

## Cancer Association of South Africa (CANSA)



### Fact Sheet on the Dangers of Alternative Cancer Treatment Utilising Vitamin B<sub>17</sub>

#### Introduction

It is claimed that a chemical found in apricot kernels, Vitamin B<sub>17</sub>, also known as 'Laetrile' and 'Amygdalin', all cyanide releasing substances, can cure cancer even though there is no evidence to support such claims.

Despite decades of research, dating back to the 1950s, there is no evidence that Laetrile or Amygdalin can treat tumours in animals or humans. Clinical trials in humans have failed to find any benefits. Proponents of Laetrile claim that cancer is caused by a vitamin deficit and that Laetrile, often referred to as Vitamin B<sub>17</sub>, helps to fix that deficit. However, Laetrile is not a vitamin and it is not essential for good health.



Laetrile is a partly man made (synthetic) form of the natural substance Amygdalin. Amygdalin is a plant substance found naturally in raw nuts and the pips of many fruits, particularly apricot pips, or kernels. It is also present in plants such as lima beans, clover and sorghum.

Some people call Laetrile Vitamin B<sub>17</sub>, although it is not a vitamin.

It also has the names:

- Mandelonitrile beta D gentiobioside
- Mandelonitrile beta glucuronide
- Laevorotatory
- Purasin
- Amygdalina
- Nitriloside

There is no scientific evidence to support claims that Laetrile or Amygdalin can treat cancer or any other illness. Despite this, it has been promoted as an alternative cancer treatment. Alternative treatment means that people use it instead of conventional cancer treatments such as cancer drugs

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or radiotherapy. The first use of Laetrile as a treatment for cancer was in Russia in 1845, and it was used in the USA from the 1920s.

**Třiskova, A. & Rudá-Kučerová, J. 2019.**

**Background:** Amygdalin is a natural compound primarily found in seeds of fruit trees. In the human body, it is hydrolyzed to benzaldehyde, glucose, and cyanide, which is considered the active component of amygdalin. The semi-synthetic form of amygdalin is known under the commercial name Laetrile® or as vitamin B17.

**Purpose:** This review aims to provide a comprehensive overview of studies that evaluated the potential therapeutic effects of amygdalin in oncology. Preclinical studies provided information about the mechanisms of action of amygdalin in vitro and in vivo and its toxicity. Recent in vitro studies demonstrated the effects of amygdalin on the cell cycle, apoptosis, and synthesis of cyclooxygenase-2, inducible nitric oxide synthase, E-cadherin, and integrins &#946;1 and &#946;4. However, amygdalin exhibited no or low treatment efficiency in preclinical in vivo studies. Conversely, many case studies describe the anti-tumor effects of amygdalin, but these have not been confirmed in clinical trials. Only two clinical studies published almost 40 years ago focused on the safety of amygdalin administered orally and intravenously. Although these studies reported that amygdalin had no benefit in 178 cancer patients, this compound has recently come to the attention of both scientists and patients. The results of recent in vitro studies are promising and indicate that amygdalin has an oncopreventive effect, although this must be confirmed by in vivo studies and clinical trials. Considering its proven toxicity and unconvincing clinical effects, amygdalin cannot currently be recommended to oncology patients as a supportive treatment.

