Fortification of Foods with Vitamin D

Buyer Beware: Not All Foods are Fortified With Vitamin D as they Should Be

Tag Words: Vitamin D; Vitamin D deficiency; fortified with vitamin D

Authors: Hanny Jhummat, Amanda Talal with Julie M. Fagan, Ph.D

Summary

Vitamin D is important for overall health and yet many Americans do not get enough of it on a daily basis. There are very few foods that naturally contain vitamin D, so the fortification of foods with vitamin helps people get what they need. Foods that are mostly commonly fortified with vitamin D include milk, cheese, yogurt, and breakfast cereals. However, these foods are not required to be fortified with vitamin D; the decision to fortify these foods is left to the food manufactures. We found that certain brands of yogurt to not be fortified with Vit D (ShopRite brand, My Essentials) so we have sent them a letter asking them to fortify their yogurts with vitamin D.

Video Link
http://youtu.be/0Y3Tu_9yGEk

Importance of Vitamin D (AT)
Vitamin D is an important vitamin that is essential to one’s health and has many roles. Vitamin D is required for the absorption of minerals such as calcium and phosphorus. When combined with calcium, Vitamin D helps increase bone density in postmenopausal women. Pregnant Women need to take vitamin D for themselves and their babies, so there will be no birth defect or other problems, like premature weight, once the baby is born. Besides maintaining bone strength, vitamin D also helps prevent the spread of diseases such as diabetes. Vitamin D deficiency results in weak bone conditions like rickets and osteoporosis (1).

Forms of vitamin D (AT)
There are two types of Vitamin D, vitamin D2, also known as ergocalciferol, and vitamin D3, known as cholecalciferol. Vitamin D2 is developed from fungi organisms by energizing ergosterol from sunlight radiation and is always present in the body (8). The value of vitamin D3 is greater than the value of vitamin D2. while vitamin D3 is the main form of vitamin D and is gathered from several sources. Vitamin D3 on the other hand, is obtained in the skin after having some sunlight. There are several ways that you can obtain vitamin D3 (3). For instance, numerous types of foods contain vitamin D3. If foods do not give you the adequate amount of vitamin D3, you can also take supplements to compensate for the amount of vitamin D3(3). Vitamin D3 can be obtained from the sun(2). So, the more times you go outside, the more vitamin D3 you will absorb. It is recommended that you spend 15-20 minutes outdoors to absorb the right amount of vitamin D3 (2). Vitamin D3 helps prevent bone disorders, like osteoporosis.
and rickets. If people do not get enough vitamin D in foods, they should take supplements so they won’t get any kind of bone disorders and deficiencies.

Vitamin D can be used for prescription purposes as well, like calcitriol and vitamin D analogs. These types of vitamin D are also synthetic, meaning that they are established from typical vitamin D metabolites. Like anything that is good for you, too much of it can be harmful to one’s health especially with calcitriol because it increases hypercalcemia if too much is taken. Using vitamin D analog helps to reduce the risks of calcitriol and getting the wholesome affects (8).

When vitamin D is produced, either inside the skin or taken orally, it breaks down into two forms, calcidiol, 25-hydroxyvitamin D, and calcitriol, 1,25-dihydroxyvitamin D. Calcidiol is composed in the liver and is a prehormone. Calcidiol helps with figuring out one’s vitamin D status because the body uses calcidiol as the main storage of vitamin D. Calcidiol is also the one that people mean when they talk about vitamin D levels. Calcidiol also helps with process of calcitriol, is manufactured in the kidneys, and is the dominate steroid hormone in the body. Calcitriol helps with DNA and with genes stimulation. Calcitriol is not a very good signal to see if your levels of vitamin D are good (8).

**Foods that have Vitamin D (AT)**
Numerous foods contain vitamin D. There are several types of fish that contain vitamin D like: flesh of fatty fish, salmon, tuna, and mackerel, and fish liver oil. Beef liver, cheese, and egg yolks contain vitamin D3. In fact, if people need to raise their Vitamin D2 levels, mushrooms are the way to go. They provide an adequate amount of vitamin D2 and will help raise your low levels of vitamin D2. Several dairy products contain Vitamin D as well like: swiss cheese and very few types of yogurt. Ready-to-eat cereals and orange juice also contain vitamin D (3). People should eat as much foods as they can so they can get vitamin D, or take supplements if they for some reason cannot get access to these foods or eat these foods. As long as people eat these foods, they will get enough vitamin D3.

