Emergency Management and Response Information Sharing and Analysis Center

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NOTE: *CIP Bulletins will be distributed as necessary to provide members of the Emergency Services Sector with timely, important, unclassified information potentially affecting the protection of their critical infrastructures. They are prepared by the Emergency Management and Response- Information Sharing and Analysis Center (EMR-ISAC) at (301) 447-1325 or by e-mail at emr-isac@dhs.gov.*

The EMR-ISAC, in collaboration with the Department of Homeland Security Office of Health Affairs, prepared this bulletin regarding total petroleum hydrocarbons (TPH) to address potential concerns from Emergency Services Sector departments and agencies when responding to incidents in the vicinity of crude oil contamination. The ToxFAQ Fact Sheet delivers general information in a question and answer format that can be used as a guide to protect the health of first responders who may be exposed to TPH in the performance of their duties.

First Priority for the Emergency Responder:

- Be sure to use the decontamination procedures set by your department before eating, drinking, or using the toilet during the workday; and do a full decontamination, including a shower if available, at the end of each shift.
- Wash and sanitize immediately if exposed to toxic substances.
- Rubber type steel toe/shank footwear will protect feet from injury and from oil exposure.
- Wear oil-resistant gloves when in contact with oil and oil waste, and outer durable gloves when handling debris.
- Use hearing protection in noisy environments.
- Know your medicines, allergies, and blood type.
- If in doubt, contact your supervisor!
- Do not stand in or come in contact with unknown liquids or substances.

Hydrocarbons from which one hydrogen atom has been removed are functional groups, called hydrocarbyls. Aromatic hydrocarbons (arenes), alkanes, alkenes, cycloalkanes and alkyne-based compounds are different types of hydrocarbons. The majority of hydrocarbons found naturally occur in crude oil, where decomposed organic matter provides an abundance of carbon and hydrogen which, when bonded, can catenate to form seemingly limitless chains.

Public Health Statement for Total Petroleum Hydrocarbons (TPH)

This public health statement tells you about total petroleum hydrocarbons (TPH) and the effects of exposure.

What are total petroleum hydrocarbons (TPH)?

Total Petroleum Hydrocarbons (TPH) is a term used to describe a broad family of several hundred chemical compounds that originally come from crude oil. In this sense, TPH is really a mixture of chemicals. They are called hydrocarbons because almost all of them are made entirely from hydrogen and carbon. Crude oils can vary in how much of each chemical they contain, and so can the petroleum products that are made from crude oils. Most products that contain TPH will burn. Some are clear or light-colored liquids that evaporate easily, and others are thick, dark liquids or semi-solids that do not evaporate. Many of these products have characteristic gasoline, kerosene, or oily odors. Because modern society uses so many petroleum-based products (for example, gasoline, kerosene, fuel oil, mineral oil, and asphalt), contamination of the environment by them is potentially widespread. Contamination caused by petroleum products will contain a variety of these hydrocarbons.

How can TPH enter and leave my body?

TPH can enter and leave your body when you breathe it in air; swallow it in water, food, or soil; or touch it. Most components of TPH will enter your bloodstream rapidly when you breathe them as a vapor or mist or when you swallow them. Some TPH compounds are widely distributed by the blood throughout your body and quickly break down into less harmful chemicals. Others may break down into more harmful chemicals. Other TPH compounds are slowly distributed by the blood to other parts of the body and do not readily break down. When you touch TPH compounds, they are absorbed more slowly and to a lesser extent than when you breathe or swallow them. Most TPH compounds leave your body through urine or when you exhale air containing the compounds.

How can TPH affect my body?

The compounds in different TPH fractions affect the body in different ways. Some of the TPH compounds, particularly the smaller compounds such as benzene, toluene, and xylene (which are present in gasoline), can affect the human central nervous system. If exposures are high enough, death can occur. Breathing toluene at concentrations greater than 100 parts per million (100 ppm) for more than several hours can cause fatigue, headache, nausea, and drowsiness. When exposure is stopped, the symptoms will go away. However, if someone is exposed for a long time, permanent damage to the central nervous system can occur. One TPH compound (n-hexane) can affect the central nervous system in a different way, causing a nerve disorder called "peripheral neuropathy" characterized by numbness in the feet and legs and, in severe cases, paralysis. This has occurred in workers exposed to 500–2,500 ppm of n-hexane in the air. Swallowing some petroleum products, such as gasoline and kerosene, causes irritation of the throat and stomach, central nervous system depression, difficulty breathing, and pneumonia from breathing liquid into the lungs. The compounds in some TPH fractions can also affect the blood, immune system, liver, spleen, kidneys, developing fetus, and lungs. Certain TPH compounds can be irritating to the skin and eyes.

Is there a medical test to determine whether I have been exposed to TPH?

There is no medical test that shows if you have been exposed to TPH. However, there are methods to determine if you have been exposed to some TPH compounds, fractions, or petroleum products. For example, a breakdown product of n-hexane can be measured in the urine. Benzene can be measured in exhaled air and a metabolite of benzene, phenol, can be measured in urine to show exposure to gasoline or to the TPH fraction containing benzene. Exposure to kerosene or gasoline can be determined by its smell on the breath or clothing. Methods also exist to determine if you have been exposed to other TPH compounds. For example, ethylbenzene can be measured in the blood, urine, breath, and some body tissues of exposed people. However, many of these tests may not be available in your doctor's office. If you have TPH compounds in your body, they could be from exposure to many different products, and tests cannot determine exactly what you were exposed to. Tests are useful if you suspect that you were exposed to a particular product or waste that contains TPH. For information on tests for exposure to specific TPH compounds, see the ATSDR toxicological profiles for benzene, toluene, total TPHsylenes, polycyclic aromatic hydrocarbons, and hexane.

What recommendations has the federal government made to protect human health?

Regulations and recommendations can be expressed in not-to-exceed levels in air, water, soil, or food that are usually based on levels that affect animals. Then they are adjusted to help protect people. Sometimes these not-to-exceed levels differ among federal organizations because of different exposure times (an 8-hour workday or a 24-hour day), the use of different animal studies, or other factors. Recommendations and regulations are also periodically updated as more information becomes available. For the most current information, check with the federal agency or organization that provides it. Although there are no federal regulations or guidelines for TPH in general, the government has developed regulations and guidelines for some of the TPH fractions and compounds. These are designed to protect the public from the possible harmful health effects of these chemicals. To protect workers, the Occupational Safety and Health Administration (OSHA) set a legal limit of 500 parts of petroleum distillates per million parts of air (500 ppm) in the workplace.

For more information:

What to Expect from the Oil Spill and How to Protect Your Health

National Institute of Environmental Health Sciences: Oil Spill Emergency Response and Cleanup

National Institute of Environmental Health Sciences: Oil Spill Response Training Tool - Oil Spill Cleanup Initiative: Safety Awareness for Oil Spill Cleanup Workers (PDF, 1.93 MB)

OSHA Fact Sheet Deepwater Horizon / Mississippi Canyon 252 Oil Spill (PDF, 48.6 KB)

Reducing Occupational Exposures while Working with Dispersants During the Gulf Oil Spill Response (PDF, 87.3 KB)