

The Case for Nutritional Supplements in Primary Prevention



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EXECUTIVE SUMMARY

The value of nutritional supplements in promoting and protecting human health is intensely debated. Some argue that supplements provide a convenient and effective means for supplying the optimal intakes of essential nutrients that people need for good health. Others argue that there is no conclusive evidence that supplements provide any true health benefits at all. The latter argument has been bolstered over the past several years by a steady stream of negative research reports published in leading medical journals.

This paper examines the supplement debate and questions some of the recent evidence suggesting that nutritional supplements are ineffective and unsafe. It is argued that much of the current controversy and negativity surrounding nutritional supplements results from inappropriate use of a pharmaceutical, acute-care model in the clinical evaluation of nutritional products; products whose real value is in preventing rather than treating disease. As a result of this mismatch, nutritional supplements are often tested inappropriately, results of studies are interpreted less than objectively, and valid but non-clinical evidence of benefit is often discounted or ignored.

As a case in point, I focus on vitamin E supplements and their role in preventing heart disease. But the central tenets raised in this paper pertain to nutritional supplements in general, and to much broader issues surrounding the field of primary prevention as a whole. We now spend about \$2.0 trillion dollars annually on healthcare in the US. Ninety-eight percent of this spending goes to the treatment of injuries and disease. And, the lion's share goes to the treatment of chronic degenerative diseases (e.g. heart disease, cancer, and type 2 diabetes), the leading causes of premature death and disability in our society. Only 2% of our healthcare dollars are spent on primary prevention; measures designed to keep healthy people healthy. This despite the fact that most chronic degenerative diseases are highly (60-90%) preventable.

In this light, increased emphasis on primary prevention holds tremendous potential for improving the effectiveness of our healthcare system. Most Americans have the opportunity to add years of health to their lives by embracing prudent lifestyle strategies and habits over the long-term. Clearly, such strategies need to be broad-based, encompassing diet, nutrition, exercise, stress management, and the avoidance of harmful habits like smoking. And just as clearly, a program of responsible supplementation, designed to compliment healthy eating habits and provide the advanced levels of essential vitamins, minerals and antioxidants required for lifelong health, can play an important role in this endeavor. The science, when approached broadly with an open mind, is convincing on this point.

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INTRODUCTION

The value of nutritional supplements in promoting and protecting human health is intensely debated. Some argue that supplements provide a convenient and effective means for supplying, on a daily basis, the optimal intakes of essential nutrients that people need for good health. Others argue that there is no conclusive evidence that supplements provide any true health benefits at all. The latter argument has been bolstered over the past several years by a steady stream of negative research reports published in leading medical journals. Several such papers have concluded that antioxidants and B vitamin supplements are ineffective at reducing the risks of heart disease and cancer (Lee et al, 2006; Kirsh et al, 2006; Zoungas et al, 2006). Others have reported that calcium and vitamin D supplements provide at best incomplete protection against osteoporosis (c.f. Jackson et al, 2006). Still others have questioned the safety of nutritional supplements (c.f. Bjelakovic et al, 2004, Bairati et al, 2005; Miller et al, 2005). Each time such studies appear, newspaper headlines blare "Supplements Proven to Be Snake Oil" or "Vitamin E May Be Deadly". Morning talk shows feature doctors and alternative practitioners who argue over the latest findings. Sadly, the public grows more confused about what to believe concerning the role of nutrition and nutritional supplements in health.

This paper examines the supplement debate and questions some of the recent evidence suggesting that nutritional supplements are ineffective and unsafe. I argue that much of the current controversy and negativity surrounding the benefits of nutritional supplements result from inappropriate use of a pharmaceutical, acute-care model in the clinical evaluation of nutritional products - products whose real value is in preventing rather than treating disease. It is further argued that while the case against supplements may be evidence-based, the relevance of much of that evidence is questionable.