**Food Sources of Vitamin D**

<table>
<thead>
<tr>
<th>Food</th>
<th>IU per serving*</th>
<th>Percent DV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cod liver oil, 1 tbsp</td>
<td>1,360</td>
<td>340</td>
</tr>
<tr>
<td>Swordfish, cooked, 3 oz</td>
<td>566</td>
<td>142</td>
</tr>
<tr>
<td>Salmon (sockeye), cooked, 3 oz</td>
<td>447</td>
<td>112</td>
</tr>
<tr>
<td>Tuna fish, canned in water, drained, 3 oz</td>
<td>154</td>
<td>39</td>
</tr>
<tr>
<td>Orange juice fortified with vitamin D, 1 cup</td>
<td>137</td>
<td>34</td>
</tr>
<tr>
<td>Milk, nonfat, reduced fat, and whole, vitamin D fortified, 1 cup</td>
<td>115-124</td>
<td>29-31</td>
</tr>
<tr>
<td>Yogurt, fortified with 20% of the DV for vitamin D, 6 oz</td>
<td>80</td>
<td>20</td>
</tr>
</tbody>
</table>
### Yogurts (HJ)

Yogurts have been promoted as being an important source of many nutrients. Yogurt is a good source of protein, calcium, phosphorus, and potassium. Yogurts that are made with active cultures include two types of probiotics which are Lactobacilli and Bifidobacteria. These probiotics are beneficial for the digestive system since they help the intestines maintain the right acidity. Probiotics also help the body fight diseases by reducing or preventing bacterial toxins.

Many people who are not able to tolerate milk because of protein allergy or lactose intolerance can eat yogurt. Yogurt becomes more digestible than milk because of the culturing process. The live active cultures create lactase which is an enzyme lactose intolerant people lack. Beta-galactosidase is another enzyme in yogurts that improve the absorption of lactose in lactase-deficient people. The enzymes which are created during the culturing process are able to partially digest the protein casein, which makes it easier to absorb and less allergenic. The culturing process breaks down lactose into glucose and galactose, sugars that can then be absorbed by lactose intolerant people.

Yogurts come in a variety of flavors, forms, and textures. There are several types of yogurt: regular, lowfat, nonfat, and greek. Yogurt that is made from whole milk has at least 3.25 percent milk fat. Low fat yogurt has between 2 and 0.5 percent milk fat. Nonfat yogurt is made from skim milk and has less than 0.5 percent milk fat. There are light yogurts which have 50% reduction in fat than regular yogurts. Greek yogurt, which is very rich, creamy, and thick, differs from regular yogurt is that Greek yogurt is allowed to rest in a cheesecloth that drains away the liquid whey. The draining of the whey gives the Greek yogurt a creamy and thick appearance. Greek yogurt has twice the protein content of regular yogurt. Greek yogurt is generally higher in calories than light yogurts as it contains more protein but it also has lower amounts of carbohydrates, sodium, potassium, and salt. Greek yogurt has three times less calcium than regular yogurt. The low calcium levels in this yogurt are due to the triple straining process in which the liquid whey is removed that contains calcium.
Brands that are fortified with vitamin D

