

# Occupational Health Guideline for 2,4,5-T \*

## INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

## SUBSTANCE IDENTIFICATION

- Formula:  $\text{Cl}_3\text{C}_6\text{H}_2\text{OCH}_2\text{COOH}$
- Synonyms: 2,4,5-Trichlorophenoxyacetic acid
- Appearance and odor: Colorless to tan odorless solid.

## PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for 2,4,5-T is 10 milligrams of 2,4,5-T per cubic meter of air ( $\text{mg}/\text{m}^3$ ) averaged over an eight-hour work shift.

## HEALTH HAZARD INFORMATION

### • Routes of exposure

2,4,5-T can affect the body if it is inhaled or if it comes in contact with the eyes or skin. It can also affect the body if it is swallowed.

### • Effects of overexposure

Exposure to 2,4,5-T may cause abdominal pain, nausea, vomiting, diarrhea, and blood in the stool. It may also cause irritation of the skin. Common contaminants of commercial preparations of 2,4,5-T may cause acne and liver damage. Animal experiments have shown that these contaminants may produce damage in unborn rats.

### • Reporting signs and symptoms:

A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to 2,4,5-T.

### • Recommended medical surveillance

The following medical procedures should be made available to each employee who is exposed to 2,4,5-T at potentially hazardous levels:

### 1. Initial Medical Examination:

—A complete history and physical examination: The purpose is to detect pre-existing conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Examination of the liver and attention to gastrointestinal complaints should be stressed. The skin should be examined for evidence of chronic disorders.

2. Periodic Medical Examination: The aforementioned medical examinations should be repeated on an annual basis.

### • Summary of toxicology

2,4,5-T (2,4,5-trichlorophenoxyacetic acid) is of low toxicity. The oral LD50 for dogs is in the range of 100 mg/kg or higher; effects are limited to a slight or moderate stiffness in the hind legs with development of ataxia. Contaminants of commercial preparations of 2,4,5-T have been 2,3,7,8-tetrachlorodibenzo-p-dioxin, a potent animal teratogen, and 2,3,6,7-tetrachlorodibenzo-p-dioxin (TCDD), a potent acnegenic agent which is hepatotoxic in animals; they are present as unwanted side products of synthesis of 2,4,5-T. In a study of 73 workers in a 2,4,5-T manufacturing plant, 13 had moderate to severe acneform dermatitis (chloracne) and 22 had gastrointestinal complaints such as nausea, vomiting, diarrhea, abdominal pain, or blood in the stool; no significant liver dysfunction was found; although no air sample results were reported, the chloracne was thought to be a result of exposure to TCDD. 2,4,5-T dust is a slight irritant of the skin.

## CHEMICAL AND PHYSICAL PROPERTIES

### • Physical data

1. Molecular weight: 255.5
2. Boiling point (760 mm Hg): Decomposes above melting point
3. Specific gravity (water = 1): Greater than 1
4. Vapor density (air = 1 at boiling point of 2,4,5-T): Not applicable
5. Melting point: 158 C (316 F) (decomposition)

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These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

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- 6. Vapor pressure at 20 C (68 F): Essentially zero
- 7. Solubility in water, g/100 g water at 20 C (68 F): 0.03
- 8. Evaporation rate (butyl acetate = 1): Not applicable

• **Reactivity**

1. Conditions contributing to instability: Temperatures above 158 C (316 F) may cause sealed metal containers to burst.

2. Incompatibilities: None.

3. Hazardous decomposition products: Toxic gases and vapors (such as hydrogen chloride and carbon monoxide) may be released when 2,4,5-T decomposes.

4. Special precautions: None.

• **Flammability**

1. Not combustible

• **Warning properties**

2,4,5-T is not known to be an eye irritant.

## MONITORING AND MEASUREMENT PROCEDURES

• **General**

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

• **Method**

An analytical method for 2,4,5-T is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 5, 1979, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00349-1).

## RESPIRATORS

• Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.

• In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection,

cleaning, and evaluation.

