

Multivitamins Lack Enough Choline

BreAnn McCord
Beloit College
Beloit, Wisconsin

Method (cont'd)

Hazard – According to the Linus Pauling Institute at Oregon State University (reference), if a pregnant woman does not get enough choline in her body she is at risk of severe liver damage and possibly liver cancer. The unborn child will not develop properly and may possibly develop the neural tube defect spina bifida (when the spinal cord does not develop properly and results in an opening in the spine and sticks out through an opening in the bones-See Figure 5). Too much choline results in what is called the fishy odor syndrome. That is when the body does not break down choline properly and the body releases a trimethylamine odor which results in a fishy smell.

My hypothesis is that multivitamins do not provide adequate choline for brain development in pregnancy and early childhood

Abstract

Choline is a newly chosen B vitamin as of 2000, designated as vitamin B4. It aids in the development of the brain, especially to make acetylcholine and neuronal membranes. **My hypothesis is that multivitamins do not provide adequate choline for brain development in pregnancy and early childhood.** I have looked at scientific literature and at multivitamins for pregnant women and young children that may or may not have choline in the vitamins. Pregnant women need at least 550 mg. Infants need between 125 and 200 mg. of choline depending on their age. The vitamins provided for infants only provide about 28mg. of choline or less. Because many multivitamins do not provide an adequate amount of choline, one must be aware of what they eat and be sure that they eat foods that do provide an appropriate amount of choline, such as eggs and broccoli. If adequate choline is not consumed at the start of life, a child's brain is likely to be permanently damaged even though they may seem what we would consider normal. People should be aware of the benefits of choline because there is more knowledge of nutritional requirements today that can benefit the children in ways than adults have known in the past.

Introduction

In early development, there are many essential nutrients that a child must have. The requirement does not start as a child, however; it starts from in the womb. One nutrient, choline, aids in many health benefits, particularly brain development. Choline (C₅H₁₄NO⁺) is a water-soluble B vitamin, known as B4. Its structure is shown Figure 1. Figure 2 shows the neurotransmitter acetylcholine which is a chemical compound in the peripheral nervous system and the central nervous system that aids in brain storage and memory. As part of phosphatidylcholine (Figure 3), it is essential for the lipid bilayer (figure 4) of neuronal cell membranes that are found in the brain. It was discovered in 1864 and synthesized in 1866. In 2000 it entered the B vitamin group (FDA: Nutrient Content Claims Notification for Choline Containing Foods 2004). Choline is also vital in controlling the fat and cholesterol levels in the human body (Linus Pauling Institute 2008), normalizing such organs as the liver, gallbladder, and kidneys. Choline is present in breast milk (The Journal of Nutrition), where it is *essential* for brain development of fetuses. Expectant mothers hold the responsibility of taking in enough choline so that the fetus' brain develops properly. There are many foods that contain choline other than breast milk, but during pregnancy and the first 3-4 years in the infant's life, the mother has the duty to nourish herself and the child.

Method

I have looked at different sources from the nutrition search on the www.beloit.edu/nutrition website as well as information from the Food and Drug Administration (FDA). Another site with useful information is the U.S Department of Agriculture (USDA 2004). I have compiled daily values for choline in men and women, particularly pregnant women and infants from 0-3 years of age. The commercial website www.GNC.com had supplemental content of some of their best selling vitamins for children (no pregnancy or prenatal vitamins were for sale). The facts available on the site had values for choline amounts in the multivitamins. The Linus Pauling Institute at Oregon State University also provided information.

Table 1 Daily Value for Choline

Age	Amount (mg/day)
Pregnant Women	450-850
Breast Feeding Women	550
0-6mos.	125
7-12mos.	150
1-3y/o	200

Table 1 shows the daily values found for choline. Recent evidence for the level required for pregnant woman was found by (Reference). A recent paper showing the requirement for infants was published in 2008 (reference). Table 2 shows that common multivitamins, in particular those designated for children, do not provide sufficient choline (Linus Pauling Institute 2008).