<table>
<thead>
<tr>
<th>Name of Brand</th>
<th>%DV value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breyer's Creme Savers</td>
<td>30%</td>
</tr>
<tr>
<td>Breyer's Light</td>
<td>20%</td>
</tr>
<tr>
<td>Dannon Light &amp; Fit</td>
<td>20%</td>
</tr>
<tr>
<td>Stonyfield Farm Fat-Free</td>
<td>20%</td>
</tr>
<tr>
<td>Stonyfield Farm Lowfat</td>
<td>20%</td>
</tr>
<tr>
<td>Yoplait Original</td>
<td>20%</td>
</tr>
<tr>
<td>Yoplait Light</td>
<td>20%</td>
</tr>
<tr>
<td>Yoplait Thick and Creamy</td>
<td>20%</td>
</tr>
<tr>
<td>Stonyfield Farm Fat-Free Probiotic</td>
<td>15%</td>
</tr>
<tr>
<td>Dannon Light &amp; Fit 0%-Plus</td>
<td>10%</td>
</tr>
<tr>
<td>Yoplait Fiber One</td>
<td>15%</td>
</tr>
</tbody>
</table>

http://health.usnews.com

Store brand yogurts

<table>
<thead>
<tr>
<th>Name of Brand</th>
<th>%DV value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wegmans Blended Lowfat Strawberry Yogurt</td>
<td>20%</td>
</tr>
<tr>
<td>Wegmans Blended Nonfat Vanilla Yogurt</td>
<td>20%</td>
</tr>
<tr>
<td>Archer Farms Fat Free Thick and Creamy Vanilla Yogurt</td>
<td>20%</td>
</tr>
<tr>
<td>Great Value Strawberry Lowfat Yogurt</td>
<td>15%</td>
</tr>
<tr>
<td>Fit &amp; Active Vanilla Nonfat Yogurt</td>
<td>25%</td>
</tr>
</tbody>
</table>

**Daily intake of Vitamin D (AT)**

Certain amounts of vitamin D should be taken daily because not the right amount can be hazardous to one’s health. For infants 0-12 months old, 400 IU(10 mcg) should be taken. While,
for children and adult 1-70 years old, 600 IU (15 mcg) should be taken. It is important for people to take the necessary amount of vitamin D so no deficiency will occur (3). People of all ages should take vitamin D. Children especially should take the right amount of vitamin D so there won’t be any problems in the future.

Recommended Dietary Allowances for Vitamin D

<table>
<thead>
<tr>
<th>Age</th>
<th>Male</th>
<th>Female</th>
<th>Pregnancy</th>
<th>Lactation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-12 months*</td>
<td>400 IU (10 mcg)</td>
<td>400 IU (10 mcg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-13 years</td>
<td>600 IU (15 mcg)</td>
<td>600 IU (15 mcg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14-18 years</td>
<td>600 IU (15 mcg)</td>
<td>600 IU (15 mcg)</td>
<td>600 IU (15 mcg)</td>
<td>600 IU (15 mcg)</td>
</tr>
<tr>
<td>19-50 years</td>
<td>600 IU (15 mcg)</td>
<td>600 IU (15 mcg)</td>
<td>600 IU (15 mcg)</td>
<td>600 IU (15 mcg)</td>
</tr>
<tr>
<td>51-70 years</td>
<td>600 IU (15 mcg)</td>
<td>600 IU (15 mcg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;70 years</td>
<td>800 IU (20 mcg)</td>
<td>800 IU (20 mcg)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Adequate Intake

http://ods.od.nih.gov/factsheets/VitaminD-HealthProfessional/

**Vitamin D deficiency (HJ)**

Vitamin D deficiency affects the growth and development of cells, teeth, bones, and regulation of hormones. Recent studies have also linked vitamin D deficiency to diseases such as heart disease, hypertension, diabetes, cancer, and other illnesses. Vitamin D deficiency is the result of insufficient exposure to sunlight, improper diet, or problems related to the absorption of vitamin D. If the body is not exposed to enough sunlight, then the body is unable to absorb the vitamin. In order to get enough vitamin D from sunlight, the body needs to be exposed to it for at least fifteen minutes without the use of sunscreen.

Vitamin D deficiency may also occur if your kidneys are unable to convert vitamin D into its active form. As you age your kidneys are less able to perform this function. Certain diseases such as Crohn’s disease, cystic fibrosis, and celiac disease can also affect the intestine’s ability to absorb vitamin D from foods. People who are obese also have lower levels of vitamin D because Vitamin D is taken from the blood by fat cells, which alters its release in circulation.

