

OVERVIEW

Hazard Characteristics

- Inhalation is the main human health hazard
- Readily breaks down in the environment
- Highly toxic to aquatic life

Background Information Summary

Rotenone is a naturally occurring chemical derived from the roots of several leguminous tropical and subtropic plant species. It is a colorless crystalline solid but is available at various concentrations as a technical-grade solution or wettable powder. It is also available as an emulsifiable concentrate.

Rotenone is often utilized as an active ingredient in insecticides used on household pets and gardens, and in agriculture and animal husbandry. It is also used in lakes, ponds, and reservoirs to control undesirable fish populations.

Selective toxicity in fish and insects is due to a high rate of absorption from the GI tract and the formation of large quantities of highly toxic metabolites. Conversely, studies suggest that rotenone is not absorbed by the mammalian digestive system, is rapidly degraded by the liver, and forms non-toxic metabolites.

Systemic lab models in rats and mice are used to induce Parkinson’s like disease symptoms, providing insights into the pathogenesis of Parkinson’s Disease in humans. There is no antidote, and care after exposure is supportive.

EXPOSURE AND HAZARD INFORMATION

Exposure Route	Symptoms	Immediate Actions after Exposure
Inhalation	The main human health hazard is the inhalation of powder spray, and smaller particle size increases toxicity. Inhalation of high doses can cause increased respiration followed by depression and convulsions. Confusion, cough, headache, tremor, labored breathing, nausea, sore throat, unconsciousness.	- Remove individual to fresh air - Seek medical attention
Oral/Ingestion	Mild irritation, abdominal cramps, convulsions, diarrhea, vomiting Absorption in the stomach and intestines is relatively slow and incomplete. The liver breaks down the compound fairly effectively.	- If conscious drink a glass of water or a slurry of activated charcoal, if available - If conscious AND wide awake induce vomiting - Rinse mouth - Seek medical attention

Eyes/Mucous Membranes	Exposure to powder may induce dermatitis, ulcers in the nose, irritation of mucous membranes, conjunctivitis, congestion, sore throat Eye irritation, numb mucous membranes	- Immediately flush contaminated eyes, mouth, etc. with water for 15 minutes - Seek medical attention if irritation persists or if powder has been inhaled
Injection	Entry into the bloodstream, through cuts, abrasions, lesions, or by injection may produce systemic injury with harmful effects.	- Flush injection site with water - Seek medical attention
Skin	Absorption through intact skin is low. Potential dermatitis and/or mild skin rash	- Remove all contaminated clothing - Wash affected area with soap and water for 5-10 min - Seek medical attention if skin irritation persists

Health Effects	
Acute	- Acute poisoning causes nausea, vomiting, numbness, and tremors. - Clinical experience suggests that humans, particularly children, are sensitive to acute effects of exposure.
Chronic	- No evidence of chronic toxicity in humans, but chronic exposure may produce changes in the liver and kidneys as indicated by certain animal studies. - No evidence of carcinogenic, genotoxic, or teratogenic action in humans.

Hazards and Exposure Limits	
Physical Hazards	Fight fires with alcohol resistant foam, carbon dioxide, or dry powder. SCBA may be necessary due to the generation of noxious fumes.
Exposure Limits	- Permissible Exposure Limit (PEL) is 5mg/m³ as an 8-hour TWA - Lowest lethal dose of 143 mg/kg cited in a child but may be less toxic in adults.

Controls	
Containment, and Engineering and Administrative Controls	- Powder should be handled in a chemical fume hood where possible. - Do not recap needles.
PPE	- General: Nitrile gloves, lab coat, safety glasses - When handling concentrates, use protective PVC or neoprene gloves - When handling powders outside of a chemical fume hood, an N95 respirator is required - When cleaning up spills: Overalls/coveralls, PVC or neoprene gloves, N95, and boots
Emergency Equipment	Showers and eyewash station must be readily available

MEDICAL SURVEILLANCE

No medical surveillance is required, but individuals should be aware of exposure signs and symptoms.

TRAINING

General training required for any chemical use and format (digital, etc. in person)

- Review of relevant information including fact sheets, SOPs, and SDS. This review should include training on hazards, symptoms of exposure, PPE, and emergency procedures.
- UW Lab Safety Training Series - New Employee Orientation, Regulated Waster Generator, and Laboratory Safety "Chemical Hygiene & GHS/OSHA

SIGNAGE AND RESTRICTED AREA INFORMATION

Signage must indicate when Rotenone is actively being handled, and can be removed once procedures are completed.

Cage cards should specify that animals have been treated with Rotenone and must indicate whether bedding or cages are considered contaminated (e.g., which cage change, see below).

ANIMAL METABOLISM OF CHEMICAL

Approximately 20 % of a rotenone dose is excreted in the urine within 24 hours of oral administration in rats and mice. Unabsorbed rotenone from the GI tract is metabolized by the liver and excreted in the feces.

DISINFECTION AND INACTIVATION

- Rotenone is chemically unstable and degrades rapidly in the environment through abiotic mechanisms (photolysis and hydrolysis).
- Autoclave contaminated materials.
- Surfaces should be cleaned with a 10% bleach solution.

CAGE/HOUSING MANAGEMENT

- The first cage change should occur no sooner than 24 hours after toxin administration and should be completed in a chemical fume hood when possible, and an N95 must be worn if a fume hood is not available. Waste from the first cage change should be autoclaved prior to disposal.
- After the first cage change animal waste and bedding can be disposed of as non-hazardous waste.

WASTE DISPOSAL

- Because rotenone is highly toxic to aquatic life, avoid release into the environment.
- All bedding and animal waste from the initial cage should be autoclaved, then disposed of as non-hazardous waste. Bedding and waste from additional/non-contaminated cage changes can be bagged and disposed of as non-hazardous.
- Materials used to clean surfaces, unused chemical, used needles/syringes, and all disposable materials contaminated with Rotenone must be autoclaved prior to disposing of as non-hazardous waste.

SPILLS/RELEASES

- Any spill clean-up requires the use of an N95 respirator.
- Liquid spills: Absorb with sawdust, earth, sand, or activated carbon. Sweep up spill material being careful not to create dust/aerosols.
- Powder spills: Wipe up powder with wipes, avoiding the production of aerosols.
- Spill clean-up materials should be disposed of as hazardous waste.
- For large spills or assistance/guidance with clean up, call the Regulated Material Management Center (RMMC) 766-3698 or 766-3697.

EMERGENCIES/MEDICAL GUIDANCE FOR EXPOSURES

- For accidental ingestion, contact Poison Control
- In case of medical emergency call 911, or seek attention immediately:
 - During business hours: Iverson Urgent Care is the occupational health provider, and it is available to assist in the arrangement of medical evaluation and treatment
 - After business hours: Emergency Room or Urgent Care
- Report all accidents, injuries, illnesses or exposures as soon as possible:
https://www.uwyo.edu/safety/procedures/incident-injury_reporting.html

CONTACT INFORMATION

Poison Control: 1-800-222-1222

Chemical Specialist: Kevin Macartney: 307-766-6116

Occupational Health: Bailey Wallace: 307-766-3203

Acknowledgment

This document was developed using adapted material from Colorado State University, with modifications to reflect institutional policies and procedures at University of Wyoming.