



Case of the Month

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"Always Read the Fine Print"

ABSTRACT

Since their advent in the 1930s, 'vitamin pills' have shown a steady rise in both variety and consumption patterns in patients. Guided by the promise of a healthier lifestyle and overall wellness, the use of vitamin supplements has become increasingly commonplace and you would be hard-pressed to find a patient who isn't on some form of regular vitamin. Most of these nutritional adjuncts are either indicated for chronic conditions or, at the very least, harmless additions to daily regimens and do not usually warrant a second thought when described during patient encounters in the ED. However, not all supplements are as benign as they might seem. The following case report details the events that unfolded when a 45 year old male patient accidentally ingested more tablets than were indicated for a vitamin he had purchased online.

CASE PRESENTATION

A 45 year old male presented to the Emergency Department with complaints of fatigue, shortness of breath and anxiety following a possible over-ingestion of vitamin supplement tablets. As per the patient, he ordered a bottle of vitamin supplements online and admitted to misreading the instructions on the label. Instead of the recommended 1 tablet per day dose, he reported taking 8 tablets for the first time earlier that morning. The tablets were bought without the need for prescription and, according to the patient's research, were meant to be "good for promoting long life and preventing cancer". Upon arrival to the ED, the patient was visibly anxious and mildly diaphoretic, stating that "I know I took too many tablets. Am I going to be okay?" Examination revealed a tired-looking patient with vital signs significant only for mild tachycardia of 105 and spO2 95% on room air.

The initial ABG and preliminary lab tests revealed no significant findings, save for a mildly elevated lactate of 1.8, for which the patient was placed on fluids with observation. Being a particularly busy shift at the Emergency Department, the patient's presentation correlated with his history of a seemingly harmless vitamin ingestion did not produce an immediate cause for concern. Nevertheless, he was monitored frequently till his investigations returned, during which time he remained clinically stable and without any subjective complaint besides a persistent feeling of fatigue.

A second ABG was performed and, despite the fluids, demonstrated a rise in his lactate levels to 2.6. By this time, the patient's companion had made their way to the hospital, carrying with them the bottle of pills he reported he took prior to the onset of his symptoms. The bottle of supplements was filled to about $\frac{3}{4}$ of its capacity, with the label indicating that each capsule contained 250mg of Vitamin B17.

Given the persistence of fatigue and rising lactate, the physician decided to perform an internet search on whether any adverse effects were linked to the over-ingestion of vitamin B17. While most sources claimed the supplement was relatively safe, with many ayurvedic webpages praising the vitamin's numerous benefits, it was soon found that the vitamin had been shown in studies to be associated with the development of cyanide toxicity when taken in large amounts. However, this toxicity apparently only seldom manifested in individuals who *only* consumed vitamin B17. Rather, the cases of cyanide toxicities observed occurred more frequently in groups of patients who had concomitant consumption of Vitamin C.

Returning back to the patient, further history taking revealed that the patient had, in fact consumed vitamin C for the past 1 month after he had a bout a flu and had failed to mention it earlier as it had 'slipped his mind at the time.' Considering the risks evident in the patient's ingestion history and his worsening fatigue (at 30 minutes after the ED arrival, the patient had now become increasingly somnolent with profuse diaphoresis, maintaining O2 saturation at 94-96% on room air), the decision was made to manage the patient as a case of cyanide toxicity and hydroxycobalamin was administered.

DISCUSSION

What is Vitamin B17?

Vitamin B17, also known as Amygdalin, is a naturally occurring chemical compound that is found most famously in the seeds of fruits such as apricots, bitter almonds, apples, peaches and plum.¹ At the molecular level, amygdalin is formed as a chemical combination of Glucose, Benzaldehyde and Cyanide. The cyanide component in amygdalin can be released by the action of Beta-Glucosidase and Emulsin- both of which are not present in human tissues. However, microorganisms present in human intestinal linings have been found to possess similar enzymes that effectively promote cyanide release from the Amygdalin compound. The resulting cyanide toxicity is therefore almost 40 times more toxic by the oral route when compared with IV injection of the compound.²

A modified form of amygdalin has been available under the brand name Laetrile since the early 1950s as an alternative treatment to fight cancer, though most studies have failed to show any such benefit in humans.³ While the US FDA continues to insist on the drug's obvious cyanogenic effects, there exist numerous advocates promoting the potential benefits of taking Amygdalin and, despite years of regulation on the original Laetrile supplement, unregulated forms of Amygdalin (or Vitamin B17 as it is often called) continue to circulate the market and are available in most outlets without the need for prescription.