Children with vitamin D deficiency can develop rickets, which is the softening of the bones. The symptoms of vitamin D in children include muscle aches, bone pain, and weakness. Young infants who are at risk for developing rickets may have muscle spasms, a soft skull, and slowness to crawl and sit up. Children who are breastfed and do not receive vitamin D supplements are at a greater risk for developing rickets. The American Academy of Pediatricians recommends that all infants have a minimum intake of 400 IU per day. A supplement of 400 IU is recommended because human milk contains a vitamin D concentration of about 25 IU per liter. Vitamin D deficiency in adults leads to osteomalacia and osteoporosis. Osteomalacia is a blood thinning
disorder and is characterized by proximal muscle weakness and bone fragility. Osteoporosis is a condition in which bone mineral density is reduced and bone fragility is increased.

**Health problems related to vitamin D deficiency**

**Vitamin D and Diabetes (AT)**

Type 2 diabetes, also called diabetes mellitus is a very serious problem. This results from having high levels of blood glucose and low levels of insulin. Type 2 diabetics have problems with the use of insulin in their body because they are insulin resistance. Diets that not healthy and being obese can make type 2 diabetes worse. Sunlight is very important because this increase vitamin D, reduces body fat, and decreases blood glucose levels which in turn helps with type 2 diabetes (12).

Vitamin D helps with controlling insulin by keeping calcium levels normal in the blood. It affects the pancreas directly which makes insulin. The genes are also affected with glucose resistance. Since glucose resistance is affected, this helps with insulin resistance by increasing levels of insulin. Calcium can vitamin D help prevent type 2 diabetes (12).

Vitamin D may help to prevent type 2 diabetes in people because it reduces the chances of type 2 diabetes. Serum 25-Hydroxyvitamin D Concentration and Subsequent Risk of Type 2 Diabetes showed that vitamin D deficiency is associated with impaired β-cell function and insulin resistance in animals and humans is in line with that hypothesis. The purpose of this experiment was to evaluate the prediction of serum 25-hydroxyvitamin D (25OHD) on subsequent type 2 diabetes incidences (4).

There were some risks that were associated with of type 2 diabetes between quartiles of serum 25OHD, adjusted for confounding factors. The relationship between serum 25OHD and type 2 diabetes had very low risks associated with correlation. In fact, people who had high level of serum 25OHD in their body resulted in a low BMI. Basically, The result showed an inverse relationship between serum 25OHD and risk of type 2 diabetes in this study. So, serum 25OHD does help reduce the chances of type 2 diabetes (4).

**Vitamin D and Pregnant Women (AT)**

Vitamin D is essential for pregnancy because vitamin D is needed to keep the levels of calcium and phosphorus normal. An insufficient amount of vitamin D can cause problems, like growth retardation and skeletal problems when women are pregnant. If the mother has low amounts of vitamin D, their child will also have low amounts of vitamin D when they are born. This can result in rickets, bones will not grow normally, and their physical development will take longer. Lack of vitamin D can affect immune function also. These abnormalities can last a long time, even through adulthood (13).

Insufficient amount of vitamin D can cause pregnancy problems. The mother can have a higher chance of delivering through c-section. Also, the mother can have preeclampsia, which is hypertension related with not enough protein in the urine. Vitamin D is very important for pregnancy (13).
Milk is very important because it is a good source of vitamin D, calcium, riboflavin, protein and energy during the time when women are pregnant. But, there are many women who to told to or do not drink their milk for numerous reasons and one reason is that they want to prevent allergies in their children. Not having enough milk in their diet jeopardize the quality of the maternal diet. In fact, women who do not drink milk may not obtain adequate levels of vitamin D, calcium, protein or riboflavin. Women who are not getting enough milk, in time will acquire high blood pressure, rickets and decreased birth weight that can result in their child being in a intensive care unit (5).

In the end, women who did not take the right amount of vitamin D or fortified milk did affect their baby in a way that it decreased the baby’s birth weight. Even with these results, more pregnant women are reducing their intake of fortified milk or vitamin D. Researchers think that the daily intake of vitamin D for pregnant women should increase since not getting the adequate amount of vitamin D can affect their baby. As you can see, vitamin D is very important (5).

