



## Murders with VX: Aum Shinrikyo in Japan and the assassination of Kim Jong-Nam in Malaysia

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### Dear Editor

VX is one of the most toxic nerve gases and is stockpiled as a chemical weapon by many countries [1, 2]. VX was first discovered in Porton Down, UK's Biological and Chemical Weapons laboratory, in 1952. The US Army continued the development and made it into a nerve gas agent. Its scientific name is *O*-ethyl *S*-2-(*N,N*-diisopropylamino)ethyl methylphosphonothiolate [3–5].

In this report, the murder with VX, the Japan case, is described first, and then the second case, which occurred in Malaysia, is described. Cases of murder with VX are rather rare, but one should never ignore the possibility of using such a special agent for terrorist action in the future. Documentation of incidents in two countries will be useful for understanding the toxic nature of VX against humans.

The first person killed by VX was Mr. Tadahito Hamaguchi in Osaka on Dec. 12, 1994, by the cult Aum Shinrikyo. At that time nobody knew how he died. Only after March 1995, when Aum Shinrikyo's criminals were rounded up, did the criminal Mr. Yamagata confess how he killed Mr. Hamaguchi with VX. The VX was transported from Kamikuishiki village to Osaka by placing it in a syringe that was kept cool in an ice box. Six members of Aum Shinrikyo were involved in trying murder Mr. Hamaguchi. Some grabbed Mr. Hamaguchi, and some acted as lookouts. Mr. Yamagata was the one who injected the syringe containing VX into Hamaguchi's neck. Mr. Hamaguchi resisted and chased the cult members, but he collapsed and died immediately.

The use of VX to kill humans was first made by the cult Aum Shinrikyo in 1994 in Japan. This was why Malaysia's assassination case using VX was of particular interest in

Japan. Aum Shinrikyo decided to make VX and asked Mr. Masami Tsuchiya to do the synthesis.

First he made a VX-hydrogen chloride salt, but it caused no injury when Aum Shinrikyo actually used it against a person considered to be an enemy to the cult. Mr. Tsuchiya made salt-free VX and Aum Shinrikyo used it against two persons—Mr. Mizuno and Mr. Nagaoka. This time the VX was effective, and it severely injured both Mr. Mizuno and Mr. Nagaoka. The VX was administered without an injection. Instead, the syringe was held above the skin and the VX was dripped drop by drop onto the skin [6, 7].

Because salt-free VX has strong penetration power through the skin; the VX entered through the skin to the internal systems.

Both people suddenly felt the surroundings become dark despite the broad daylight. This was because the pupils shrank preventing light from entering the eyes. The reason VX hydrogen chloride salt was not effective was due to its ionized form that cannot penetrate the skin well. On the other hand, the salt-free form of VX was effective because both the skin and salt-free VX were hydrophobic in nature. There is no documentation regarding the toxic nature of the two types of VX (salt-free and HCl) in the literature; however, this was actually shown by Aum Shirikyo's terrorist action. This was known only by two persons who were involved in the manufacture of VX. The first author of this paper was actually involved in such manufacturing [unpublished observation].

After almost 1 year since Mr. Hamaguchi's death, Dr. Tsuchihashi analyzed the blood that was kept in the Osaka Prefecture Police Forensic Lab. He found metabolites of VX confirming the death due to VX. This was the solid scientific proof of Mr. Hamaguchi's assassination [8].

At the beginning nobody knew who killed Mr. Kim Jong-Nam, with what poison and for what purpose. The killing took place at the busy Kuala Lumpur airport, in the capital of Malaysia, in broad daylight by two women rubbing Kim's face—the first woman with one hand followed by a second

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