

Cyanide

History

Cyanides are salts and esters of hydrocyanic acid (hydrogen cyanide). The most commonly found in industry are sodium or potassium salts that are white crystalline powders. Organic cyanide compounds are also produced and are called nitriles. Cyanides are found naturally in foods such as spoiled cabbage, cauliflower, mustard and kale and other members of the *Brassica* family. Certain grasses such as spoiled Johnson grass can produce cyanide poisoning in grazing animals. Some plants and pits have more bioavailable cyanide than others and have been known since antiquity as being poisonous. Cyanide poisoning has been reported from eating chokecherries, bitter almonds and apricot pits. It is a component of Laetrile. It is said that Nero used the essence of a plant containing cyanide to poison members of his family and enemies. Napoleon III proposed that his troops dip their bayonets in cyanide in the Franco-Prussian War.¹

In World War I the French were the only advocates of using cyanides. Since hydrogen cyanide is lighter than air and subject to variation with the wind, the agent proved to be difficult to be delivered effectively enough to gain the concentration needed to affect the enemy. To reduce the volatility and permit greater delivery potential to the enemy, the French devised Cyanogen chloride which basically is providing chlorine gas to hydrogen cyanide at 0° C. This irritating, peppery and lethal gas had limited use on the battlefield after being introduced in September 1916. In 1916, the Austrians chose to experiment with hydrogen cyanide mixed with bromide instead of chloride. This agent was difficult to handle and corroded the storage tanks so they abandoned this agent.

In WWII cyanide was not known to be used by either military opponent against each other. The Nazis with Zyklon B, a rodenticide, gased millions in the holocaust. Zyklon B caused more deaths than any other agent before or since. It is hydrocyanic acid adsorbed in a special dispersible base. The exact amount of deaths from the 4 main gas chambers is unknown although it has been calculated that between 1.6 and 2.6 million deaths could have occurred limited primarily by the crematoriums.

More recent history indicates that Iraq may have used cyanide against the Kurds, the Iranians and a Syrian village in 1981. The Aum Shinriko in Japan left potassium cyanide and dilute sulfuric acid in the restrooms of the same subway two weeks after they had killed 12 people and injured 5,500 with a sarin nerve gas attack in 1995. The materials were discovered before they could be employed.

Tylenol capsules, deliberately contaminated with cyanide, were responsible for seven deaths in 1982. The killer has never been found. Johnson and Johnson recalled 264,000 bottles of Tylenol capsules and redesigned the package.

Though uncommon, most information about cyanide poisoning comes from the civilian sector since hundreds of thousands of pounds of cyanide salts and organic cyanates are produced and used in industry every year. NIOSH estimates that about 250,000 workers have the potential to be exposed to cyanide each year. These include firefighters, electroplaters, steel workers, metal cleaners and pesticide applicators. All of us carry some background amount of cyanide. Burning of biomass, vehicular exhausts, electroplating operations and various organic chemical and plastic manufacturing facilities efflux all contribute to cyanide in the air. Cyanide is thus ubiquitous and man has four natural enzyme pathways to detoxify cyanides when present in trace amounts. Both active and passive tobacco smokers and the fetus of a smoker have elevated cyanide levels in their blood compared with controls. Effluents from the cyanidation process in the extraction of precious metals occur and are a significant contributor to water based cyanide along with effluents from iron and steel mills and organic chemical facilities.²

In February 2000, a mine accident in Baia Mare Romania released 100,000 cubic meters of cyanide-contaminated water into the Tizna River system and eventually the Danube, which caused a large fish and plant kill in Romania, Yugoslavia and Hungary and closed the public drinking system for an extended period of time to over 2 million people. Local Authorities called it one of the worse environmental catastrophes since Chernobyl.³

References:

1. Textbook of Military Medicine. Medical Aspects of Chemical and Biologic Warfare. Eds. Zajtchuk R, Bellamy R. 1997 Office of the Surgeon General, Department of the Army. Borden Institute. Walter Reed Medical Center. Washington
2. Toxic Profile for Cyanide – Department of Health and Human Services, Public Health Service, Agency for Toxic substances and Disease Registry. September 1997
3. The United Nations Economic commission for Europe UN/ECE News Geneva 15 Feb 2000