**Fortification of foods with Vitamin D (HJ)**

Fortification of foods with vitamin D has been an important strategy for meeting the recommended intake for vitamin D since very few foods are naturally found to be rich in this vitamin. Two forms of vitamin D that are used to fortify foods are vitamin D2 (ergocalciferol) and vitamin D3 (cholecalciferol). Both of these vitamins raise 25-hydroxy vitamin D levels, but vitamin D3 is about three times more effective at maintaining those levels. Mostly all fluid milk in the U.S. is fortified with Vitamin D3 since it is readily available. Ready to eat cereals, milk substitutes, yogurts, some cheeses, and juices are also fortified with vitamin D. They generally provide 10-25% of the Daily Value.

Vitamins that are used for fortification come in different forms that can affect the final product. Vitamins come as different isomers, compounds, and formats. The suppliers assist the foods manufacturers to develop the desired product. Food manufacturers face challenges in developing a desired product that will not affect the flavor, solubility, sensory properties, and the bioavailability of the final product. The supplier is able to guide the food manufacturers throughout the process by providing suggestions that will help them reach their goal. A custom premix designed for specific products is needed in order to add vitamin D to those products. The custom premix is used to avoid the changes in taste and mouthfeel of the final product. Another issue that food manufacturers have to face is that vitamin D is not stable at low pH in the stomach. At low pH levels vitamin D gets converted into 5, 6-trans Vitamin D and isotachysterol. This form of vitamin D does not provide any benefits to the body.

There are only some foods that are authorized to be fortified with vitamin D. Foods that are fortified with vitamin D are regulated in the U.S. in agreement with FDA’s Code of Federal Regulations. Vitamin D is stated as being Generally Recognized as Safe (GRAS) at specific maximum levels of safe use for different food categories. For example breakfast cereals need to be (350 IU/100 g), milk (42 IU/100 g), and milk products (89 IU/100g). These levels are set by the FDA to avoid the potential for toxicity if it is consumed at very high doses.
Vitamin D supplements (HJ)

Americans spent an estimated $10 billion on vitamins and minerals in 2008, according to the Nutrition Business Journal. The importance of vitamin D has led to an increase in the intake of vitamin D to improve health. A government study found that more than half of American adults take at least one dietary supplement. The use of vitamin D supplement increased for all women aged 60 and over from 2003 to 2006 according to the National Center for Health Statistics. Vitamin D is especially important in the prevention of osteoporosis so there has been an increase in the supplements of vitamin D and vitamin C for this reason. There are a variety of vitamin D supplements to choose from but the amount varies widely so it is important to read the labels. Vitamin D is available as an individual supplement and it is also included in most multivitamins.

Addressing the Issue

As we learned about the importance of vitamin D through this research, we realized how the fortification of foods is related to the decline in vitamin D deficiencies. While we were researching on the types of yogurt that were fortified with vitamin D, it came to our attention that two brands of yogurt did not fortify their yogurts, which are ShopRite and My Essentials. In order to address this issue, we contacted both food manufacturers asking them for the reason as to why they do not add vitamin D to their yogurts. As of right now we are still waiting for their response on this matter. We also wrote letters to both food manufacturers asking them to consider fortifying their yogurts with vitamin D.

Letters we wrote to My Essentials and Wakefern Food Corporation:

Attn: Customer Relations
P.O. Box 1330
Salisbury, NC, 28145-1330

To My Essentials,

Many people buy foods like yogurt because they think it contains vitamin D and they may need these foods because they may be vitamin D deficient. Many foods, including yours (My Essential yogurts), are not fortified with vitamin D. Vitamin D deficiency leads to weak bone disorders like rickets and osteoporosis. Vitamin D is also essential for pregnant women. More women are lowering their amount of milk and vitamin D intake. This can result in jeopardizing their maternal diet and hypertension. This is also very important for the baby because an inadequate amount of vitamin D can result in decreased birth weight. Studies have shown that vitamin D has a relationship with insulin by making it harder for blood sugar levels to decrease. So, taking vitamin D will help with lowering blood sugar levels and possibly prevent type 2 diabetes.