Healthcare versus Disease Management

This year, Americans will spend \$2 trillion on healthcare (Borger et al, 2006). This enormous sum represents about \$7,000 in healthcare spending for every man, woman, and child in the US. It also equates to a spending rate of more than \$60,000 per second...and that's 24-7-365. How is this money being spent? Ninety-eight percent goes to the treatment of injuries and disease, and the lion's share of this goes to the treatment of chronic degenerative diseases such as heart disease, cancer, type 2 diabetes, osteoporosis, Alzheimer's disease, and the like. Today, these are the leading causes of premature death and disability in our society (CDC, 2002).

In comparison, only 2% of our healthcare dollars are spent on primary prevention - measures designed to keep healthy people healthy. This despite the fact that all of the chronic degenerative diseases listed above are highly preventable. It is estimated, for example, that 60-70% of the current cases of heart disease could have been prevented through improved nutrition, better exercise habits, avoidance of smoking, and the adoption of other healthy lifestyle habits (Koop, 2002). Similar statistics apply to the prevention of cancer, stroke, cataracts, osteoporosis, and macular degeneration (c.f. Michel, 2002; Rosenthal, 2002). Type 2 diabetes is thought to be 90% preventable, largely through improved nutrition and exercise (Hu et al, 2001).

This lopsided pattern in spending is a clear reflection of today's dominant healthcare paradigm; one that focuses on disease treatment rather than disease prevention. Ours is a reactive as opposed to proactive healthcare system. We wait for people to develop chronic illnesses, and then we spend enormous amounts of money treating those illnesses. The alternative, a focus on primary prevention and an investment in keeping healthy people healthy, receives lip service, but is largely ignored in practice. Clearly our healthcare system is less about caring for health and more about managing disease.

It is also a system of high-tech, acute-care medicine based on the promise of powerful, fast acting drugs and surgeries that produce therapeutic results in hours, days or weeks. We spend tens of billions of dollars every year on medical research in a quest to develop ever more effective diagnostics, drugs, drug delivery systems, implants, and surgeries (Meeks, 2002). And we spend billions more on patenting these technologies. Why? Because our healthcare system is lucrative. It is no accident that we spend \$2 trillion annually on healthcare in the US, that pharmaceutical companies rank among the most profitable in America, and that our healthcare costs are rising at near double-digit rates that surpass inflation and growth in our Gross Domestic Product (Polich, 2005; Berger et al, 2006).

To be sure, acute, treatment-based medicine is useful and effective in dealing with urgent medical conditions such as trauma, infection, or incipient heart attacks. However, our almost singular focus on reactive, acute-care medicine also carries serious limitations, costs and liabilities. This approach is not particularly effective in dealing with chronic degenerative diseases like heart disease, cancer and osteoporosis. After decades of research, we still have no reliable cures for these diseases. We can treat them and manage them, but we cannot cure them. Moreover, this approach is expensive, both in dollars spent and in years of health lost to premature death and disability. Chronic diseases rob far too many Americans of their health, independence, and quality of life far too early (Michaud et al, 2001). Finally, acutely acting medicines and surgeries have many undesirable side effects. Every year, prescription drugs - taken as prescribed - injure more than 1.5 million Americans so severely that they require hospitalization. One hundred thousand others are killed by prescription drugs, making such medicines a leading cause of death in the United States (Lazarou et al, 1998).

A Vital Role for Primary Prevention

Is there a better way? I would argue that rebalancing our healthcare system to include a larger emphasis on primary prevention is an essential step. I would further argue that we can act now. We know enough today about the principles of primary prevention, and about the basics of a healthy lifestyle (nutrition, exercise, stress management, avoidance of smoking, etc) to implement significant improvements without delay. And I would argue that nutritional supplementation can play a vital role in this arena.

The research is clear. Diet and nutrition play key roles in supporting good health (WHO, 2003). It is equally clear that Americans, as a whole suffer from generally poor nutritional habits (Frazao, 1999). As a nation we are overfed and undernourished. Two thirds of American adults are overweight or obese (Flegal et al, 2002; Hedley et al, 2004), and high percentages of us are chronically deficient for one or more of the essential vitamins, minerals and antioxidants (FASEB, 1995).

