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Superiority of Methylcobalamin over Cyanocobalamin

SANJAY AGRAWAL

Introduction

Vitamins are used to treat and prevent certain deficiency states, as well as when a person's diet is known to be inadequate. Vitamin B12, also known as cobalamin, is one of the vitamin B complexes, which are made up of many different substances.

Depending on the ligand of the cobalt ion, the term "cobalamin" can refer to a variety of chemical forms of vitamin B12. Adenosylcobalamin, methylcobalamin, Cyanocobalamin, and hydroxycobalamin are all examples of these. Vitamin B12 (cobalamin) preparations have been used in medicine for a long time. Each type of cobalamin are available in significant sums in the human and animal organism. In the methionine synthase reaction, cobalamin plays a specific role in the metabolism of amino acids. Except for hydroxycobalamin, crystalline cobalamin are taken orally or parenterally to treat deficiency states.

Cyanocobalamin is a synthetic form of vitamin B12 that comes in the form of dark red crystals, orthorhombic needles, or crystalline red powder. In its anhydrous form, it is very hygroscopic and less soluble in water.

Methylcobalamin, also known as mecobalamin or methyl B12, is essential to healthy living. It is the only pharmaceutical form of vitamin B12 that can bypass biotransformation to cross the blood-brain barrier.

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Methylcobalamin comes in bright red crystals and has an octahedral cobalt (III) center. Methylcobalamin stands out as a unique compound with metal-alkyl bonds from the perspective of coordination chemistry. Nickel-methyl intermediates have been proposed as the final step in methanogenesis. Its methyl group stimulates serotonin secretion, a neurotransmitter that enhances mood and protects the brain from damage caused by excitatory neurotransmitters.

The primary objective of this article is to discuss the benefits and drawbacks of the two forms of B12 that we are interested in: methylcobalamin and Cyanocobalamin. These are the forms that are typically used as supplements.

Evidence suggests that methylcobalamin is superior to Cyanocobalamin.

Pharmacokinetics

- **Cyanocobalamin**

  Oral absorption in GI tract requires intrinsic factor and calcium, Cyanocobalamin takes a lot of effort to reduce it to the active form, hence Cyanocobalamin absorption varies greatly between individuals. Stored in the liver and bone marrow; crosses placenta, enters breast milk. Excreted unchanged in urine. Half-life is 6 days but it takes a lot of effort to reduce it to the active form, hence Cyanocobalamin absorption varies greatly between individuals

- **Methylcobalamin**

  Methylcobalamin oral administration has been shown to have a similar absorption rate, according to research. The amount of cobalamin distinguished following a little oral portion of methylcobalamin is like the sum following organization of Cyanocobalamin; However, administration of methylcobalamin results in a significant accumulation of cobalamin in liver tissue. Methylcobalamin has a half-life of six days and is excreted by the kidneys in a manner similar to that of Cyanocobalamin, indicating significantly greater tissue retention. These evidences promptly show methylcobalamin is utilized more efficiently than Cyanocobalamin to increase levels of one of the coenzyme forms of vitamin B12.

Mechanism of Action

Nucleoprotein and myelin synthesis, growth, cell reproduction, and hematopoiesis all depend on vitamin B12. Vitamin B12 appears to be most needed by cells with rapid division, such as myeloid cells, epithelial cells, and bone marrow cells. Because it is possible for vitamin B12 to become coenzyme B12 in tissues, it is necessary for the reactions methylmalonate to succinate and methionine synthesis from homocysteine, both of which require folate. Tetrahydrofolate cannot be regenerated from its inactive storage form, 5-methyltetrahydrofolate, without coenzyme B12, resulting in a functional folate deficiency. Sulfhydryl (SH) groups may also be kept in the reduced form required by many SH-activated enzyme systems by vitamin B12. Vitamin B12 is linked to protein synthesis and metabolism of fat and carbohydrates through these reactions. Lack of vitamin B12 brings about megaloblastic sickliness, GI injuries, and neurologic harm that starts with a powerlessness to deliver myelin and is trailed by steady degeneration of the axon and nerve head.

Cyanocobalamin absorption happens through the small intestine

subsequent to restricting to intrinsic factors and other cobalamin restricting proteins. At the point when given through the parenteral course, it arrives at the blood right away. In the blood, it attaches itself to plasma proteins. Tissues absorb vitamin B12 by certain B12 binding proteins, transcobalamin I and II, permitting it to enter the cells. The vast majority of the vitamin is put away in the liver. Vitamin B12 is fundamental for DNA combination and energy creation, especially in erythroid progenitor cells.

Methylcobalamin restores the harmed neuron. Without enough methylcobalamin, myelin sheath doesn't frame as expected because of which nerve strands endures and individuals experience irreversible nerve harm. An intrinsic factor made in the stomach, should be available in the digestive system to permit its legitimate absorption. Individuals coming up short on this factor show lack of vitamin B12 like pernicious anemia. Methylcobalamin is utilized as a cofactor in methionine transferase compound, a catalyst which changes over amino acid homocysteine to methionine through folate cycle

Uses

- Cyanocobalamin are shown in patients who require supplementation because of multiple factors. Portion necessities for vitamin B12 which are higher than normal (caused by pregnancy, thyrotoxicosis, hemolytic anemia, drain, danger, hepatic and renal infection) can ordinarily be accomplished with oral supplementation. Oral products of vitamin B12 are not suggested in patients with malabsorption, as these structures are basically caught up in the gastrointestinal tract.
- Methylcobalamin helps with neuronal lipid creation, axonal nerve recovery, and has a neuroprotective action that empowers neurons to work appropriately, in this manner reinforcing Alzheimer's disease, Parkinson's disease, dementia, and neuropathic disorders.