Since the toxicity of amygdalin depends on intestinal conversion, peak levels of cyanide are usually reached at around 2 hours post-ingestion. A curious phenomenon was evidenced in studies which found that the conversion of amygdalin to cyanide in vitro was further accelerated when amygdalin was ingested with foods containing beta-glucuronidase (such as bean sprouts, peaches, celery, and carrots) or with concurrent intake of high doses of vitamin C.^{4,5}

Cyanide Toxicity- Principles & Management

Oral intake of 500 mg of amygdalin may contain up to 30 mg of cyanide.⁶ A minimum lethal dose of cyanide is approximately 50 mg or 0.5 mg/kg body weight.⁷ Our patient had ingested eight 250mg tablets, totaling 2000mg of amygdalin, thereby exposing him to a dose of cyanide well above the lethal dose.

Cyanide has a famously dangerous mechanism of toxicity. It binds to the ferric ion on cytochrome oxidase in mitochondria and blocks the electron transport chain, thus halting oxidative metabolism and leading to cell death by interfering with mitochondrial oxygen utilization leading to cell death, hypoxia and lactic acidosis.⁸ Mild to moderate cases of cyanide toxicity manifest as tachycardia, headache, confusion, nausea, and weakness. Severe cases may present with cyanosis, coma, convulsions, cardiac arrhythmias, cardiac arrest, and death.

Treatment involves addressing the patient's vitals, oxygen saturation and acidosis as well as administering the appropriate antidote as detailed in **Figure 1**. A sequence of these medications can be incorporated or hydroxycobalamin can be administered alone, as was done in the case above.

CONCLUSION

As with most cases of toxic ingestion, the key to effective management is appropriate stabilization followed by rapid identification of the potential toxicity through focused history taking and physical examination of the patient. In cases such as the one outlined above, where the ingested agent is unfamiliar but poses a potential threat, efforts should be made to probe deeper into the potential side effects, interactions and toxicities of such drugs and the Poison Control Center contacted immediately when and where available to expedite successful treatment of affected patients.

For our patient, the decision to administer hydroxycobalamin was followed by an admission to the ICU with serial investigations done to monitor for any metabolic derangements. The patient showed remarkable improvement in his symptoms over the course of 24 hours and was eventually discharged in a stable condition.

Cyanide Toxicity Treatment		
Medication	Dose	Mechanism of Action
Amyl Nitrite	0.3 mL ampule inhaled for 15 sec; May repeat q 3 – 5 min until IV established; DC once IV established and sodium nitrite infusion started	Induces methemoglobinemia via oxidation to bind cyanide
Sodium Nitrite	300mg (10 mL in 3% soln) or 10 mg/kg IV for 3 – 5 min (2.5 – 5 mL/min in adults) 6 – 8 mL/m ² , or 0.2 mL/kg in children (DO NOT exceed 10 mL)	Induces methemoglobinemia via oxidation to bind cyanide
Sodium Thiosulfate	1 ampule or 12.5g in 50 mL IV for 30 min in adults 7 g/m ² , not to exceed 12.5g in children	Combines with unbound cyanide to form renally excreted thiocyanate
Hydroxocobalamin	5 g IV for 15 min in adults, may repeat ½ dose if needed 70 mg/kg in children	Combines with unbound cyanide to form cyanocobalamin


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Figure 1- Medications used in Cyanide toxicity

REFERENCES

- 1) National Center for Biotechnology Information. PubChem Compound Database; CID=656516, <https://pubchem.ncbi.nlm.nih.gov/compound/656516>
- 2) <http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@DOCNO+3559>
- 3) Laetrile (Vitamin B17 or Amygdalin): Benefits, Myths and Food Sources, <https://www.healthline.com/nutrition/laetrile-vitamin-b17>
- 4) Bromley J., Hughes B. G. M., Leong D. C. S., Buckley N. A. Life-threatening interaction between complementary medicines: Cyanide toxicity following ingestion of amygdalin and vitamin C. *Annals of Pharmacotherapy*. 2005;39(9):1566–1569. doi: 10.1345/aph.1E634
- 5) Conjoint use of laetrile and megadoses of ascorbic acid in cancer treatment: possible side effects, 1979 Sep;5(9):995-7, PMID: 522711
- 6) Newton G. W., Schmidt E. S., Lewis J. P., Conn E., Lawrence R. Amygdalin toxicity studies in rats predict chronic cyanide poisoning in humans. *Western Journal of Medicine*. 1981;134(2):97–103.
- 7) Shragg T. A., Albertson T. E., Fisher C. J., Jr. Cyanide poisoning after bitter almond ingestion. *Western Journal of Medicine*. 1982;136(1):65–69
- 8) Physician Beware: Severe Cyanide Toxicity from Amygdalin Tablets Ingestion- 2017; 2017: 4289527, DOI: 10.1155/2017/4289527
- 9) Figure 1 – excerpt from REBEL Review #67, <http://rebelem.com/rebel-reviews/>

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