## SANITATION

- Eating and smoking should not be permitted in areas where 2,4,5-T is handled, processed, or stored.
- Employees who handle 2,4,5-T should wash their hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.

## COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to 2,4,5-T may occur and control methods which may be effective in each case:

Operation	Controls
Formulation of herbicides and plant hormones	Process enclosure; local exhaust ventilation; personal protective equipment
Application as herbicide, defoliant, and plant hormone	Personal protective equipment
Manufacture of 2,4,5-T	Process enclosure; local exhaust ventilation; personal protective equipment

## EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

• **Eye Exposure**

If 2,4,5-T gets into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. If irritation is present after washing, get medical attention. Contact lenses should not be worn when working with this chemical.

• **Skin Exposure**

If 2,4,5-T or liquids containing 2,4,5-T get on the skin, wash the contaminated skin using soap or mild detergent and water. If 2,4,5-T or liquids containing 2,4,5-T soak through the clothing, remove the clothing and wash the skin using soap or mild detergent and water. If irritation is present after washing, get medical attention.

• **Breathing**

If a person breathes in large amounts of 2,4,5-T, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

• **Swallowing**

When 2,4,5-T or liquids containing 2,4,5-T have been swallowed and the person is conscious, give the person large quantities of water immediately. After the water has been swallowed, try to get the person to vomit by having him touch the back of his throat with his finger. Do not make an unconscious person vomit. Get medical

attention immediately.

- **Rescue**

Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

## SPILL AND DISPOSAL PROCEDURES

- Persons not wearing protective equipment and clothing should be restricted from areas of spills until cleanup has been completed.

- If 2,4,5-T is spilled, the following steps should be taken:

1. Ventilate area of spill.

2. Collect spilled material in the most convenient and safe manner and deposit in sealed containers for reclamation, or for disposal in a secured sanitary landfill. Liquid containing 2,4,5-T should be absorbed in vermiculite, dry sand, earth, or a similar material.

- Waste disposal method:

2,4,5-T may be disposed of in sealed containers in a secured sanitary landfill.

## REFERENCES

- American Conference of Governmental Industrial Hygienists: "2,4,5-T (2,4,5-Trichlorophenoxyacetic Acid)," *Documentation of the Threshold Limit Values for*

*Substances in Workroom Air* (3rd ed., 2nd printing), Cincinnati, 1974.

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- International Labour Office: *Encyclopedia of Occupational Health and Safety*, McGraw-Hill, New York, 1971.

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- Patty, F. A. (ed.): *Toxicology*, Vol. II of *Industrial Hygiene and Toxicology* (2nd ed. rev.), Interscience, New York, 1963.

- Poland, A. P., et al.: "A Health Survey of Workers in a 2,4-D and 2,4,5-T Plant," *Archives of Environmental Health*, 22:316-327, 1971.

- Spencer, E. Y.: *Guide to the Chemicals Used in Crop Protection* (6th ed.), Publication 1093, Research Branch Agriculture, Canada, 1973.

## \* SPECIAL NOTE

The International Agency for Research on Cancer (IARC) has evaluated the data on this chemical and has concluded that it causes cancer. See *IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man*, Volume 15, 1977.

## RESPIRATORY PROTECTION FOR 2,4,5-T

Condition	Minimum Respiratory Protection* Required Above 10 mg/m <sup>3</sup>
Particulate Concentration	
50 mg/m <sup>3</sup> or less	Any dust and mist respirator, except single-use.
100 mg/m <sup>3</sup> or less	Any dust and mist respirator, except single-use or quarter-mask respirator. Any fume respirator or high efficiency particulate filter respirator. Any supplied-air respirator. Any self-contained breathing apparatus.
500 mg/m <sup>3</sup> or less	A high efficiency particulate filter respirator with a full facepiece. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
5000 mg/m <sup>3</sup> or less	A powered air-purifying respirator with a high efficiency particulate filter. A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode.
Greater than 5000 mg/m <sup>3</sup> or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.  A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any dust and mist respirator, except single-use. Any escape self-contained breathing apparatus.

\*Only NIOSH-approved or MSHA-approved equipment should be used.