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Breaking Bad

Gary A. Flory presents an agent overview of ricin



In the popular television series *Breaking Bad*, chemistry teacher-turned-drug-dealer Walter White attempted to use ricin to kill several rival drug dealers. There have been more than two dozen documented real-life incidents involving this toxin, some of the most recent inspired by the series.

Perhaps the most famous ricin incident was the assassination of Bulgarian dissident Georgi Markov on 7 September 1978. Markov, an author and broadcaster highly critical of communist Bulgaria, was poisoned by a small pellet fired into his leg while waiting at a bus stop in broad daylight in the centre of London. Although the assassin was never caught, it is widely believed Markov was killed by the Bulgarian Secret Services.

One of the most intriguing aspects of the case was the poisoned umbrella suspected of firing the pellet that killed Markov. Following his death, investigators found in Markov's leg a metal pellet with holes drilled into it to create a reservoir holding 0.2 mg of ricin. Once Markov's body temperature melted the waxy coating on the pellet, the ricin was released into his bloodstream.

More recently there were ricin tainted letters mailed in 2013 to President Obama and US Senator Roger Wicker. A third letter addressed to a Mississippi judge also tested positive for ricin. An

early suspect in the investigation was released after investigators were unable to find any evidence linking him to the crime. Ultimately, investigators determined that the first suspect was framed; a second suspect was arrested who pleaded guilty and was sentenced to 25 years in prison.

On the same day, but receiving less publicity in an unrelated case, Ray Adams and Samuel Crump were convicted of planning to manufacture ricin in 2011 to harm Federal employees. Three months later, a 19-year-old student, Daniel Harry Milzman, at Georgetown University, Washington, DC, was arrested and charged with producing a powdered ricin in his dormitory room, sealed in plastic bags. In December 2012 a plot was uncovered by a group associated with AQAP (al-Qaeda in the Arab Peninsula) which involved poisoning salad bars and buffets in restaurants and hotels in the US with ricin and sodium cyanide.

Exposure to ricin

Ricin is one of the most toxic biological

agents known and is listed as a Schedule 1 Controlled Substance under both the 1972 Biological Weapons Convention and the 1997 Chemical Weapons Convention. It is a white powder extracted from the seeds of the castor plant. It can also be formed into pellets or dissolved in water or weak acid for release as a liquid.

Ricin's toxic effects come from its ability to get inside cells and prevent them from synthesizing proteins. Like most toxins, the symptoms of ricin exposure depend on the dose and the route of exposure. Potential exposure routes include inhalation, injection, ingestion and skin and eye contact.

Inhalation

If inhaled, ricin causes respiratory symptoms within four to eight hours. Symptoms include difficulty breathing, fever, cough and nausea. As fluid builds up in the lungs, breathing becomes more difficult, blood pressure decreases and respiratory failure may occur.

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Injection

Ricin can be injected into the body as a pellet or in a liquid form. Initially the tissue near the injection site would die followed by failure of the liver, kidneys and spleen. Ultimately, the patient would experience bleeding in the stomach and intestines. Death may result from multiple organ failure.

Skin and eye contact

Ricin, like many toxins, is unlikely to be readily absorbed through healthy skin. However, it may enter the body through openings in the skin, eye membranes, and when transferred to the mouth while eating or smoking.

Ingestion

Ingestion tends to be less toxic than inhalation or injection because some of the toxin is inactivated in the stomach. Additionally, the consumption of castor seeds rarely has the same effect as exposure to extracted ricin. Unless the seeds are thoroughly chewed, much of the ricin passes through the system. Ingestion of ricin results in vomiting and bloody diarrhea and eventually the failure of the liver, spleen and kidneys.

Bioterrorism agents

There are several types of biological

RICIN IN THE UK

Right-wing extremists have also used ricin. In May 2010 a Newcastle-based British white supremacist, Ian Davison and his son were convicted for producing reportedly enough ricin to kill nine people. They were aligned to an extreme fascist group, Aryan Strike Force, and ran a training camp in northern England similar to right-wing militias in the US.

In September 2015, a Liverpool man, Mohammed Ali, was jailed for eight years for trying to buy deadly ricin poison from the 'dark Web' after being inspired by *Breaking Bad*. Ali struck a deal with a supplier on the Internet black market to buy 500 mg of powder for \$500 (£320) – enough to kill 1,400 people. His 'supplier' was actually an FBI agent who notified police on Merseyside and substituted the consignment of ricin for harmless powder. Ali was arrested after he took delivery of a toy car with five vials hidden in the battery compartment.



A victim is decontaminated during a bioterrorism response drill.

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BIOLOGICAL TOXINS



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Above: Castor beans.

Above right: Poisoned umbrella of the design suspected of being used to kill Georgi Markov.

Right: The metal sphere containing ricin was discovered in Georgi Markov's leg.

Far right: The castor plant *Ricinus communis*.



agents including bacterial agents, viral agents, and biological toxins. Two of the best-known bacterial agents are *Bacillus anthracis* and *Yersinia pestis* which cause anthrax and plague, respectively. Viruses are the simplest microorganisms, with serious consequences in human and animal populations. The Spanish Flu of 1918 infected between 25% and 30% of the world's population – causing the deaths of an estimated 50 million people. The variola virus Orthopoxvirus causes smallpox, which has killed millions throughout history.

Ricin falls into the third category of



Military personnel prepare to respond to a biological attack.

bioterrorism agents – biological toxins. These are harmful substances produced by biological organisms. Ricin is often considered the perfect poison for a number of reasons. First, the castor plant (*Ricinus communis*) grows worldwide. About a million tons of castor beans are processed each year in the production of castor oil. The waste from the production process is 5% ricin by weight. Ricin is also relatively easy to extract from castor beans. Instructions for producing ricin are widely available and the production of crude forms require very little equipment or expertise.

Pure forms of ricin are deadly in very small doses with the lethal dose in an average adult being only 500 micrograms, or about the size of the head of a pin. Ricin is also very stable – making it easier to handle and store than other agents. Finally, ricin poisoning is hard to detect and no antidote exists.

Ricin as a weapon

Research into the military potential of ricin has been conducted by a number of countries including the United States, Soviet Union and Canada. During World War I, the US explored the use of ricin as a toxic dust and as a coating for shrapnel and bullets. Ultimately when the war ended, the US halted its research before producing weaponized ricin.

During World War II the US and Canada conducted studies into the use of ricin in cluster bombs. Although field trials were conducted, ricin was not deployed as a weapon. The Soviet Union also weaponized ricin around the same time. More recently, reports have indicated that ricin may have been used in the Iran-Iraq war during the 1980s and that quantities of ricin were found in al-Qaeda caves in Afghanistan.

Despite the successful weaponization of ricin as a biological warfare agent and a number of recent incidents involving the toxin, ricin remains an unlikely choice for mass-causality attacks. Compared to anthrax, for example, an attack on a large geographical area would require tons of ricin compared to kilograms of anthrax. However, although there have been very few documented cases of fatalities from ricin attacks, smaller targeted attacks are likely to continue. ■

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