**Shi, J., Che, Q., Xu, M., Xia, Q., Zheng, T., Teng, J., Ming, L. & Fan, L. 2019.**

The overall incidence of cancer is increasing in recent years. Despite advances in various comprehensive treatments, the mortality of advanced malignant tumors remains at a high level. Numerous pharmacological studies have confirmed that many Chinese herbal medicines possess remarkable antitumor activities. Amygdalin, mainly existing in bitter almond, is reported to have antitumor properties in addition to the antioxidative, antibacterial, anti-inflammatory and immunoregulatory activities. This article summarizes the structural characteristics of amygdalin, its antitumor mechanisms, and recent progress and achievement in the research of amygdalin, hoping that it could provide theoretical clues for exploring the clinical value of amygdalin against tumors. Amygdalin is known to have an antitumor effect in solid tumors such as lung cancer, bladder cancer and renal cell carcinoma by affecting cell cycle, inducing apoptosis and cytotoxicity, and regulating immune function. Further research is needed to elucidate the pharmacological mechanisms of amygdalin in terms of the optimal dosage, the feasibility of combined use of amygdalin with other antitumor drugs, and even artificial synthesis of the active components in amygdalin, for the sake of enhancing its antitumor activities and reducing its adverse effects for clinical use.

### **Side Effects of Laetrile (Vitamin B<sub>17</sub>)**

The [side effects](#) associated with [laetrile](#) treatment mirror the symptoms of cyanide poisoning. Cyanide is a [neurotoxin](#) that can cause the following side effects:

- [Nausea](#) and [vomiting](#).
- Headache.
- Dizziness.
- [Cyanosis](#) (bluish discoloration of the skin resulting from oxygen-deprived hemoglobin in the blood).

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Page 2

- [Liver](#) damage.
- [Hypotension](#) (abnormally low blood pressure).
- [Ptosis](#) (droopy upper eyelid).
- [Ataxic neuropathies](#) (difficulty walking caused by damaged nerves).
- Fever.
- Mental confusion.
- Coma.
- Death.

[Oral](#) laetrile causes more severe side effects than [injected](#) laetrile. These side effects can be potentiated (increased) by the concurrent administration of raw almonds or crushed fruit pits, and by eating fruits or vegetables that contain beta-glucosidase (e.g., celery, peaches, bean sprouts, carrots), or by taking high [doses](#) of [vitamin C](#) orally.

### **Position of the Cancer Association of South Africa**

The Cancer Association of South Africa (CANSA) recommends that one should not replace conventional cancer treatment with any type of alternative cancer therapy, such as Laetrile. Laetrile can cause serious side effects because of its cyanide content. It is also not recommended that Laetrile be used alongside or instead of conventional cancer treatment.

### **Other Sources of Cyanide**

Cyanide is a rare, but potentially deadly poison. It works by making the body unable to use life-sustaining oxygen. Cyanide compounds that can be poisonous include hydrogen cyanide gas, and the crystalline solids, potassium cyanide and sodium cyanide.

Common sources of cyanide poisoning include:

- Smoke inhalation from fires
- Industries that use cyanide (photography, chemical research, synthetic plastics, metal processing, and electroplating)
- Plants (such as apricot pits and a type of potato called cassava)
- The cancer treatment laetrile, and
- Cigarette smoking.

### **Uses of Cyanide**

In manufacturing, cyanide is used to make paper, textiles, and plastics. It is present in the chemicals used to develop photographs. Cyanide salts are used in metallurgy for electroplating, metal cleaning, and removing gold from its ore. Cyanide gas is used to exterminate pests and vermin in ships and buildings.

Hydrogen cyanide, under the name Zyklon B, was used as a genocidal agent by the Germans in World War II.

Reports have indicated that during the Iran-Iraq War in the 1980s, hydrogen cyanide gas may have been used along with other chemical agents against the inhabitants of the Kurdish city of Halabja in northern Iraq.

### **Toxicity of Cyanide**

Cyanide toxicity is generally considered to be a rare form of poisoning. However, cyanide exposure occurs relatively frequently in patients with smoke inhalation from residential or industrial fires. In addition, intensive treatment with sodium nitroprusside or long-term consumption of cyanide-containing foods is a possible source of cyanide poisoning. Historically, cyanide has been used as a chemical warfare agent, and it could potentially be an agent for a terrorist attack.

Depending on its form, cyanide may cause toxicity through inhalation, ingestion, dermal absorption, or parenteral administration. Clinical manifestations vary widely, depending on the dose and route of exposure, and may range from minor upper airway irritation to cardiovascular collapse and death within minutes. In severe cases, rapid, aggressive therapy consisting of supportive care and antidote administration can be lifesaving.

