have been found in foods such as smoked summer sausage, smoked pork belly, mountain cheese, fried bacon, fried chicken, and black fermented tea.</p>
<b>Consumer products</b>	<p>Dermal contact can occur through the use of general disinfectants and ointments containing phenol.</p> <p>Ingestion can occur through the use of products such as throat lozenges or sore throat sprays that contain phenol.</p>

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### 1.4 HOW CAN PHENOL ENTER AND LEAVE MY BODY?

<p><b>Enter your body</b></p> <ul style="list-style-type: none"> <li>• <b>Inhalation</b></li> <li>• <b>Ingestion</b></li> <li>• <b>Dermal contact</b></li> </ul>	<p>When you breathe air containing phenol, most of the phenol will rapidly enter your body through your lungs.</p> <p>Phenol in food or water may also rapidly enter your body through the digestive tract.</p> <p>A significant amount may enter through your skin when you come into contact with phenol vapor, liquid phenol or liquids containing phenol.</p>
<p><b>Leave your body</b></p>	<p>Once in your body, phenol is transformed into other chemicals called metabolites. Most of these other chemicals leave your body in the urine within few days.</p>

### 1.5 HOW CAN PHENOL AFFECT MY HEALTH?

This section looks at studies concerning potential health effects in animal and human studies.

<p><b>Workers</b></p> <ul style="list-style-type: none"> <li>• <b>Inhalation/dermal</b></li> </ul>	<p>Long-term exposure to phenol at work has been associated with cardiovascular disease, but the workers were also exposed to other chemicals at the same time.</p>
<p><b>General population</b></p> <ul style="list-style-type: none"> <li>• <b>Oral</b></li> </ul>	<p>Ingestion of liquid products containing concentrated phenol can cause serious gastrointestinal damage and even death.</p>
<p><b>General population</b></p> <ul style="list-style-type: none"> <li>• <b>Dermal</b></li> </ul>	<p>Application of concentrated phenol to the skin can cause severe skin damage.</p>
<p><b>Laboratory animals</b></p> <ul style="list-style-type: none"> <li>• <b>Inhalation</b></li> </ul>	<p>Short-term exposure to high levels of phenol has caused irritation of the respiratory tract and muscle twitching in animals.</p> <p>Longer-term exposure to high levels of phenol caused damaged to the heart, kidneys, liver, and lungs in animals.</p>

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<b>Laboratory animals</b> • Oral	Drinking water with extremely high concentrations of phenol has caused muscle tremors, difficulty walking, and death in animals.
<b>Laboratory animals</b> • Dermal	Short-term application of phenol to the skin has produced blisters and burns in animals.
<b>Cancer</b>	There is no evidence that phenol causes cancer in humans.  The International Agency for Research on Cancer (IARC) and the EPA determined that phenol is not classifiable as to human carcinogenicity.

### 1.6 HOW CAN PHENOL AFFECT CHILDREN?

This section discusses potential health effects in humans from exposures during the period from conception to maturity at 18 years of age.

<b>Effects in children</b>	Vomiting and lethargy were the main symptoms observed in children following accidental ingestion of a disinfectant containing phenol. We do not know whether children would be more sensitive than adults to the effects of phenol.
<b>Birth defects</b>	Two studies of women exposed to phenol and other chemicals during pregnancy did not provide evidence of birth defects.  Some birth defects have been observed in animals born to females exposed to phenol during pregnancy. This generally occurred at exposure levels that were also toxic to the mothers.
<b>Breast milk</b>	There is no information on levels of phenol in human breast milk.

### 1.7 HOW CAN FAMILIES REDUCE THE RISK OF EXPOSURE TO PHENOL?

<b>Tobacco smoke</b>	Phenol is a component of tobacco smoke. Avoid smoking in enclosed spaces like inside the home or car in order to limit exposure to children and other family members.
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<b>Consumer products</b>	Household products and over-the-counter medications containing phenol should be stored out of the reach of young children to prevent accidental poisonings and skin burns.
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## 1.8 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO PHENOL?

<b>Detecting exposure</b>	Phenol can be measured in blood and urine. Phenol is a normal constituent of human urine.
<b>Measuring exposure</b>	A higher-than-normal concentration of phenol in the urine may suggest recent exposure to phenol or to substances that are converted to phenol in the body.  The detection of phenol and/or its metabolites in your urine cannot be used to predict the kind of health effects that might develop from that exposure.

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

The federal government develops regulations and recommendations to protect public health. Regulations *can* be enforced by law. The EPA, the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA) are some federal agencies that develop regulations for toxic substances. Recommendations provide valuable guidelines to protect public health, but *cannot* be enforced by law. The Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH) are two federal organizations that develop recommendations for toxic substances.

Regulations and recommendations can be expressed as “not-to-exceed” levels. These are levels of a toxic substance in air, water, soil, or food that do not exceed a critical value. This critical value is usually based on levels that affect animals; they are then adjusted to levels that will help protect humans. Sometimes these not-to-exceed levels differ among federal organizations because they used different exposure times (an 8-hour workday or a 24-hour day), different animal studies, or other factors.

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Recommendations and regulations are also updated periodically as more information becomes available. For the most current information, check with the federal agency or organization that provides it.

Some regulations and recommendations for phenol include the following:

<b>Drinking water</b>	The EPA has determined that exposure to phenol in drinking water at a concentration of 6 milligrams per liter (mg/L) for up to 10 days is not expected to cause any adverse effects in a child.  The EPA has determined that lifetime exposure to 2 mg/L phenol in drinking water is not expected to cause any adverse effects.
<b>Bottled water</b>	The FDA has determined that the phenol concentration in bottled drinking water should not exceed 0.001 mg/L.
<b>Workplace air</b>	OSHA set a legal limit of 5 parts per million (ppm) phenol in air averaged over an 8-hour work day.

## 1.10 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 contact ATSDR at the address and phone number below.

ATSDR can also tell you the location of occupational and environmental health clinics. These clinics specialize in recognizing, evaluating, and treating illnesses that result from exposure to hazardous substances.

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Toxicological profiles are also available on-line at [www.atsdr.cdc.gov](http://www.atsdr.cdc.gov) and on CD-ROM. You may request a copy of the ATSDR ToxProfiles™ CD-ROM by calling the toll-free information and technical assistance number at 1-800-CDCINFO (1-800-232-4636), by e-mail at [cdcinfo@cdc.gov](mailto:cdcinfo@cdc.gov), or by writing to:

Agency for Toxic Substances and Disease Registry  
Division of Toxicology and Environmental Medicine  
1600 Clifton Road NE  
Mailstop F-32  
Atlanta, GA 30333  
Fax: 1-770-488-4178

Organizations for-profit may request copies of final Toxicological Profiles from the following:

National Technical Information Service (NTIS)  
5285 Port Royal Road  
Springfield, VA 22161  
Phone: 1-800-553-6847 or 1-703-605-6000  
Web site: <http://www.ntis.gov/>

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