Some would argue that this problem lies in poor diet alone; that all we need to do is eat better. Clearly, a healthy well balanced diet is an absolute foundation for any program of optimal nutrition. But is a healthy diet enough? Can we obtain “optimal levels” of the essential vitamins, minerals, and antioxidants on a routine basis from diet alone? Many, including myself, argue “no”; that optimal intakes of the essential nutrients, intakes required to optimize health and minimize the risk of chronic diseases, are significantly higher than the amounts that can be obtained routinely from food (and significantly higher than the current RDA’s). In my view, optimal nutrition is best achieved through a combination of a healthy well balanced diet plus a responsible program of nutritional supplementation. In my view, a healthy diet and nutritional supplements are not mutually exclusive. This is not an “either-or” proposition. It is an “and” proposition.

Is there substantial scientific evidence to support this notion? Yes. There are hundreds of scientific studies showing that regular and responsible use of nutritional supplements can benefit people’s health both in the short- and long-terms (Dickinson, 1998). Have all supplement studies shown positive benefits, and are all the findings consistent? No. As with any body of exploratory research, negative findings and inconsistent results appear in the mix. But when the science is reviewed in full, the evidence for defined benefits is convincing. There are scores of studies supporting the role of calcium and vitamin D supplementation for promoting strong, mineral-rich bones and reducing the risk and progression of osteoporosis (c.f. Chevalley et al, 1994; Dawson-Hughes et al, 1997; Chapuy et al, 1994; Recker et al, 1996; Larsen et al, 2004). There are scores of studies supporting the use of B vitamin supplements for reducing the risks of some birth defects and lowering some markers of heart disease (c.f. MRC Vitamin Study Research Group, 1991; Berry et al, 1999; Czeizel and Dudas, 1992; Lobo et al, 1999; Woodside et al, 1998; Bronstrup et al, 1998; Schnyder et al, 2002). In addition, numerous studies link antioxidant supplementation to reduced incidence of cataracts, heart disease, and some cancers (Jacques et al, 1997; Mares-Perlman et al, 2000; AREDS Research Group, 2001; Stampfer et al, 1993; Stephens et al, 1996; Clark et al, 1998; Meyer et al, 2005). Fish oil supplements have been shown to support improved cardiovascular health and neural development (GISSI-Prevenzione Investigators, 1999; Bucher et al, 2002; Studer et al, 2005; Carlson et al, 1993; Birch et al, 2000). And the list goes on.

Why then, is the role of nutritional supplementation in healthcare so hotly debated? Clearly, this is a complex issue, but I believe that much of this debate stems from a fundamental incompatibility between our current healthcare paradigm (acute, disease-focused medicine) and the basic tenets of primary prevention. Moreover, current approaches to medical research, geared largely toward the evaluation of acute, fast-acting medicines and surgeries, are in most cases inappropriate for the study of long-term primary preventive measures like nutritional supplementation. As a result, nutritional supplements are often tested inappropriately, results of studies are interpreted less than objectively, and valid but non-clinical evidence of benefit is often discounted or ignored.

Conventional Medicine Looks at Vitamin E: A Case in Point

These challenges are perhaps most evident in the scientific literature concerning vitamin E supplements and heart disease. In the early 1990's, a large body of scientific evidence pointed to oxidative stress as a disease process in the onset and progression of atherosclerosis. This same research suggested in various ways that antioxidants like vitamin E might be important in preventing this disorder. Numerous epidemiological (population based) studies, many involving tens of thousands of subjects, concluded with consistency that people who consumed high amounts of vitamin E through diet and supplements were at 30-50% lower risk for heart attacks or death due to heart disease relative to those people who consumed minimal amounts of vitamin E (Stampfer et al, 1993; Rimm et al, 1993; Losonczy et al, 1996; Kushi et al, 1996; Meyer et al, 1996). Typically, the levels of vitamin E that were protective totaled hundreds of International Units per day, many times higher than the Recommended dietary Allowance (RDA).

