

## TRICHOTHECENE MYCOTOXINS

### Bioterrorism Agent Profiles for Health Care Workers

**Causative Agent:** Tricothecene mycotoxins (T-2 mycotoxins) are nonvolatile compounds produced by filamentous fungi primarily of the genera *Fusarium*, *Myrotecium*, *Trichoderma*, and *Stachybotrys*.

**Routes of Exposure:** Inhalation, Dermal, and Oral.

**Toxic Dose:**

*Inhalation* – Unknown.

*Dermal* – Unknown.

*Oral* – Leukopenia seen with as little as 0.1mg/kg/day for several weeks.

**Incubation Period:**

*Inhalation* – Minutes

*Dermal* – Minutes to hours

*Oral* – Minutes to days

**Clinical Effects:** Mycotoxins act by inhibition of protein synthesis. Symptoms start within minutes to hours after exposure, and involve eyes, skin, respiratory and gastrointestinal tracts.

*Eyes* – Eye pain, excessive lacrimation, visual blurring and scleral injection.

*Inhalation* – Nasal itching and pain, epistaxis, rhinorrhea, cough, dyspnea, wheezing.

*Dermal* – Burning skin, redness, blistering progressing to necrosis, skin sloughing.

*Oral* – Anorexia, mouth pain, nausea, vomiting, hematemesis, abdominal pain, watery or bloody diarrhea, abdominal cramps.

*Early systemic effects* – Weakness, loss of coordination, dizziness, ataxia, tachycardia, hypothermia, hypotension or death.

*Late systemic effects* – Two to eight weeks after ingestion on contaminated food, bone marrow suppression occurs with severe neutropenia and hemorrhagic syndromes such as diffuse bleeding into skin with petechiae, melena, hematuria, hematemesis, epistaxis, and vaginal bleeding. Other common problems include fever, oral and GI ulceration, and secondary sepsis. These effects are similar to the effects seen with exposure to radiation.

**Lethality:** There is a death rate of 10-20% with ingestion of contaminated food.

**Transmissibility:** Person-to-person transmission of intoxication does not occur, although exposure could occur by contact with contaminated objects and surfaces that had not been appropriately decontaminated.

**Primary dissemination:** There were reports that mycotoxins may have been used in the past as bioterrorism weapons in Iran and Southeast Asia. These were described as aerosol attacks in the form of “yellow rain” with droplets of yellow fluid contaminating clothes and the environment.

**Secondary Contamination:** There is no person-to-person transmission but contaminated fomites, such as clothing, could be a source of exposure.

**Decontamination & Isolation:**

*Patients* – Outer clothing should be removed and exposed skin decontaminated by washing thoroughly with soap and water. Eye exposure should be treated with copious saline or water irrigation. Once decontamination is complete, isolation is not required.

*Equipment, clothing & other objects* – T-2 mycotoxins are stable in the environment, resistant to heat and ultraviolet light. Environmental decontamination requires the use of a chlorine bleach solution under alkaline conditions such as a 1% sodium hypochlorite (1 part bleach + 4 parts water) and 0.1M sodium hydroxide solution with one hour contact time.

**Personal Protective Equipment:** Respiratory, skin and eye protection are required since toxin can be absorbed by the respiratory, gastrointestinal, dermal and ocular routes.

**Health Care Facility:** There is no person-to-person transmission. However, avoid contact with contaminated clothing. If a contaminated person arrives fully clothed, protective clothing should be worn until decontamination of the patient is completed and contaminated clothing discarded.

**Identification of Exposure:** Exposure to T-2 mycotoxins should be suspected if an aerosol attack occurs in the form of “yellow rain”. Currently, there are no commercially available rapid field diagnostic tests available. Confirmation requires testing of blood, tissue, and environmental samples using gas liquid chromatography-mass spectrometry techniques.

**Laboratory testing:** Serum, nasopharyngeal swab, and urine can be sent for toxin.

**Therapeutic Treatment:** Superactivated charcoal should be administered to persons who may have ingested T-2 mycotoxins in order to adsorb the toxin. There is no vaccine and no specific antidote or therapeutic regimen. Treatment is symptomatic and supportive.

**Prophylactic Treatment:** None

**Differential Diagnosis:** Mustard gas has a delay of several hours before symptoms start. Staphylococcus enterotoxin B can cause fever, cough, dyspnea and wheezing but does not involve the skin. Ricin can cause severe respiratory distress, and gastrointestinal symptoms, but does not involve the skin.

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For more information call (602) 364-3289

## Frequently Asked Questions About Trichothecene Mycotoxins

### **What are trichothecene mycotoxins?**

Trichothecene mycotoxins, biological toxins, are a group of 40 compounds produced by a common grain mold. Biological toxins are harmful substances that are produced by living organisms such as fungi.

### **Why are we concerned about trichothecene mycotoxins as a biological weapon?**

We are concerned about trichothecene mycotoxins, especially T-2, as a biological weapon because they are very stable, resistant to disinfectants, easy to produce in large quantities, and can be dispersed through a number of different ways. Additionally, there is strong evidence to suggest that they have been used as biological warfare agents in the past.

### **How are trichothecene mycotoxins transmitted?**

Trichothecene mycotoxins can be inhaled, ingested, or absorbed through the skin. The T-2 mycotoxins are the only potential biological agent that can adhere to and penetrate intact skin. Trichothecene mycotoxins cannot be transmitted person to person.

### **Can trichothecene mycotoxin exposure occur naturally?**

Yes. This usually occurs when contaminated foods, such as moldy grain, are eaten.

### **What are the symptoms of trichothecene mycotoxin exposure?**

After exposure early symptoms begin within 5 to 60 minutes. Symptoms are dependant on the route of exposure.

Inhalational exposure results in nasal itching, pain, sneezing, bloody and runny nose, difficulty breathing, wheezing, cough, and blood-tinged saliva and sputum.

Exposure through ingestion causes loss of appetite, nausea and vomiting, stomach cramping, and watery and/or bloody diarrhea.

Skin symptoms include burning, tender and reddened skin, swelling, and blistering progressing to death of skin tissues and, in lethal cases, sloughing of large areas of skin. After exposure to the eyes, pain, tearing, redness, and blurred vision occur.

Exposure through any route can lead to full body illness, the symptoms of which include weakness, fatigue, dizziness, lack of muscular coordination, irregular heartbeat, hyperthermia or hypothermia, extensive bleeding, and low blood pressure.

### **How is exposure to trichothecene mycotoxins diagnosed?**

A diagnosis is generally made based on the symptoms the patient is experiencing and the results from blood and urine tests. Environmental tests may also be done to help support the diagnosis. Additionally, if the exposure were the result of a bioterrorism event, many patients may report seeing a "yellow rain" or a smoke attack.

## **Frequently Asked Questions About Trichothecene Mycotoxins**

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### **How can trichothecene mycotoxin exposure be treated?**

There is no antitoxin for the trichothecene mycotoxins therefore, the only thing that can be done is to provide supportive care and treat the symptoms that occur. If given early, superactivated charcoal can be useful in treating patients who have ingested trichothecene mycotoxins.

### **What should people do if they are exposed to trichothecene mycotoxins?**

People who are known have been exposed to trichothecene mycotoxins should seek immediate medical. Exposed skin should be washed thoroughly with soap and water and eyes should be flooded with saline or water.

### **How can trichothecene mycotoxin exposure be prevented?**

The only way to prevent exposure is to avoid contact with the trichothecene mycotoxins. This can be done by wearing protective clothing and a mask.

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