

Occupational Health Guideline for Ronnel

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: $(\text{CH}_3\text{O})_2\text{PSOC}_6\text{H}_2\text{Cl}_3$
- Synonyms: Fenclorphos; O,O-dimethyl O-(2,4,5-trichlorophenyl) phosphorothioate
- Appearance and odor: White to tan waxy solid.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for ronnel is 15 milligrams of ronnel per cubic meter of air (mg/m^3) averaged over an eight-hour work shift (*Federal Register*, Vol. 43, p. 57603, 8 December 1978).

HEALTH HAZARD INFORMATION

• Routes of exposure

Ronnel can affect the body if it is inhaled or if it comes in contact with the eyes. It can also affect the body if it is swallowed.

• Effects of overexposure

1. Short-term Exposure: Ronnel is one of the least toxic of the organophosphate insecticides. Very large exposures are required to cause symptoms. In animal experiments, ronnel has caused watering of the mouth, tremors, diarrhea, small pupils, and respiratory distress. Ronnel powder is irritating to the eye in rabbits.

2. Long-term Exposure: In animals ronnel has caused liver and kidney damage.

3. 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 ronnel.

• Recommended medical surveillance

The following medical procedures should be made available to each employee who is exposed to ronnel at potentially hazardous levels:

1. Initial Medical Screening: Employees should be screened for history of certain medical conditions (listed below) which might place the employee at increased risk from ronnel exposure.

—Chronic respiratory disease: In persons with impaired pulmonary function, especially those with obstructive airway diseases, the breathing of ronnel might cause exacerbation of symptoms due to an anticholinesterase effect.

—Liver disease: Ronnel causes liver damage in animals. The importance of this organ in the biotransformation and detoxification of foreign substances should be considered before exposing persons with impaired liver function.

—Kidney disease: Ronnel causes kidney damage in animals. The importance of this organ in the elimination of toxic substances justifies special consideration in those with impaired renal function.

2. Periodic Medical Examination: Any employee developing the above-listed conditions should be referred for further medical examination.

• Summary of toxicology

Ronnel is a weak cholinesterase inhibitor. It affects primarily the pseudoesterases of the blood plasma rather than the erythrocyte acetylcholinesterase. In male rats, the oral LD50 was 1.7 g/kg; effects were salivation, tremors, diarrhea, miosis, and respiratory distress – all attributed to the anticholinesterase effect of ronnel. Rats fed 50 mg/kg body weight in the diet for 105 days developed slight liver and kidney damage. When a small amount of ronnel powder was placed in the eye of a rabbit, there were slight discomfort and transient conjunctival irritation which subsided within 48 hours. In an experiment on humans in which 50 subjects received 3 applications per week for 3 weeks of

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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gauze saturated with a 10% suspension of ronnel in sesame oil, there were no significant effects on the skin.

CHEMICAL AND PHYSICAL PROPERTIES

• Physical data

1. Molecular weight: 321.5
2. Boiling point (760 mm Hg): Decomposes
3. Specific gravity (water = 1): 1.48
4. Vapor density (air = 1 at boiling point of ronnel): Not applicable
5. Melting point: 35 C (95 F)
6. Vapor pressure at 20 C (68 F): 0.0008 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): 0.0044
8. Evaporation rate (butyl acetate = 1): Not applicable

• Reactivity

1. Conditions contributing to instability: Temperatures above 150 C (300 F) may cause explosive decomposition and formation of toxic gases.
2. Incompatibilities: Contact with strong oxidizers may cause fires and explosions.
3. Hazardous decomposition products: Toxic gases and vapors (such as sulfur dioxide, dimethyl sulfide, trichlorophenol, etc., and carbon monoxide) may be released when ronnel decomposes.
4. Special precautions: Melted ronnel will attack some forms of plastics, rubber, and coatings.

• Flammability

1. Not combustible

• Warning properties

Ronnel may cause mild eye irritation.

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 ronnel is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 6, 1980, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00369-6).

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.

PERSONAL PROTECTIVE EQUIPMENT

- Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent repeated or prolonged skin contact with ronnel or liquids containing ronnel.
- If employees' clothing may have become contaminated with ronnel or liquids containing ronnel, employees should change into uncontaminated clothing before leaving the work premises.
- Clothing contaminated with ronnel should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of ronnel from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the ronnel, the person performing the operation should be informed of ronnel's hazardous properties.
- Non-impervious clothing which becomes contaminated with ronnel should be removed promptly and not reworn until the ronnel is removed from the clothing.
- Employees should be provided with and required to use dust- and splash-proof safety goggles where ronnel or liquids containing ronnel may contact the eyes.

