

How dangerous is the sodium cyanide found at the Chinese explosion site?

August 18 2015, by Benjamin Burke

Officials investigating a huge explosion at a warehouse in Tianjin in China have [discovered a store](#) of 700 tonnes of sodium cyanide – more than 70 times the legal limit allowed. Cyanide has a particularly unpleasant reputation and finding it at a major disaster site is far from welcome. However, if officials act fast they should be able to limit its damaging effects.

What is sodium cyanide?

The term cyanide is clearly understood in the public consciousness to be almost synonymous with poison itself. This is largely because of its use as lethal suicide pill (L-pill) in World War 2, most notably with the suicide of Nazi army officer Erwin Rommel. The cyanide used in the L-pill was potassium cyanide but the properties of sodium cyanide are nearly identical.

An inorganic and very innocent looking white solid with deadly properties, sodium cyanide (NaCN) can be fatal at amounts as little as [5% of a teaspoon](#). It is produced from the equally dangerous gas [hydrogen cyanide](#) (HCN) in a simple process with sodium hydroxide.

Why would a company want so much of it?

Sodium cyanide is used industrially across the globe, most frequently in the mining of [gold](#). Although most of us have the traditional imagery of

a 19th-century gold miner panning for nuggets, this isn't the industrial method used today.

Most of the world's gold is not found in nugget form but as very fine gold powders in rocks. In fact, our cultural demand for gold forces us to mine in rocks that can be as low as 0.005% gold. This means we need [industrial extraction](#) to separate and [purify gold](#) from all the other materials.

After mining and milling, the crude rock mixture is turned into a fine powder and added to a solution of sodium cyanide. The gold forms strong bonds with cyanide molecules and can then be separated from the rest of the minerals because it is then soluble in water. It then reacts with zinc and turns back into a solid. Finally is smelted to isolate the gold and cast into bars.

How dangerous is it?

As with the very similar potassium cyanide used in the L-pill, sodium cyanide is [extremely toxic to humans](#). Although there are risks with skin absorption, the biggest risk is ingestion. Inhaling or swallowing sodium cyanide blocks oxygen transport causing serious medical problems and ultimately death.

However, the safety of sodium cyanide changes if it is present during an explosion. Avoiding oral ingestion should usually be relatively simple but an explosion can cause it to be inhaled as a fine powder (this danger should have passed quickly – and face masks will also prevent fine powder inhalation). The biggest fear is the formation of hydrogen cyanide upon exposure to water or high temperatures. [Hydrogen cyanide](#), as a gas, is very dangerous if inhaled.

What if the remaining store leaks?

Contamination of water supplies could be a concern but is easily tested for. The Chinese authorities seem to be [treating the spill with hydrogen peroxide](#), which forms significantly less dangerous [fulminates](#). Waste water and other areas could be simply [treated with sodium hypochlorate](#) (bleach) to remove cyanide ions.

The spill is (but more significantly was) very dangerous, especially at these levels. But the nature of cyanides means we can detect them easily and monitor the process of cleaning up. The clean-up should proceed as quickly as possible. The other heartening factor is that after the short-term – albeit very seriously deadly – effects, there should be no slow-onset ramifications, as you would get with a carcinogen or something harder to deal with.

All previous spills have been dealt with easily with no long-term effects and the procedures are well known, so all the hydrogen cyanide in Tianjin should now be gone. The solid sodium cyanide is not so dangerous in passing: you can open a bottle with 3,000 times the lethal dose without any problems (without letting it react with moisture and convert to hydrogen cyanide). The advice for anyone nearby would be to avoid drinking the contaminated water and stay out of the area while the hydrogen cyanide is processed by natural biochemical pathways and climate dilution to safe levels.

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