Agent: Tetrodotoxin (anhydrotetrodotoxin 4-epitetrodotoxin, tetrodonic acid)

Tetrodotoxin is a naturally occurring substance found in widely differing aquatic species, including pufferfish, parrotfish, California newts, angelfish, starfish, octopus and xanthid crabs. Recent reports indicate that the toxin may be synthesized by common marine bacteria that are often associated with marine animals. Tetrodotoxicosis is most important in Japan where consumption of pufferfish is a delicacy. From 1974 through 1983 there were 646 reported cases of pufferfish poisoning in Japan, with 179 fatalities. Tetrodotoxin is used in research animals to inactivate nerves and study the effect.

In general, tetrodotoxin is among the most toxic substances known to man and targets nerves and skeletal muscle. Death can occur within 30 minutes. It is extremely dangerous by ingestion, inhalation, and skin absorption, or if it enters the blood stream in any manner. However, there are two forms: tetrodotoxin (IO1450000) and tetrodotoxin citrate (XF884500). The latter is highly toxic and must be used with special precautions.

The first symptom of intoxication is a slight numbness of the lips and tongue, appearing between 20 minutes to three hours after exposure, followed by tingling or numbness of the entire face. Headache, stomachache, nausea, diarrhea, and/or vomiting may occur. A loss of balance, paralysis, unconsciousness and death follow. There have been no reports of tetrodotoxicosis in laboratory or animal care personnel.

Potential Hazard: Animals given tetrodotoxin may excrete the chemical in their urine and feces and contaminate the cage and its bedding. The amount of toxin given to an animal is sufficient to alter a nerve or group of nerves, but generally is not a lethal dose for the animal. Consequently, even if the entire dose is excreted into the cage, it is not likely to represent an amount sufficient to intoxicate a human. However, to avoid exposure to any toxin, animal care and research personnel should wear protective outerwear and gloves and practice good hygienic practices such as washing hands after handling affected animals, their bedding, or any animal that dies unexpectedly.

Recommended Precautions: There is no cure nor an anti-toxin for tetrodotoxicosis. Cages of animals given tetrodotoxin or tetrodotoxin citrate should be labeled indicating the toxic hazard and agent. For animals given tetrodotoxin, always wear gloves, lab coat/gown and surgical-type mask when handling inoculated animals, their cages or bedding. For animals given tetrodotoxin citrate, also wear goggles and use an N-95 mask.

If skin contact occurs with pure toxin, remove contaminated clothing and rinse with copious amounts of soap and water for a considerable amount of time. If pure toxin is ingested, drink 1 or 2 glasses of water within 15 minutes and then induce vomiting. For eye contact, wash liberally with water. In all cases, after initial self-treatment, seek immediate medical attention at EUH employee health.

References: JAMA 1981;246:247
MMWR 45: 1996
MSDS, ICN Biochemicals, 4/10/95.