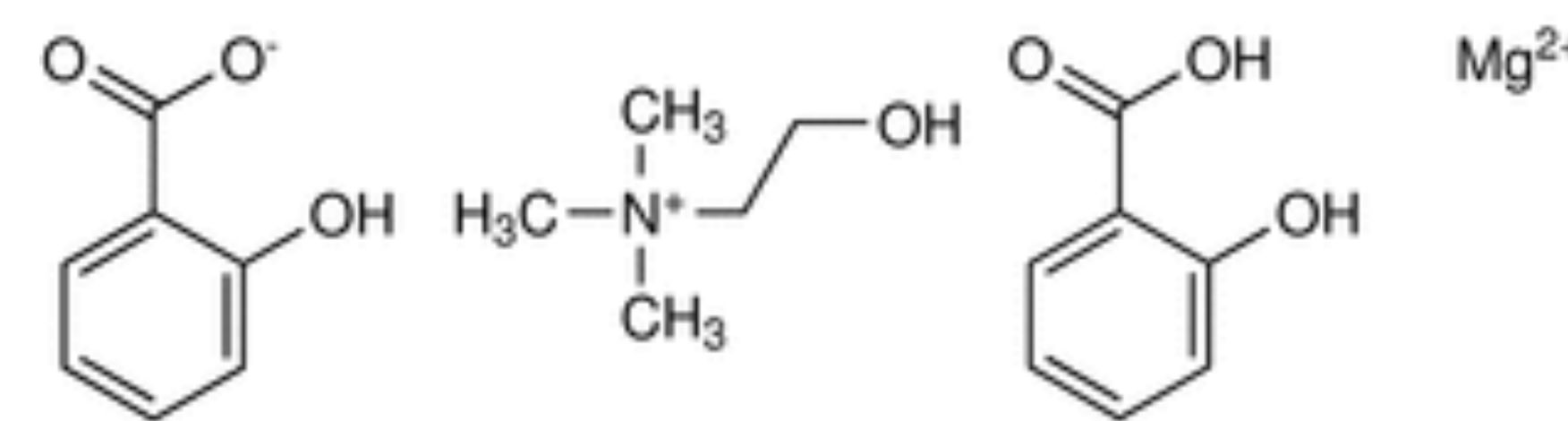
Table 2 Deficiencies in Choline in Children's Multivitamins

Brand of Multivitamin	Amount (mg)
Flintstones Complete	38
L'il Critters Gummy Vites	.04
Scooby Doo! Gummies	.03
Centrum Kids Complete Chewables	0
Natrol	0
Twinlab Infant Formula	0

Table 2 shows that children's vitamins often lack sufficient choline. None of the children's multivitamins examined had more than 38 mg of choline, which is only 19% of what a 2 year old requires for brain development.

Figure 1 Molecular Structure of Choline

<http://www.medicinescomplete.com/mc/martindale/current/images/MRT8592C001.gif>



Results

Table 2 proves that the vitamins that you feed your children are not providing an adequate amount of choline for proper development. But Table 3 shows many alternatives to get the right amount. But one must select the correct foods for eating, especially during pregnancy and ring.

