

TESTIMONY OF BARBARA LEVINE  
BEFORE  
THE COMMITTEE ON GOVERNMENT REFORM  
HOUSE OF REPRESENTATIVES  
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Mr. Chairman and members of the Committee, I am Dr. Barbara Levine, Associate Professor of Nutrition in Medicine, Weill College of Medicine of Cornell University. I also serve as a non-paid member of the Scientific Advisory Board of the Dietary Supplement Education Alliance. It is a great honor to be able to address you today about the importance of the nutritional health of Americans. More specifically, I will be discussing two nutrients I have studied for most of my career.

The first nutrient is actually part of a group of nutritional components – the much-heralded omega-3 fatty acids. These include DHA (docosahexaenoic acid) that has a major role in the development of the central nervous system. DHA, together with EPA (eicosapentaenoic acid), is also very important to maintaining cardiovascular health. EPA also is responsible for suppression of immune function. The second nutrient is calcium, found in every cell of the body and is so important to numerous biological functions. Calcium is essential for bone development and growth, and in the protection of the human body through all stages of life.<sup>1</sup>

These two nutrients have a common thread. They are essential from the very beginning of life – and even before -- because a woman needs to be replete in these nutrients before entering pregnancy to ensure that the fetus will derive what is essential for proper growth and development from the mother. And they are also essential to maintaining the mother's health and a successful outcome in the birth of her child. Thus, these two nutrients are needed throughout the entire life cycle in the development and growth of the human body as well as for prevention and treatment of a variety of diseases that occur during life. One would have assumed that, living as we do in the richest country in the world, that our diet would also be rich in these nutrients. Yet the reality is that despite our best intentions, the nutritional health of our nation remains sub-optimal. Our whole way of eating has come very far from the original hunter-gatherers who were able to fulfill their need for calcium and DHA through their diet of meat, grains, nuts and berries and other dietary sources. The obesity epidemic for both adults and children is on the rise. Notwithstanding the role of genetics and economic status, this epidemic is largely due to less physical exercise, eating less healthful foods and eating larger portions. Because childhood obesity is likely to persist into adulthood, the American Academy of Pediatrics recently published a policy statement on Prevention of Pediatric Overweight and Obesity, which addresses the recognized risk factors.<sup>2</sup>

### *Omega-3's*

The role of omega-3 fatty acids in cardiovascular function has been studied for the last 40 years. As we are learning more about the three primary omega-3 fatty acids (linolenic acid, LNA; eicosapentaenoic acid, EPA; and docosahexaenoic acid, DHA), it is becoming clear that each of these fatty acids have different functions in the body. For example, DHA is primarily involved in central nervous system function, EPA is responsible for blood thinning and suppression of immune function, and LNA is a precursor molecule that, by itself, has little or no effect. Although a general triglyceride lowering effect has been reported with fish oil (fish oils contain both EPA and DHA), it has only recently become clear which omega-3 fatty acid is responsible for this effect.

### *DHA and Infant Development*

Over the past 20 years, there has been a dramatic increase in the scientific scrutiny of the essential polyunsaturated fatty acid, DHA, and its impact on health. While DHA is important for all people at all stages of life, optimum amounts of DHA are particularly vital for pregnant and lactating women. To acquire appropriate levels of fatty acids, nursing newborns rely upon the mother's store of DHA, which, in the United States, is usually insufficient. If adequate amounts of DHA are not transferred from the nursing mother's blood via the placenta, the newborn's brain, nervous system, and eye function may not reach their peak development.

One of the most significant areas of research on DHA involves infant brain development. DHA plays a critical role in supporting brain and retina development in infants. A mother provides DHA to her baby *in-utero* and via breast milk. Throughout pregnancy, a developing fetus will receive DHA from the mother, particularly during the last trimester when there is significant brain growth. The human brain grows at a rapid pace during this late stage of fetal development; and the DHA content of the fetal brain increases three to five times during the final trimester of pregnancy and triples during the first twelve weeks of life. In addition, the retina, which is rich in DHA, develops rapidly during the final months of pregnancy and the first six months of infancy. Preterm infants run the greatest risk of vision problems because they miss the final weeks of gestation when the retina concentrates DHA.

For an assortment of reasons, the average American diet lacks adequate amounts of DHA. Historically, human beings have, up until recently, consumed large amounts of fish, game and organ meats (all sources of DHA). In the past 100 years or so, our intake of these foods has decreased dramatically. In fact, the typical American diet contains less than 100mg DHA a day. Scientists are concerned that pregnant women in particular are not getting enough of this vital omega-3 in their diets.

