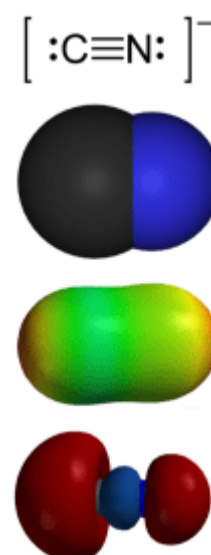


Ever find yourself watching a WWII spy movie, and an enemy spy is captured? Those scenes usually play out the same, with the good guys yelling questions at the enemy with hopes for answers, only for the bad guy to flash one last mischievous smile, crunch down on a capsule hidden in their mouth, and die a few seconds later.

Have you ever wondered, “what is in that pill and why does it work so fast?”

Those little lethal pills are filled with a chemical called cyanide.

The term “cyanide” refers to any chemical containing a carbon-nitrogen (CN) bond. What is interesting is that many substances contain cyanide, but not all of them are deadly. Sodium cyanide (NaCN), potassium cyanide (KCN), hydrogen cyanide (HCN), and cyanogen chloride (CNCl) are lethal, but thousands of compounds called nitriles contain the cyanide group, but aren’t as toxic. Nitriles aren’t as dangerous, and can actually be found in some pharmaceuticals, because they don’t release the CN ion.



### But How Does Cyanide Work?

The cyanide ion, CN<sup>-</sup>, binds to the iron atom in cytochrome C oxidase in the mitochondria of the cells and acts as an irreversible enzyme inhibitor. This prevents cytochrome C oxidase from doing what it needs to do, which is to send electrons to oxygen in the electron transport chain of aerobic cellular respiration.

Mitochondria are then unable to produce the energy carrier adenosine triphosphate (ATP), without oxygen. This results in tissues that require this form of energy, like heart muscle cells

and nerve cells, quickly expand all their energy and being to die. When these die...the victim dies.

In more layman's terms, cyanide works by interfering with the subtle chemical mechanism in our cells. It essentially prevents cells from using oxygen to make energy molecules. Our cells need energy, and that energy comes from sugars in our food. This process is called respiration, which is the chemical reaction of our cells using oxygen molecules from the air we breathe to free up energy from sugar.

So, when cyanide molecules are introduced in the system, it throws off the cell's mechanism of respiration. The cyanide molecules look like oxygen to the parts of the cell responsible for respiration (the mitochondria), confusing our cells into latching onto the poison in hopes of energy.

### **Why is Cyanide Poisoning So Terrible?**

If poisoned with this deadly chemical, the individual's diaphragm will begin to slow down in contractions, leaving the victim gasping for air. Skeletal muscles in the face, arms, and body will also begin to seize up, making the person convolute and contract. Finally, the heart will beat less and less until it stops completely, resulting in cardiac arrest.

One reason cyanide gains such a bad repour is that the victim is entirely conscious for the whole ordeal. They can feel every muscle in their body start to tense, and all they can do is wait for the few minutes to be over. Eventually the victim will pass out and when their brain shuts down from lack of oxygen, it is all finally over.

The process can be quick; however, it depends on the amount of poison administered. If given a lethal amount, it can last from 2-5 minutes.

Cyanide is able to kill so fast because the molecules are exceptionally small and can disperse throughout the entire body very quickly, affecting all major organs and tissues in a short amount of time.

It may not be an honorable way to go, but the effectiveness and the relatively quick process

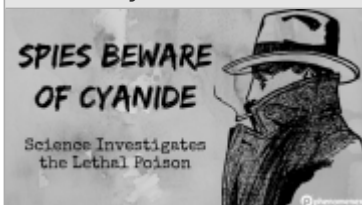
(depending on the amount of cyanide administered), made an effective way to prevent captured spies giving up secrets to the enemy.



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## Summary



### Article Name

The Science of Cyanide

### Description

Cyanide poisoning has been used in movies and real life, mostly associated with espionage. But have you ever stopped to wonder what causes it to be lethal?