Figure 3 Chemical Structure for Acetylcholine

<http://www.rathbuc.com/poster.html>

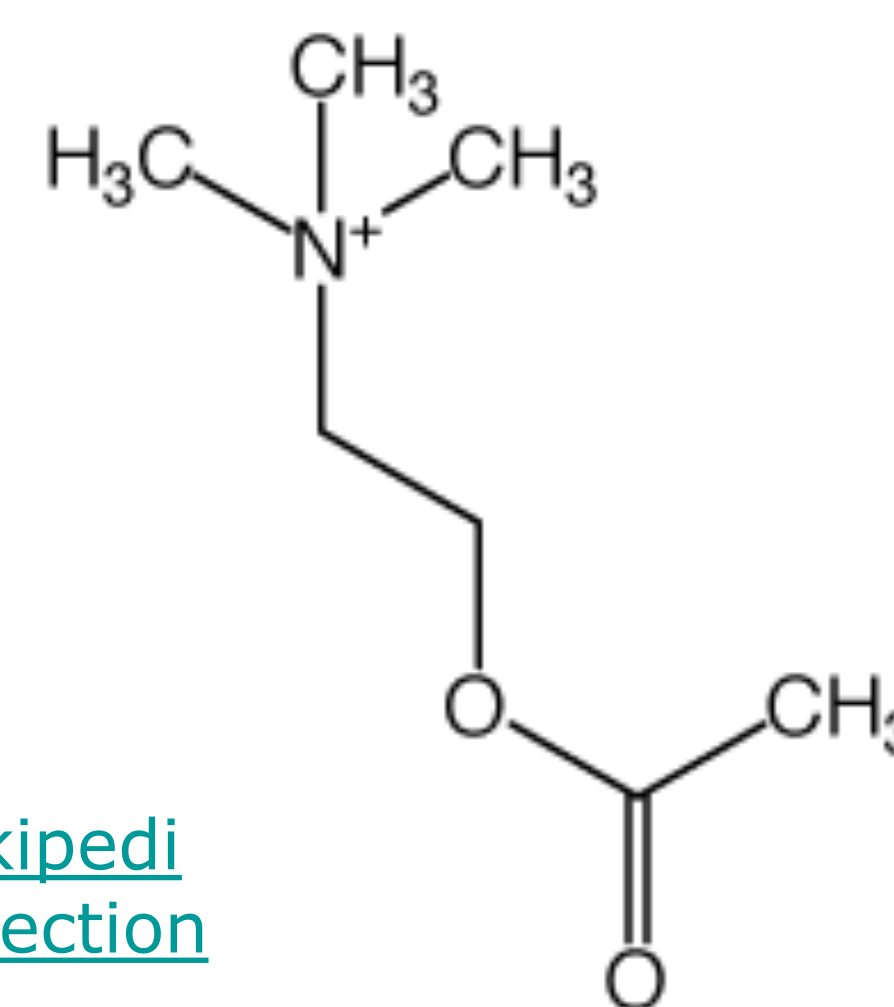


Figure 2 Lipid Bilayer

http://upload.wikimedia.org/wikipedia/commons/f/f0/Lipid_bilayer_section.gif

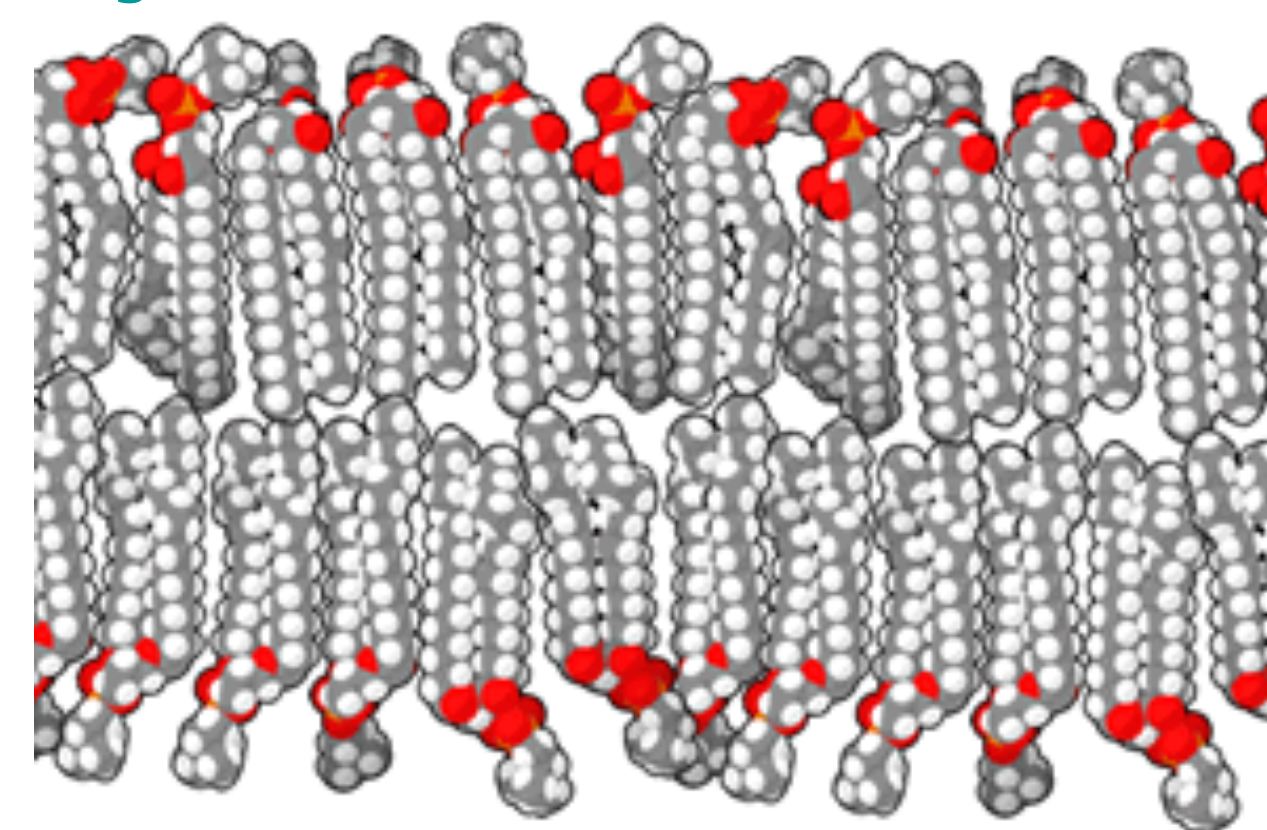


Table 3 Sources of Choline

Food	Amount	Choline Content (mg)
Eggs	2 large	252
Brussel Sprouts (cooked)	1 C.	63
Broccoli (cooked)	1 C. (chopped)	62
Beef Liver (pan fried)	3 oz.	355
Nestle' Good Start Supreme Formula	100 g. of Powder	123