The principal dietary source of DHA is cold-water fish, like salmon and trout, foods that are not consumed in great amounts by American women. The purest

source of DHA is not the fish itself, but rather what fish consume: the ocean's marine phytoplankton, vegetarian plant algae. Taking DHA supplements produced from marine algae is therefore a safe way for pregnant women to boost their fatty acid stores. And although breast feeding is the "gold standard", due to the paucity of omega-3-rich foods in the typical American diet, the amount of DHA in the breast milk of American women is far lower than that found in women in Europe and Japan.

Since its inception in 1998, Pregnant Physicians for DHA has been at the forefront of educating people about the importance of breast-feeding. They have also stressed the importance of the addition of DHA to infant formula in the United States. Notable scientific organizations such as the National Academy of Sciences, the World Health Organization (WHO) as well as the International Society for the Study of Fatty Acids and Lipids (ISSFAL) have recommended the addition of DHA to infant formula for those infants who are not breast fed. A workshop sponsored by NIH/ISSFAL recommends 300mg DHA a day for pregnant and nursing women to promote optimum neurological development and visual acuity in their babies. New research contributes to the growing body of scientific and clinical evidence that pregnant women, or women who intend to become pregnant, should consider supplementing their diets with DHA. Adding DHA derived from algae to infant formulas, in particular, is a safe and convenient way to supplement with this important fatty acid. Supplements derived from fish oil are not recommended for pregnant women and children 5 years and younger because of the potential contamination with organic toxins such as pesticides and methyl mercury. I'll talk more about that later. A study published in the July/August 2004 issue of the journal *Child Development*, found that infants whose mothers had higher blood levels of DHA at delivery had advanced levels of attention spans well into their second year of life. During the first six months of life, these infants were two months ahead of those babies whose mothers had lower DHA levels. These discoveries add to the documentation that DHA plays an important role in early development.

### *Omega 3 Fatty Acids and Cardiovascular Diseases*

According to the American Heart Association (AHA) and the National Heart, Lung, and Blood Institute (NHLBI), the cost of cardiovascular disease and stroke in 2004 is estimated to be \$368.4 billion, including both direct and indirect costs, which include lost productivity resulting from illness and death. And this is only the economic cost. The cost in human terms of suffering and lost lives is incalculable.

I would like to commend the American Heart Association (AHA) for its recent Scientific Statement on Fish Consumption, Fish Oil, Omega-3 Fatty Acids, and Cardiovascular Disease.<sup>3</sup>

The statement confirms the importance of two long-chain omega-3 fatty acids, docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) for their

significant role in the reduction of cardiac death. The AHA recommends that patients with coronary artery disease and hypertriglyceridemic patients consume 1g and 2-4g daily of long-chain omega-3, respectively, as part of their medical management.

The statement, however, points out a risk factor important to consider when recommending that a patient's diet be fortified with DHA and EPA from fish. Both the United States Food and Drug Administration (FDA) and the Environmental Protection Agency have recently scrutinized certain fish such as shark, swordfish, and fresh/frozen tuna for having potentially high levels of methyl mercury. In fact, the methyl mercury content of fish was cited as a potential reason for inconsistencies among studies regarding the cardiovascular health benefits of DHA and EPA from fish. For example, Salonen et al. (2000) reported that in a study of hair mercury content in 1,014 men, the highest quintile of methyl mercury was associated with a 32% greater carotid intima-media thickness compared to the lowest quintile.<sup>4</sup> This suggests accelerated progression of carotid atherosclerosis in response to methyl mercury exposure. In light of these findings, the AHA tempers its recommendation to increase DHA and EPA intake by stating that "the availability of high-quality omega-3 fatty acid supplements, free of contaminants, is an important prerequisite to their extensive use."

### *Calcium*

Calcium intake is essential in youth to build peak bone mass. In later life, ongoing attention to calcium helps reduce the rate of bone loss that naturally occurs. Prolonged low calcium intake has been linked to the development of several chronic diseases, including colon cancer,<sup>5-8</sup> hypertension,<sup>9-11</sup> and osteoporosis.<sup>5</sup> It has been proposed that disease occurs either when the body's adaptation to low calcium intake is inadequate to maintain critical calcium regulatory system or when the constant, forced adaptive response itself produces adverse consequences.

