

# Cantharidin and Its Toxicity

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## ABSTRACT

Cantharidin is a very vicious and toxic chemical present in all life stages of Blister Beetle. It is used as a last resort in the battle to save Blister Beetle from the predators. Adult beetles kept in isolation for 80-90 days produce different types of cantharidin. Cantharidin shows dermatologic, genitourinary, pulmonary, and other anatomical effects. The male biosynthesizes about 17mg of Cantharidin which is 10% of the live weight of the beetle. The females don't have this compound but receive it from the male while copulation.

### Introduction:

Blister beetles (*Epicauta* spp.) are insects that contain Cantharidin, a potent and very vicious or poisonous agent, which gets absorbed directly into the gastrointestinal tract (GI) tract and skin. It can cause shock to even death in some cases within 4 hours of consumption depending upon the dose. Beetles lay their eggs on the ground under stones or on the food plants that animals eat and accidentally consume the toxin. Cantharidin the active and potent ingredient of the Blister beetle family is a well-known vesicant. These beetles are found mostly in Southern Europe, Africa, and Asia. The name Blister was introduced in the family due to its nature which causes blisters upon consumption. Many preparations have been made from these insects with the ancient belief that be work as aphrodisiacs in males or as abortifacients. Dried bodies of some species belonging to *Mylabris* such as *Mylabris* (*M.*) *phalerata* and *M. cichori* have been used as traditional medicine in China for more than 2000 years and are still used as folk medicine. Many cases of cantharidin poisoning have been linked to the use of dried beetle powder which can cause more harmful than any of its assumed benefits (1).

### Cantharidin production

When stimulated, larvae secrete cantharidin from the mouth as a milky mouth secretion, and adults secrete this cantharidin from their legs. The cantharidin of one beetle varies from 0.6% to more than 5% of the dry weight. The older insect produces more cantharidin. When the female hasn't mated, she loses almost all of her reserves. In the wild, females continue to receive cantharidin as a gift from male beetles while copulation (2, 3).

### Effects of cantharidin on various systems

#### 1. Effects on the gastrointestinal (GI) system

Previous research describes the swelling in the upper intestine. Many patients complain about burning and blistering in the mouth, tongue, and oropharynx region. Difficulty in swallowing, abdominal cramps, vomiting, and internal bleeding. When an excessive amount of cantharidin is consumed it may cause swelling of the GI tract. Deaths from GI bleeding have also been reported. Pathological changes include edema in the mucosa of the intestine, blister formation, ulcers, and bleeding seen in the oral mucosa, esophagus, stomach, and duodenum in autopsy. Hemorrhages are seen microscopically in the liver, edema is seen in the intestine, and nuclear changes have also been reported (5).

#### 2. Dermatological effects

A variety of symptoms are seen when cantharidin comes in contact with the skin. It may vary from itching and swelling to burns, blisters, and wounds. The symptoms may appear late or immediately after consumption of this chemical. Additionally, it was reported that cantharidin can be absorbed through the lipid layer of the membrane, causing toxicity and when comes in contact with the skin. It can also cause sweating, increased heart rate, blood in urine, and decreased urination (4).

#### 3. Renal effects

Due to the excretion of cantharidin through glomerulus filtration, it can cause damage to the kidneys, and most of its life-threatening causes are secondary to its nephrotoxicity. Symptoms include back pain, increased urination, difficulty while urinating, frequent urination, and bloody urine that can last up to 15 days. Excessive protein wastage through urine can last up to 19 days. These symptoms with renal failure leads to death, and decreased urination can happen although initially polyuria has also been reported. Tubular with kidney failure necrosis can be fatal (4).

#### 4. Cardiac effects

The most common cardiac pathology of cantharidin toxicity is presented as increased heart rate and many of the blood flow-relevant problems may be secondary to anemia and vascular collapse due to bleeding. The bleeding is seen in the pericardium and sub-endocardium in autopsy, especially in the

ventricular septum. Studies regarding human health have shown dose-relevant muscle fibril degeneration and mitochondrial inflammation (6).

#### 5. Pulmonary Effect

Although reports of edema in the respiratory system, hemorrhages of bronchial structure, and subpleural bleeding have all been shown in fatal cases of cantharidin poisoning. Very seldom we come across lung injury due to cantharidin poisoning, and very rarely are people found injured in such regard (4, 7).

#### 6. Hematologic effects

Early reports have shown increased red blood cell count after cantharidin poisoning, which was due to poison-causing hyperplasia in the bone marrow. Later, the researchers found no abnormality with bone marrow after examination and gave the credit to increased hemoglobin and white blood cell counts to insufficient blood volume and excessive blood concentration. Hemoglobin usually returns to normal with enough water consumption (8).

#### 7. Neurologic effects

Seizures without a given cause, ataxia, and muscle spasm reflexes have been reported in cantharidin poisoning, but these are not usual for toxicity. Seizures have been reported within thirty-six hours of ingestion. Clinical examination of patients with seizures using cantharidin revealed meningeal and cerebral petechiae or hemorrhages (4, 8).

### Conclusion

The poisoning must be avoided or cured otherwise it may cause death within a day if dealt with enough doses. The toxic beetle introduces cantharidin into the system through absorption which occurs in the gastrointestinal tract and might also cause ulcers and blisters and if dealt with in a greater dose it may cause death or paralysis. When it's absorbed into the body it may also induce other pathological complications which may include tachycardia, irritation and redness of the skin, renal degeneration, and other conditions that might prove to be fatal.

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