Table 3 shows the level of choline in various foods. Instead of supplements, a good diet is essential during pregnancy and breastfeeding.

Figure 4

General Structure of Phosphatidyl choline and specific example

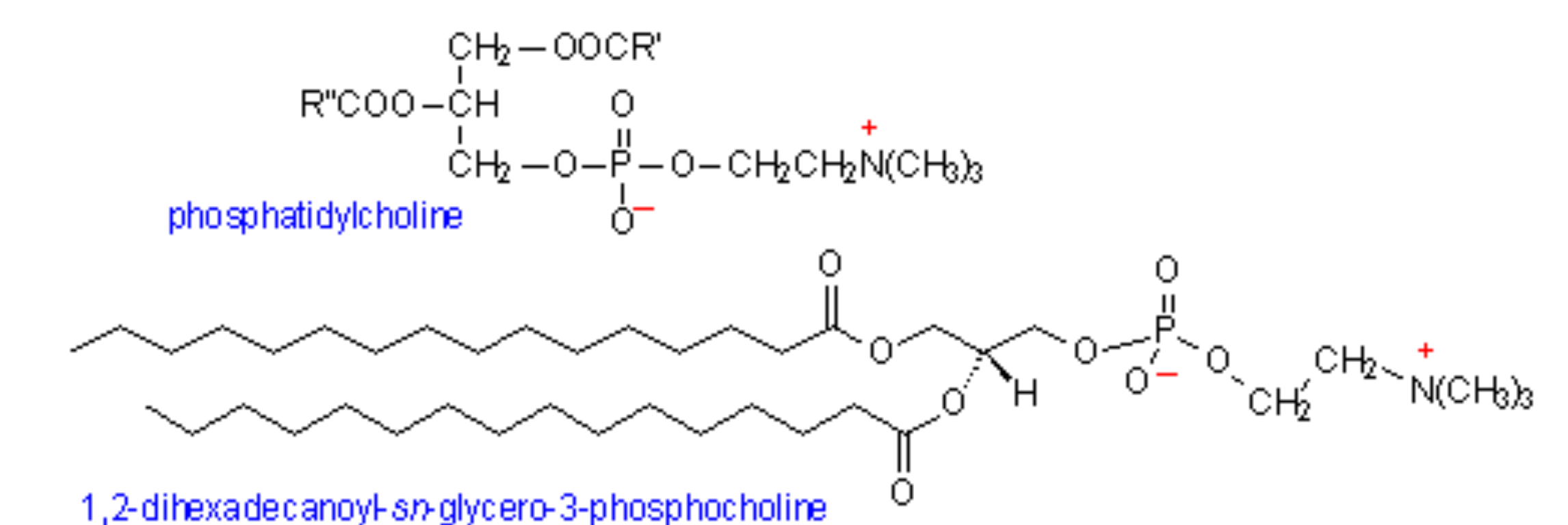


Table 2(cont'd) Supplements Lacking Adequate Choline (2)



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Figure 5 Spina Bifida

<http://www.nlm.nih.gov/MEDLINEPL/US/ency/imagepages/19087.htm>