Adverse Effects

Cyanocobalamin shows most common side effect as diarrhea and swelling, other side effects include: Headache, heart failure, itching, swelling of the body, hypokalemia, thrombocytosis, pulmonary edema, hypersensitivity reactions including anaphylaxis.

"Adverse events reported with methylcobalamin use are infrequent and nonserious." – FDA

Even though at a very high dose, methylcobalamin causes blood clots, diarrhea, paresthesia, rhinitis, ataxia, pruritis and allergic reactions. Sometimes intravenous injection of this drug leads to hypersensitivity reactions and end up in anaphylactic shock. In some cases, hypokalemia and thrombocytosis have occurred in the patient while treating megaloblastic anemia with methylcobalamin

Current Scenario

There are two significant bodies that control the drugs and food varieties in our country one of them is the DCGI (Drug Controller General of India) and the other FSSI (Food handling Administrations Global). Presently the contention in our nation is that the DCGI has approved the utilization of methylcobalamin in the nation yet it has been restricted by the FSSI and just cynacobalamin is approved for the utilization.

Despite the fact that methylcobalamin is viewed as superior to cynacobalamin the utilization of methylcobalamin isn't permitted in the country.

The global market is focusing more on the utilization of methylcobalamin however not cynacobalaamin since the long term effects and release of free radicals for the end of cyanide despite the fact that present in modest quantities. Therefore every one of the nations are for the utilization of methylcobalamin since it is viewed as more protected and held for longer time in the body.

USFDA approved Methylcobalamin, while FSSAI is as yet unfit to reach a conclusion in India for a choice that USFDA supporting worldwide and methylcobalamin is superior to cynacobalaamin.

Conclusion:

Cynocobalamin which when enters the body leaves the cyanide group and takes methyl group from the human body to shape methylcobalamin as methylcobalamin is the dynamic type of vitamin B12 in the human body and helps in growth of healthy platelets, nerve cells in the body. It is the best treatment as well as dietary enhancement for individuals who can't ingest vitamin B12 and/or experiences its lacks.

Methylcobalamin is giving a very important methyl group that further improves our wellbeing (and doesn't take any, like cynacobalamin does). This is exceptionally significant for pernicious anemia patients or anybody experiencing high homocysteine levels. Methylcobalamin is considered significantly better utilized compared to other forms and is around 2.5 times more potent (about 1/3 less is excreted in the urine) than Cyanocobalamin

This donation of methyl groups and any remaining confirmations may be the support for methylcobalamin is superior to cynacobalamin and according to USFDA choice exceptionally soon in India methylcobalamin will be accessible in Indian market.

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New on the COVID-19 Hub

It was one year ago in March that the ACC released its first clinical bulletin addressing the cardiac implications of the novel SARS-CoV-2 (COVID-19) virus initially originating in Wuhan, China, and quickly making its way around the world.

The bulletin provided background on what was soon to be an official global pandemic, assessed information on the potential cardiac implications based on analog viral respiratory pandemics and offered early clinical guidance. Of note, the bulletin cautioned clinicians to be prepared for guidance to shift as more information became available, especially given the speed at which the virus was spreading and the uncertain clinical profile.

Not long after the bulletin, the first iteration of the ACC's COVID-19 Hub was born — offering a single place for clinicians around the world to easily keep up with the quickly shifting guidance and fast-tracked research. Overseen by the College's Science and Quality Committee, the Hub quickly became the go-to source for the latest clinical and operational guidance and clinical practice updates, as well as a place to share best practices and lessons learned from the front lines in countries like China, Brazil, Italy, Africa and the U.S.

At its peak in mid-March, the site was accessed by more than 300,000 people daily, with the greatest number of hits coming from individuals in the U.S, Canada, United Kingdom, India, Australia and Latin America. More than 7,500 people downloaded the original clinical bulletin, making it the most downloaded document in ACC.org history, while subsequent new guidance addressing topics like influenza and COVID-19, RAAS inhibitors, troponin and BNP use, and hydroxychloroquine drew upwards of 100,000 visits to the Hub each time new information was posted. Additionally, more than 56,000 clinicians from around the world tuned in for a live virtual webinar featuring firsthand insights from clinicians treating COVID-19 patients in China, while an early Cardio Smart patient education piece on COVID-19 and heart disease also rocketed to the top of most-searched items with more than 90,000 views. [Editor's Note: Turn to page 7 for more facts on the COVID-19 Hub, by the numbers.]

By late spring, the pace of content being posted to the Hub was nearly as fast as the spread of the virus itself and traffic averaged roughly 25,000 visits per day. The process established by the COVID-19 Hub leadership team to assess member needs and then work closely and quickly to engage with experts and develop and disseminate content was working.

- Cardiology