



Fact Sheet RICIN

Where does ricin come from?

Ricin is a plant poison. The seeds of *Ricinus communis* (castor bean plant) from the *Euphorbiaceae* family contain about 1-2% ricin. This subtropical to tropical plant is predominantly cultivated on a large scale in India, Brazil and China for the production of castor oil. It is frequently found as a magnificent ornamental plant in the garden.



Blossoming castor bean bush



Seed kernels of *Ricinus communis*

Ricin is one of the strongest poisons of biological origin. A few chewed seed kernels are deadly. The widespread distribution of *Ricinus* plants and the easy preparation of poisonous ricin make this a preferred biological weapon. In the Second World War, ricin had been available for use as a warfare agent by the Allies under the code name "W", however it was never deployed. UNSCOM inspectors found 10 litres of concentrated ricin solution in Iraq after the Gulf War for filling into 155 mm artillery shells. Ricin is specified in the list of banned materials in the Chemical Weapons Convention (CWC). Today ricin is still considered an attractive weapon for terrorists. Instructions for preparation of the poison on a small scale is well known among dubious circles.

What is Ricin?

Ricin is a polypeptide. It belongs to the Type 2 ribosome-inactivating proteins (RIPs). It consists of two glycoprotein chains – A-chain (alanine chain) and B-chain (isoleucine chain), which are covalently bound by disulfide bridges. The A-chain is an enzyme (N-glycosidase) and is considered the active toxic component, which can enzymatically inactivate a large number of ribosomes; while the B chain is necessary for binding the toxin to the cell surface.

Name	Ricin
CAS No.	9009-86-3
RTECS No.	VJ2625000
Molecular weight	60'000 Subunits approx. 30'000

Pure, crystalline ricin is odourless and tasteless, and practically only soluble in water. Ricin is inactivated by boiling water.

Routes of uptake

Skin

As a polypeptide, ricin is hardly taken up by intact skin. However, it can pass directly into the bloodstream through the smallest lesion.

Inhalation

Ricin can be taken up over the respiratory tract (droplets, dust). Protective masks with aerosol filters provide effective protection.

Ingestion

Ricin poisoning most frequently results from the intentional or unintentional intake of Ricinus seeds, assuming this would work as a laxative like castor oil. Ricin can be distributed through the food chain (drinking water). The polypeptide is very resistant to protease in the digestive tract and is well-absorbed.

Injection

Besides animal experiments, such as to determine the lethal dose of ricin, ricin can also be directly injected with criminal intent. The mysterious murder case of the Bulgarian dissident Georgi Markov in London in 1978 is well-known. Allegedly, the murderer "implanted" a 0.6 mm diameter pellet with two 0.2 mm holes, into the victim's thigh using an umbrella. The drilled holes contained so much ricin that Markov died four days later.

Effect

With the uptake of Ricinus seeds, the toxic effect is partly based on the agglutination (clumping) of blood corpuscles by Ricinus communis agglutinin followed by dissolution. The actual poison (Ricin = Ricinus communis lectin) causes an irreversible inhibition of the protein synthesis in the body's cells by inactivating ribosomes, leading to cell death.

Symptoms

The expression of symptoms is less specific and depends on the method of uptake of ricin. As a rule, symptoms usually occur within 2 - 24 hours (rarely up to 3 days) following poisoning.

Ingestion

Vomiting, malaise, stomach-ache, bloody diarrhoea (rice water-like stool), painful need to defecate or urinate (anuria), dehydration, drowsiness, muscle weakness, cramps, paralysis of hands and legs (vasomotor palsy), tachycardia.

Inhalation

Weakness, fever, dizziness, difficulty breathing, cough, pulmonary oedema, pain in the limbs.

After apparent improvement, it can lead to a fatal outcome. Allergic symptoms (bronchial asthma, dermatitis, conjunctivitis).

Treatment

An effective antidote to ricin does not exist. Only symptoms can be treated.

Oral poisoning:

- immediate gastrolavage
- plentiful activated charcoal
- stop diarrhoea
- monitor electrolytes
- rehydrate

Inhalation poisoning:

- support respiration
- treat pulmonary oedema

Evidence

It is important in chemical analysis that the amino acids histidine, serine, methionine and hydroxyproline do not occur in ricin.

Rapid tests which are based on an antigen-antibody reaction are commercially available. Chemical proof of poisoning is very difficult, because the samples usually contain only extremely small concentrations of ricin.

Toxicity

In humans, less than 1 mg of ricin is lethal, if the poison is inhaled. Approximately the same dose is also lethal with intravenous or intramuscular administration. If taken orally, a few mg of ricin are deadly.

vgl. <http://www.emedicine.com/emerg/topic889.htm>

Links

<http://www.mitretek.org/home.nsf/HomelandSecurity/Toxins#ricin>

<http://www.asanltr.com/newsletter/01-4/articles/Abrin&RicinRev.htm>

<http://www.ansci.cornell.edu/plants/castorbean.html>

<http://www.emedicine.com/emerg/topic889.htm>

<http://www.cbwinfo.com/Biological/Toxins/ricin.html>

<http://www.aret.asso.fr/artoxinmts3.htm>

<http://www.portfolio.mvm.ed.ac.uk/studentwebs/session2/group12/ricin.htm>

http://www.awl.ch/heilpflanzen/ricinus_communis/index.htm

<http://www.cnn.com/2003/WORLD/europe/01/08/uk.ricin/>

<http://www.spiegel.de/panorama/0,1518,druck-229810,00.html>

<http://www.spiegel.de/panorama/0,1518,druck-229917,00.html>

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