SANITATION

- Skin that becomes contaminated with ronnel should be promptly washed or showered with soap or mild detergent and water to remove any ronnel.
- Eating and smoking should not be permitted in areas where solid ronnel is handled, processed, or stored.
- Employees who handle ronnel or liquids containing ronnel 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 ronnel may occur and control methods which may be effective in each case:

Operation	Controls
Use as an insecticide and pest control agent for agricultural and livestock operations	General dilution ventilation; personal protective equipment
Formulation of insecticides for agricultural and livestock use	General dilution ventilation; personal protective equipment
Use as an insecticide for fruits	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 ronnel or liquids containing ronnel get 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 ronnel or liquids containing ronnel get on the skin, promptly wash the contaminated skin using soap or mild detergent and water. If ronnel or liquids containing ronnel penetrate through the clothing, remove the clothing promptly 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 ronnel, 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 ronnel or liquids containing ronnel 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 ronnel 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. Molten ronnel should be absorbed in vermiculite, dry sand, earth, or a similar material.

- Waste disposal method:

Ronnel may be disposed of in sealed containers in a secured sanitary landfill.

REFERENCES

- American Conference of Governmental Industrial Hygienists: "Ronnel," *Documentation of the Threshold Limit Values for Substances in Workroom Air* (3rd ed., 2nd printing), Cincinnati, 1974.
- Christensen, H. E., and Luginbyhl, T. L. (eds.): *NIOSH Toxic Substances List*, 1974 Edition, HEW Publication No. 74-134, 1974.
- Deichmann, W. B., and Gerarde, H. W.: *Toxicology of Drugs and Chemicals*, Academic Press, New York, 1969.
- *Federal Register*, Vol. 43, p. 57603, 8 December 1978.
- Hamilton, A., and Hardy, H.: *Industrial Toxicology* (3rd ed.), Publishing Sciences Group, Acton, Massachusetts, 1974.
- Hayes, W. J., Jr.: *Clinical Handbook on Economic Poisons, Emergency Information for Treating Poisoning*, U.S. Public Health Service Publication No. 476, U.S. Government Printing Office, Washington, D.C., 1963.
- McCollister, D. D., et al.: "Toxicological Studies of O,O-Dimethyl-O-(2,4,5-trichlorophenyl) Phosphorothioate (Ronnel) in Laboratory Animals," *Agricultural and Food Chemistry*, 7:689-693, 1959.
- Patty, F. A. (ed.): *Toxicology*, Vol. II of *Industrial Hygiene and Toxicology* (2nd ed. rev.), Interscience, New York, 1963.
- Spencer, E. Y.: *Guide to the Chemicals Used in Crop Protection* (6th ed.), Publication 1093, Research Branch Agriculture, Canada, 1973.
- Stecher, P. G. (ed.): *The Merck Index* (8th ed.), Merck Co., Inc., Rahway, New Jersey, 1968.

RESPIRATORY PROTECTION FOR RONNEL

Condition	Minimum Respiratory Protection* Required Above 15 mg/m ³
Particulate Concentration	
150 mg/m ³ or less	Any chemical cartridge respirator with an organic vapor cartridge(s) and dust, fume, and mist filter(s), including pesticide respirators which meet the requirements of this class. Any supplied-air respirator. Any self-contained breathing apparatus.
750 mg/m ³ or less	A chemical cartridge respirator with a full facepiece, organic vapor cartridge(s), and dust, fume, and mist filter(s), including pesticide respirators which meet the requirements of this class. A gas mask with a chin-style or a front- or back-mounted organic vapor canister and dust, fume, and mist filter, including pesticide respirators which meet the requirements of this class. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
7500 mg/m ³ or less	A powered air-purifying respirator with an organic vapor cartridge and high efficiency particulate filter, including pesticide respirators which meet the requirements of this class. A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode.
Greater than 7500 mg/m ³ 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 gas mask providing protection against organic vapors and particulates, including pesticide respirators which meet the requirements of this class. Any escape self-contained breathing apparatus.

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