Supplementing your My Essential yogurts with vitamin D will benefit many people. You should fortify your food (My Essential yogurts) with vitamin D. If more people knew that your product
had vitamin D, then maybe more people would buy it. Please consider this; you would also benefit from it in terms of increased sales).

Sincerely,
Amanda Talal,

Wakefern Food Corporation
600 York St.
Elizabeth, NJ 07201

To Wakefern Food Corporation:

We are students at Rutgers University and we are researching on the importance of food fortification with vitamin D for our class project. While working on our class project on the importance of vitamin D, we have learned how the fortification of foods has contributed to the decline in vitamin D deficiency. According to the National Institutes of Health Office of Dietary Supplements, one third of all those that are over the age of one receive their vitamin intake from foods. Since only a few foods are naturally rich in this vitamin, many people depend on fortified foods to meet the daily recommended intake for vitamin D. The foods that are most commonly fortified with vitamin D are milk, cheese, yogurt, and breakfast cereals. The prevalence of vitamin D deficiency in the United States has remained lower than other countries due to the fortification of these foods.

While researching on this project, it has come to our attention that the ShopRite brand yogurt is not fortified with vitamin D. As of yet we are not aware of why your brand is not fortified with vitamin D but most other brands are able to fortify their yogurts with vitamin D. Brands such as Yoplait, Dannon, Archer Farms, Wegmans, Fit and Active, Stonyfield and Great deals have fortified their yogurts with vitamin D. These brands have fortified their yogurts in order to meet the needs of people who have vitamin D deficiency or possibly are at risk for becoming vitamin D deficient.

As Americans try to increase their daily intake, their options of foods fortified with vitamin D are limited. People assume that dairy products such as the ShopRite yogurt are fortified with vitamin D. It is surprising to know that your brand is not fortified especially since both vitamin D and yogurt provide many benefits to our health. People are now aware of the benefits that vitamin D provides to their health, so they seek out food products that have vitamin D in them. We hope that you will look into this matter and consider fortifying your brand of yogurt with vitamin D in the near future.

Sincerely,
Hanny Jhummat and Amanda Talal

References:


Letter to the Editor (sent to the Trentonian)

Dear Editor:
I am writing in regard to the importance of vitamin D and the need to fortify more foods with vitamin D. Vitamin D deficiency is becoming a global problem and recent estimates indicate that greater than 50% of the population is at risk. Vitamin D deficiency is the result of insufficient exposure to sunlight, improper diet, or problems related to the absorption of vitamin D. The increasing use of sunscreen and wearing long sleeves to prevent skin cancer has played a role that has lead to a substantial increase in vitamin D deficiency. Vitamin D deficiency not only leads to osteoporosis but studies also indicate that it affects other illnesses such as diabetes, obesity, cancer, and depression.

Many Americans struggle to meet the recommended daily intake of vitamin D, so they depend on fortified foods and vitamin D supplements to meet this need. Foods are fortified with vitamin D since very few foods are naturally found to be rich in this vitamin. Milk is usually always fortified with vitamin D. There are other foods such as yogurts, cheeses, and cereals that are also fortified with vitamin D. But it has come to my attention that there are some food brands that do not fortify some of their foods with vitamin D. For example, the ShopRite brand does not fortify their yogurts with vitamin D. Since many Americans are struggling to get the required intake of vitamin D, it is important that ShopRite should consider fortifying their yogurts with vitamin D as well.

Sincerely,
Hanny Jhummat

Letter to the Editor sent to Asbury Park Press

To The Editor,

Vitamin D is very important to have in your diet. Many people do not get enough vitamin D. A lot of it is food companies’ fault because many “fortified” foods do not contain vitamin D. Many people do not know this and sometime they buy the foods, like yogurt, because they think it contains vitamin D, but it doesn’t. Consumers don’t carefully look at the ingredients on the package before purchasing. Vitamin D is very important because it helps prevent bone disorders, like osteoporosis, and is important for pregnant women. What must be done is contact food companies, like yogurt brands and supermarket brands, and get them to include vitamin D in their foods.

Sincerely,
Amanda Talal