Universitat Autònoma de Barcelona

METABOLIC BASIS OF VITAMIN B12 REQUIREMENTS

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Introduction and objectives

Popularity of vegan and vegetarian diets is increasing constantly in our society. However, there is a molecule called vitamin B12 that can hardly be obtained from vegetal products. Does people know enough about the importance of vitamin B12? Are alternative vitamin B12 sources well-known amongst vegan community?

The aim of this project is to spread the knowledge about the importance of vitamin B12, in order to ensure everyone takes sufficient amounts of the molecule and to reduce vitamin B12 ingestion deficiencies.

What is vitamin B12?

It is the most complex vitamin of them all, being a B group vitamin, it is hydrosoluble. Also called cobalamin because of the cobalt atom it has, it can appear in four different forms, although we are interested in only 2 of them: Metilcobalamin and adenosylcobalamin. Moreover, our body can store it in the liver.

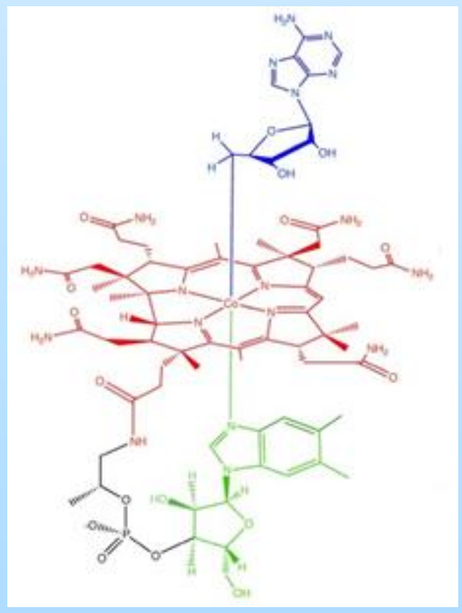


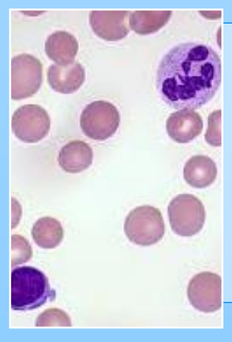
Figure 1: structure of adenosylcobalamine

Metabolic importance of vitamin B12

There are only two enzymes that utilize cobalamin as a cofactor in humans, however, both of them are of vital importance. Metilcobalamin catalyzes the reaction that regenerates methionine from homocysteine, making the activated methyl cycle possible, which is also related to other biologic processes such as DNA metilation.

Adenosylcobalamin is the cofactor of the enzyme L-metylmalonyl-CoA mutase. It's aim is to finally obtain succinyl-CoA, making our bodies capable of obtaining energy from certain fatty acids.

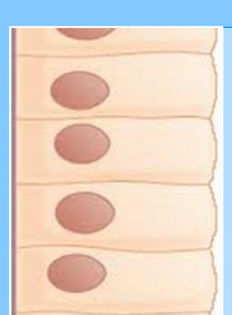
Vitamin B12 deficency symptoms



Pernicious anemia: condition in which the red blood cell count is low.

Megaloblastic anemia: disorder caused by the appearance of large red blood cells that can't function properly. As seen in the image, some red blood cells are larger.

Neurologic symptoms: Vitamin B12 deficiency would cause an accumulation of methylmalonic acid, which negatively affects the myelin around our nerves, Moreover, cobalamin's role as a cofactor in the methyl activated cycle helps regenerate and maintain the myelin. Which ultimately means that a wide range of neurological symptoms from dizziness to dementia can occur in case of vitamin B12 deficiency. The image represents a demyelinated neuron.



Gastrointestinal symptoms: Because of the effects that cobalamin deficiency has over DNA, rapidly multiplying cells such as gastric epithelial cells will be the first ones to be affected. Causing problems like malabsorption of nutrients and tongue inflammation. The image represents the gastrointestinal mucosa.

Some Vitamin B12 sources

Beef	0,7 – 5,2	Broccoli / asparagus	<0,01
Poultry meat	0,2 – 0,6	Tempe	0,7 - 8
Pork meat	0,4 – 2,0	There are also vitamin B12 fortified breakfast cereals. Some algae contain reasonable amounts too.	
Cow milk	0,2 - 0,7		
Eggs	0,9 – 1,4		

Vitamin B12 content represented as µg/100g

Recommended daily intake of vitamin B12 is 2.4µg

Conclusion: Vitamin B12 has proven to be vital for humans, participating in important metabolic pathways. Because of our storages of the molecule, any deficiency could not be noticeable until severe damage has occurred. This means that it is a necessity to ensure that we supply our organism with enough cobalamin. Although it is mainly obtained from animal origin products, there are still vegan and vegetarian alternatives which provide us considerable quantities of vitamin B12.