

# Vitamin B12 – Questions Answered

*This video summarizes the current information about vitamin B12. What is vitamin B12, what are the causes and prevalence of deficiencies, where is it found, and what is the best source? Dr. Pineda Ochoa answers all of these questions in this short video.*

- Sources
- Transcript
- Credits

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More and more mainstream health authorities are promoting plant-based vegan diets – like Kaiser Permanente, one of the

largest HMOs in the U.S. that wants to make plant-based diets “the new normal for [its] patients and employees”; or the president of the American College of Cardiology, Dr. Kim Williams, who vigorously promotes a vegan diet; or the chair of Harvard’s Department of Nutrition, Dr. Walter Willett, who recommends choosing plant proteins over animal proteins.

As we see this awareness about plant-based nutrition increase, concern is sometimes expressed about vegan diets and vitamin B12 deficiencies. Some might ask, “If a vegan diet really is healthy and natural, why do I need to watch my vitamin B12 levels or take vitamin B12 supplements?”

And this is a great question. So, let’s review the current information about vitamin B12, and the causes and prevalence of vitamin B12 deficiencies.

Vitamin B12, also called cobalamin, is a water-soluble vitamin. It is produced by bacteria, not animals or plants. So animals, including humans, must obtain vitamin B12 directly or indirectly from bacteria.

In the past, vitamin B12 from bacteria was naturally and more reliably present in plant foods. Today, however, with modern hygienic practices that more deeply clean and sanitize our produce, along with the soil being exposed to more antibiotics and pesticides, most plant foods are no longer reliable sources for vitamin B12. And, it’s probably not a good idea to go back and reverse sanitary practices just to get more of this bacterial product in our diet.

For this reason, we have seen that people who abstain from eating animal foods can have lower levels of vitamin B12. But it’s important to also know that vitamin B12 deficiencies are not uncommon in the general population regardless of diet, even among many those eating large amounts of animal foods.

As this review in the American Journal of Clinical Nutrition notes, “[a]cross studies in Latin America, ≈40% of children

and adults [were found to have a] deficient or marginal status" of vitamin B12. In the U.S., full-blown vitamin B12 deficiencies are estimated to occur in about "≈4% of those aged 40-59", and "≈6% of those aged ≥60", with approximately 20% of those over the age of 60 having a marginal status. That's a really high prevalence for a vitamin deficiency in the general population.

Another review that combined nine studies in the U.S. found that 40% of patients had unexplained low B12 levels, which the researchers attributed to what's called "food cobalamin malabsorption", where the B12 that is naturally present in foods is simply not absorbed. Luckily, these people are still able to absorb the crystalline form of vitamin B12, which is the form that is used in supplements and B12-fortified foods.

So, it happens to be the case that there are many things that can go wrong with our bodies using or absorbing vitamin B12, regardless of our diet, because the absorption process is fairly complex and requires specific physiologic elements to take place for it to occur adequately.

One crucial factor, for example, is a step where vitamin B12 has to be coupled with a substance called "intrinsic factor," which is produced in the parietal cells in our stomach. Then, most of the absorption for this coupled pair occurs in the third segment of the small intestine (or ileum). As such, any problem in those portions of our gastrointestinal tract can lead to B12 deficiencies.

For example, *H. pylori* infection, alcohol abuse, smoking, atrophic gastritis, and conditions that slow the movement of food in our gastrointestinal tract (such as diabetes, scleroderma, strictures, diverticula) are all associated with vitamin B12 deficiencies.

So many conditions that affect the gastrointestinal tract can lead to B12 deficiencies, from something big and notorious

like a gastric bypass or resection, to something much more common like bacterial overgrowth in the upper intestine. But, fortunately, here too, with bacterial overgrowth, the crystalline form of vitamin B12, which is the form that is added to fortified foods and used in supplements, can still be absorbed okay.

Some medications can also cause vitamin B12 deficiencies, including long-term use of antacids (or acid-suppressing drugs) – which, by the way, have been classified as the most commonly used pharmaceuticals in the U.S. Gastric acid in our stomach is required to separate vitamin B12 from dietary proteins for it to be absorbed. Thus, medications that suppress the production of gastric acid can lead to B12 malabsorption. This study concluded, both previous and current antacid use was associated with B12 deficiency.

Lastly, there is also a genetic variant of a B12 transporter in our body that some people have that is associated with low B12 levels, and this genetic variant is present in 20% of the population.