### **Vitamin B<sub>17</sub> and Cancer Treatment**

Laetrile (also known as Vitamin B<sub>17</sub>) is the name for a semi-synthetic compound which is chemically related to Amygdalin, a cyanogenic (cyanide producing) glycoside from the kernels of apricots and also from various other species of the genus *Prunus*. Laetrile and Amygdalin are promoted under various names for the treatment of cancer although there is no evidence for its efficacy. Due to possible cyanide poisoning, Laetrile and Amygdalin as well as so-called Vitamin B<sub>17</sub> can be dangerous.

The term 'Laetrile' is used interchangeably with 'Amygdalin' to designate natural substances, derived primarily from apricots and other kernels that can release cyanide, which is lethal to living organisms.

The cyanogenic diglycoside, Amygdalin, has gained high popularity among cancer patients together with, or in place of, conventional therapy. Still, evidence based research on Amygdalin is sparse and its benefit controversial.

A retrospective analysis was conducted by Blaheta, *et al.*, (2016) for Amygdalin relevant reports using the PubMed database with the main search term "Amygdalin" or "Laetrile", at times combined with "cancer", "patient", "cyanide" or "toxic". The researchers did not exclude any "unwanted" articles. Additionally, internet sources authorised by governmental or national institutions have also been included. The researchers concluded that no convincing evidence showing that Amygdalin induces rapid, distinct tumour regression in cancer patients, particularly in those with late-stage disease, is apparent. There was also no evidence that purified Amygdalin, administered in "therapeutic" dosage, causes toxicity. Multiple aspects of Amygdalin administration have not yet been adequately explored, making further investigation necessary to evaluate its actual therapeutic potential.

In the 1920s, Dr Ernst T Krebs (Senior) formulated a theory that Amygdalin could kill cancer cells. His theory was inconsistent with biochemical facts and has since been modified at least twice by his son,

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Ernst T Krebs (Junior). Extensive work has been done by cancer scientists to test the claims that Laetrile fights cancer. Many animal experiments in the 1970s showed a complete lack of tumour killing ability by Laetrile. Reviews of the medical records of patients whose cancers were claimed to be reduced or cured after Laetrile treatment found insufficient medical evidence to judge Laetrile's efficacy.

In a clinical trial among cancer patients reported in 1982, Laetrile neither caused shrinkage of tumours, nor increased survival time, neither alleviated cancer symptoms, nor enhanced well-being of any of the participants. Several reports, however, in the medical literature documented instances in which Laetrile caused serious, life-threatening toxicity when taken in large doses in the manner prescribed by Laetrile advocates.

A group of researchers found that various claims that Laetrile or Amygdalin has beneficial effects for cancer patients are not currently supported by sound clinical data. The researchers found that there is a considerable risk of serious adverse effects from cyanide poisoning after Laetrile or Amygdalin, especially after oral ingestion. The risk-benefit balance of Laetrile or Amygdalin as a treatment for cancer is, therefore, unambiguously negative. (Milazzo & Horneber, 2015).

Greenberg (1980) reviewed the evidence for the claims that Laetrile (Amygdalin) can prevent or control cancers. The beta-glucosidase content of cancer tissues is low compared to the tissues of normal liver and small intestine. Cancer tissues contain the enzyme *rhodanese* in amounts comparable to that of liver and kidney and hence, cannot be attacked selectively by cyanide release through beta-glucosidase action of Amygdalin. Amygdalin does not have the properties of a vitamin. Rats have been reared for several generations on diets devoid of cyanogenic glycosides, without developing neoplasms. Experiments with tumour-bearing rodents have demonstrated no curative properties by administration of the substance, Amygdalin.