Calcium is a critical consideration for individuals who are undergoing treatment or recovering from cancer and other major illnesses. If calcium needs are ignored during this pivotal time of treatment and recovery, an individual may conquer one terrifying disease, only to face another: osteoporosis—the devastating disease of brittle bones. Each year, osteoporosis causes more than 1.5 million bone fractures of the hip, spine, wrist or other site, draining more than \$14 billion from the U.S. healthcare system. It is a painful, debilitating, and in some cases, life-threatening disease.<sup>12</sup>

Adequate intake of calcium is essential and it is generally accepted that the ideal method for obtaining calcium is through regular dietary sources. One reason that high calcium foods are the preferred source of calcium for maintaining calcium balance is because they contain additional essential nutrients.<sup>13</sup> Unfortunately, meeting the recommended daily intake of calcium has proven to be difficult for

the average American, as evidenced by the low percentage of individuals actually meeting recommended calcium intake levels on a continuing daily basis.<sup>14,15</sup> In the recent National Health and Nutrition Examination Survey,<sup>16</sup> it was reported that the average intake of calcium for women age 40 and over was only 698 mg/day. This is well below the 1500 mg/day calcium intake recommended for postmenopausal women.<sup>14</sup>

Meeting the calcium intake requirements can prove to be especially difficult in vegetarians and the lactose intolerant, as the primary source of dietary calcium is usually dairy products. There are an increasing number of foods being fortified with calcium, including cereals, orange juice, and some soy products, which could help to increase calcium intake in these special populations.

In those who are unable or unwilling to change their dietary habits to include enough calcium-containing foods to meet the daily recommended intake of calcium, calcium supplements are and should continue to be strongly encouraged. These dietary supplements are available in the form of various calcium salts. Not only can supplements help to increase the intake of calcium among our population but also the resultant disease prevention can help cut health care costs. There are as yet no guidelines available for the use of supplements and this is something that should be seriously considered.

Thank you for the opportunity to speak with you about these important nutrition issues.

#### *Selected References*

1. Levenson, D. I. and Bockman, R. S. A review of calcium preparations. *Nutr Rev.* 1994 Jul; 52(7):221-32.
2. American Academy of Pediatrics. Policy Statement. Prevention of Pediatric Overweight and Obesity. *Pediatrics* 2003;112(2):424-430.
3. Kris-Etherton, PM. Harris, WS. Appel, LJ. American Heart Association. Scientific Statement on Fish Consumption, Fish Oil, Omega-3 Fatty Acids, and Cardiovascular Disease. *Circulation.* 2002;106:2747-2757
4. Salonen, JT., et al. Atherosclerosis. 2000; 148:265-73
5. McCarron DA, Lipkin M, Rivlin RS, Heaney RP. 1990. Dietary calcium and chronic diseases. *Med Hypoth* 31: 265.
6. Lipkin, M., Newmark, H.L. 1985. Effect of added dietary calcium on colonic epithelial-cell proliferation in subjects at high risk for familial colonic cancer. *N Engl J Med* 313 (22): 1381-1384.

7. Lipkin, M., Newmark, H.L. 1995. Calcium and the prevention of colon cancer. NCI Conference on Cancer Chemoprevention Agents, October 18, 1994. *J Cell Biochem Suppl* 22: 65-73.
8. Holt, P., Atallasoy, E., Gelman, J., Guss, J., Moss, S., Newmark, H.L., Fan, K., Yang, K., Lipkin, M. 1998. Modulation of abnormal colonic epithelial cell proliferation and differentiation by low fat dairy foods. *J Am Med Assoc* 280: 1074-1079.
9. Resnick, L.M. Role of calcium and magnesium in the therapy of human hypertension. In Laragh, J.H., Brenner, B.M. (ed.), *Hypertension: Pathophysiology, Diagnosis, and Management*, Raven Press, 1990, pp. 2037-2059.
10. Bucher HC, Cook RJ, Guyatt GH, Lang JD, Cook DJ, Hatala R, Hunt DL. 1996. Effects of dietary calcium supplementation on blood pressure. *JAMA* 275(14): 1113.
11. Resnick LM. 1999. The role of dietary calcium in hypertension. A hierarchal overview. *Am J Hypert* 12, 99-112.
12. National Institutes of Health (NIH). Osteoporosis and Related Bone Diseases – National Resource Center. [www.osteoporosis.org](http://www.osteoporosis.org). Retrieved Sept. 9, 2004.
13. Nieves, J. W. Calcium, vitamin D, and nutrition in elderly adults. *Clin Geriatr Med*. 2003 May; 19(2):321-35.
14. National Institutes of Health. NIH Consensus conference. Optimal calcium intake. NIH Consensus Development Panel on Optimal Calcium Intake. *JAMA*. 1994 Dec 28; 272(24):1942-8.
15. National Center for Health Statistics. Third national health and nutrition examination survey (NHANES III). 1988.
16. (Wright et al., 2003)