So, as you can see, vitamin B12 adequacy is a delicate matter, and deficiencies are fairly common in the general population. So, regardless of one's diet, it's something that people need to be mindful of.

Now moving on to other issues – where can we find vitamin B12? Well, let's remember it's made from bacteria. Our own intestinal tract contains feces and B12-producing bacteria. However, we think that the majority of the B12 produced by bacteria in our gut occurs in the large intestine, which is further down from the small intestine where most of the B12 absorption takes place. So, a lot of the B12 produced in our intestine is excreted in our feces. Some studies have shown though that bacteria in our small intestines may also synthesize significant amounts of vitamin B12, but it's not clear whether sufficient amounts are made and absorbed to meet

our nutritional needs.

So our own human feces contain large quantities of vitamin B12. As unpleasant as this may sound, we actually do end up inadvertently eating feces sometimes. Which brings me to another source that has B12 from bacteria – animal foods.

Now, just like us, animals don't make vitamin B12. They obtain it either directly or indirectly from the bacteria that makes it.

Also adding manure usually results in higher vitamin B12 levels. Scientists even found that adding manure to the soil where spinach was growing added B12 to the spinach leaves. And, many animal foods have significant amounts of manure and thus bacterial contamination.

Thanks to the FDA retail meat monitoring program, we know that 98% of chicken breasts sampled over seven years were contaminated with fecal bacteria; ground turkey 94%; ground beef 93%; and pork chops, a little bit lower at 86.9%, but still very high. Manure from some animals is even used to feed other animals in the livestock industry. And while this can raise B12 levels in the animal fed the manure, it also raises some serious health concerns.

But apart from infectious disease related concerns with bacterial contamination, animal products – regardless of how clean they may be – are not the best source for vitamin B12, because consuming them results in us having increased levels of cancer promoting hormone IGF-1, as well as cholesterol, TMAO, phosphorus, heme-iron, and other substances that are problematic for our health. Better sources of B12 are fortified plant foods, like non-dairy milks, nutritional yeast and the like.

And apparently some plant foods can have considerable amounts of vitamin B12 due to bacterial contamination during the production process, or because they live a symbiotic

relationship with bacteria. For example, this article in the journal *Nutrients* found the following plant foods to contain vitamin B12: tempe, which is a fermented soybean-based food, due to bacterial process in its production; vegetable products that are fermented with bacteria; various types of tea leaves; fruiting bodies of shitake and another types of mushrooms; and, apparently, the most widely-consumed algae also contains levels of vitamin B12.

B12 can also be found in lakes if the water has not been sanitized. And although it's not a good idea to drink un-sanitized water in general, we really get the picture of how this is a bacterial and not an animal product.

Again, it's not a good idea to go back and reverse sanitary practices in order to get more of this bacterial product in our diet, since bacteria can also cause disease. It's also not a good idea to get vitamin B12 from animal foods, given the problematic health issues associated with consuming animal foods that I mentioned earlier.

From a health standpoint, it's best to go with a plant-based vegan diet. Just like Harvard's Healthy Eating Plate recommends, "Go with plants. Eating a plant-based diet is [best]."

So, what I recommend is to monitor vitamin B12 levels or take a B12 supplement, or both, and include plant-based B12-fortified foods in your diet.

I personally don't take a B12 supplement, but I have my B12 levels checked every year. I've been eating a plant-based vegan diet with no animal products for about five years now. And, at my most recent insurance-required annual checkup, my B12 level was 884 pg/mL, which is within the normal range. If it wasn't within normal range, then I would just take a supplement, which is an easy fix.

But, I definitely keep an eye on my levels, and I recommend

both vegans and non-vegans alike to do the same. Thank you very much.

***This transcript is an approximation of the audio in above video. To hear the audio and see the accompanying visuals, please play the video.***

This video was written and narrated by Sofia Pineda Ochoa, MD, and edited by Bob Rapfogel.

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Without limiting the foregoing, this presentation also includes the following (in order of appearance in the video):

- Screenshots and text from the following other websites:  
(1) American College of Cardiology Website: "Latest in Cardiology – ACC Presidential Year in Review: Kim Allan Williams Sr., MD, FACC", available here (accessed May 17, 2016); (2) Daily Kos website: "President-elect of American College of Cardiologists [sic] is Vegan", available here (accessed May 17, 2016); (3) Harvard TH Chan School of Public Health website, "Walter Willett – Fredrick John Stare Professor of Epidemiology and Nutrition, Chair, Department of Nutrition", available here (accessed May 17, 2016).