Greenberg found that Amygdalin was not as non-toxic as claimed, particularly when ingested orally, and especially when taken with plant material high in beta-glucosidase. The claims for cure and control of cancers in humans were refuted. According to him, the writings of Laetrile proponents are also filled with erroneous and absurd statements.

In a study (Sauer, *et al.*, 2015) found that the use of complementary and alternative medicine (CAM) is widespread in children with cancer and its use is poorly regulated. They describe a case of severe cyanide poisoning arising from CAM use. A severely agitated, encephalopathic, unresponsive 4-year-old boy (initial Glasgow Coma Scale of 3) with a history of metastatic ependymoma (a type of childhood brain cancer) was brought to the emergency department by ambulance services. Initial blood gas analysis demonstrated severe metabolic/lactic acidosis. On detailed questioning of the parents, the use of CAM including intravenous and oral "Vitamin B<sub>17</sub>" (Amygdalin) and ingestion of apricot kernel was reported. After administering sodium thiosulfate, there was a rapid improvement in the child's medical condition with complete recovery without need for further intensive care treatment. His serum cyanide level was markedly elevated. Cyanide poisoning is known to cause severe encephalopathy in children receiving CAM treatment with substances containing cyanogenic glycosides.

In a research article by Kalyanaraman, *et al.*, (1983) there is a report of a 67-year-old woman with lymphoma who presented with a neuromyopathy following Laetrile (Amygdalin) treatment. She had significant elevation of blood and urinary thiocyanate and cyanide levels. Sural nerve biopsy

specimen revealed a mixed pattern of demyelination (disintegration of the myelin sheath of nerve cells) and axonal degeneration. The latter being very prominent. Gastrocnemius muscle biopsy specimen showed a mixed pattern of denervation and myopathy with Type II atrophy upon histochemical examination.

Kalyanaraman and his fellow researchers concluded that cyanide toxicity, secondary to Laetrile therapy, and nutritional deficiency caused the neuromyopathy, as the changes in peripheral nerve observed in the 67-year old woman were similar to changes described in ataxic polyneuropathy occurring in Nigeria where it was attributed to high cyanide content in the diet and nutritional deficiency. The patient's clinical condition improved following discontinuation of Laetrile treatment. This supported the diagnosis that her condition was caused by Laetrile (Amygdalin).

In a clinical trial by Moertel, *et al.* (1982), one hundred and seventy-eight patients with cancer were treated with Amygdalin (Laetrile) plus a "metabolic therapy" programme consisting of diet, enzymes, and vitamins. The great majority of these patients were in good general condition before treatment. None was totally disabled or in pre-terminal condition. One third had not received any previous chemotherapy. The pharmaceutical preparations of Amygdalin, the dosage, and the schedule were representative of past and present Laetrile practice. No substantive benefit was observed among the patients in terms of cure, improvement or stabilisation of cancer, improvement of symptoms related to cancer, nor extension of life span.

The hazards of Amygdalin therapy were evidenced in several of the patients through symptoms of cyanide toxicity or by blood cyanide levels approaching lethal range. The researchers concluded that Amygdalin (Laetrile) was a toxic drug that was not effective as a treatment for cancer.

### **About Clinical Trials**

Clinical trials are research studies that involve people. They are conducted under controlled conditions. Only about 10% of all drugs started in human clinical trials become an approved drug.

Clinical trials include:

- Trials to test effectiveness of new treatments
- Trials to test new ways of using current treatments
- Tests new interventions that may lower the risk of developing certain types of cancers
- Tests to find new ways of screening for cancer

The [South African National Clinical Trials Register](#) provides the public with updated information on clinical trials on human participants being conducted in South Africa. The Register provides information on the purpose of the clinical trial; who can participate, where the trial is located, and contact details.

For additional information, please visit: [www.sanctr.gov.za/](http://www.sanctr.gov.za/)

### **Medical Disclaimer**

This Fact Sheet is intended to provide general information only and, as such, should not be considered as a substitute for advice, medically or otherwise, covering any specific situation. Users

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