ToxTidbits

Maryland Poison Center
UNIVERSITY OF MARYLAND SCHOOL OF PHARMACY

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The Maryland Poison Center's Monthly Update: News, Advances, Information

Acute Cyanide Toxicity from Amygdalin

The husband of a woman who made a smoothie out of 2-3 apricots, pits and all, called the Maryland Poison Center. She was asymptomatic, but he was worried about possible cyanide toxicity. Is there cause for concern?

Sources of Cyanogenic Glycosides

Cyanogenic glycosides such as amygdalin, prunasin and linamarin are in some plant species. The most common plant source is the *Prunus* genus, which includes apricot, plum, peach, cherry laurel, choke cherry and bitter almond. Other plant sources include apple, cassava, elderberry, hydrangea, pear and some lima beans. The cyanide content varies greatly depending on plant, plant part, season and geographic location. For example, the toxin is in the pit kernel for *Prunus* genus and in the flower bud for *Hydrangea*.

Laetrile, also known as vitamin B17, is a semi-synthetic form of amygdalin isolated from the seeds of apricots. Clinical data does not support claims that it is of benefit for cancer. Banned in the U.S. by the FDA due to lack of effectiveness and potential for serious adverse effects, it is still possible to buy laetrile on the internet. Fruit kernels can also be purchased on the internet and in health food stores as vitamin supplements.

Presentation and Toxicity

Swallowing pits or seeds whole, without chewing, does not usually result in toxicity. Ingestion of large quantities of chewed seeds can cause cyanide poisoning. After chewing seeds, enzymatic hydrolysis of the cyanogenic glycoside to cyanide occurs in the GI tract, resulting in delay in onset of toxicity of up to 2 hours or more. Cyanide causes cellular hypoxia by inhibiting cytochrome oxidase in the final step of the mitochondrial electron transport chain. Vital sign abnormalities from cyanide include tachypnea, Kussmaul's respiration, respiratory arrest and hypotension. Patients experience vomiting, diarrhea, abdominal pain, dyspnea, weakness, lightheadedness and cyanosis, which then can progress to coma, seizures, dysrhythmias and cardiovascular collapse.

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Did you know?

In cyanide poisoning, venous blood is bright red and skin may be pink or cherry red.

The bright red color of blood is due to elevated venous pO2 and measured oxygen saturation. The cyanide antidote hydroxocobalamin causes a reddish color to skin and urine. Patients with cyanide poisoning may have a bitter almond smell, although only about 50% of people can detect this odor.

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Acute Cyanide Toxicity from Amygdalin (continued)

Recall the example presented at the beginning of this issue. If an apricot pit weighs close to 0.5 g, three apricot pits (1.5 g) would release around 6 mg of cyanide. Since a lethal dose of cyanide is 50-300 mg, the poison center told the caller that his wife should be fine. Serious toxicity and death is possible with large doses. Purportedly, as much as a cupful of apple seeds would be required to cause death in an adult. There are reports of laetrile toxicity and fatalities in children and adults.

Case Example

A 4 year old boy with metastatic brain cancer developed encephalopathy caused by cyanide poisoning from the use of complementary and alternative medicine including daily oral and intravenous amygdalin (vitamin B 17) and oral apricot kernels. After a therapy session, he became unresponsive and collapsed. Laboratory evaluation of blood showed severe metabolic acidosis and markedly elevated cyanide concentration. He improved rapidly with sodium thiosulfate administration. (Wien Med Wochenschr 2015;165:185–188).

Management and Treatment

When managing a cyanide exposure, laboratory evaluation includes serum chemistries, lactate, blood gases and possibly blood cyanide concentration. Metabolic acidosis may be severe and is due in part to lactate accumulation. The arterial: central venous oxygen saturation difference diminishes due to decreased oxygen consumption with resultant elevated oxygen content of venous blood. Blood cyanide concentrations can confirm the diagnosis but are not useful clinically due to the time it takes for results to be available. Patients with cyanide poisoning should be on a cardiac monitor. Supportive treatment includes oxygen, and if needed, assisted ventilation. Supplemental oxygen is adjunct therapy to antidotal therapy. Administer intravenous fluids and vasopressors for hypotension, sodium bicarbonate for acidemia, and benzodiazepines for seizures.

Administer a cyanide antidote, either hydroxocobalamin or sodium nitrite/sodium thiosulfate, to symptomatic patients. Hydroxocobalamin (Cyanokit) binds with cyanide to form non-toxic cyanocobalamin which can be excreted renally. Administer a 5 gram dose as an intravenous infusion over 15 minutes; if needed, a second dose can be administered. Adverse effects include transient hypertension, allergic reactions, headache, nausea and changes in skin and urine color. The Cyanide Antidote Kit contains sodium nitrite and sodium thiosulfate, both of which are given intravenously. Sodium nitrite administration produces methemoglobinemia. The cyanide that is bound to cytochrome oxidase binds to methemoglobin forming cyanomethemoglobin. Give sodium thiosulfate after sodium nitrite. This produces thiocyanate which is renally eliminated. Adverse effects of sodium nitrite are excessive methemoglobinemia and hypotension. In some situations, especially in patients with increased risk of methemoglobinemia, sodium thiosulfate is used alone. Adverse effects of sodium thiosulfate are minimal; hypotension, headache, nausea and vomiting are possible.

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