A. An Early Clinical Evaluation

To further test this protective effect, clinical research on vitamin E supplementation and heart disease was undertaken at several centers. In January 2000, results from one of the first such studies were published in the *New England Journal of Medicine* (Yusuf et al, 2000). The Heart Outcomes Prevention Evaluation (HOPE) involved over 9,500 subjects 55 years of age or older who were at high risk for cardiovascular events because they had advanced cardiovascular disease, diabetes, or similar risk factors. Over half, in fact, had had a previous heart attack. Half the subjects in the trial were assigned at random to take 400 IU daily of natural-source vitamin E. The remainder were given placebo capsules. Average follow-up was 4.5 years, during which time, subjects were monitored for primary and secondary cardiovascular events such as nonfatal heart attacks, stroke, angina, and death.

Results of the HOPE study showed that, after 4.5 years, there were no significant differences in the numbers of heart attacks, strokes, reports of angina, or deaths due to heart disease between the treatment and placebo groups. The authors of the paper correctly and appropriately concluded that "in patients at high risk [emphasis added] for cardiovascular events, treatment with vitamin E for 4.5 years has no apparent effect on cardiovascular outcomes".

Unfortunately, while the conclusions reached by the authors were appropriate, much of the editorializing in the medical and popular press was not. Instead, headlines and sound bites touted the results of the HOPE study as conclusive proof that vitamin E supplements provided no benefits for cardiovascular health. Others declared the findings as "the last nail in the coffin for vitamin E".

HOPE is only one of several clinical trials to have evaluated the efficacy of vitamin E in preventing cardiovascular events in high-risk groups. While two such trials showed significant benefit (Stephens et al, 1996; Boaz et al, 2000), the majority, like the HOPE study, produced disappointing results (GISSI-Prevenzione Investigators, 1999; Collaborative Group of the PPP, 2001). Does this mean that vitamin E is ineffective as a preventive agent? In answering this question, two important issues need to be addressed.

First, the standard model for clinical research requires testing one remedy (one drug) at a time, so that the true, isolated effect of that drug can be identified and measured. This is good science. However, it is not necessarily appropriate in the field of preventive nutrition.

Humans require a full range of some 25-plus essential vitamins, minerals, and antioxidants, in proper amounts and balances, to support good health. This is because vitamins and minerals work in teams to support, for example, robust energy metabolism and protein synthesis. Similarly, antioxidants work most effectively in groups and networks (Packer and Obermuller-Jevic, 2002), each playing a unique role in channeling and quenching the chain-like series of oxidative reactions that can result from a single oxidative event. As such, high-doses of a single nutrient represent an incomplete and inappropriate approach to boosting overall antioxidant protection. This would be analogous to testing the hypothesis that broccoli has cancer-preventive properties by putting people on an all- broccoli diet. It's not likely to work, and it carries the risk of creating nutrient imbalances, unwanted side effects, and experimental artifacts.

Second, an important distinction needs to be drawn between primary and secondary prevention. Primary prevention involves keeping healthy people healthy. It is about preventing the development of disorders like heart disease in the first place. Secondary prevention is about preventing further progression of a disease that people already have (CDC, 1992). Moreover, because chronic diseases like heart disease and osteoporosis develop over a lifetime, primary prevention needs to be viewed as a lifelong (decades long) undertaking. It is not something that is accomplished over a year or a few years. Within this context, the HOPE study was clearly a secondary prevention trial. It had nothing to do with primary prevention. Study subjects were selected because they already had advanced heart disease. Consequently, attributing the findings of this study to the general (healthy) public is inappropriate.

Is it possible for something to be an effective primary preventive agent without being an effective secondary preventive agent? I believe so. Dentists tell us to floss our teeth to prevent tooth decay and avoid the need for root canal surgery. If you were to select a group of people with advanced tooth decay, many who had chronic tooth aches, and divided them into two groups, telling one to floss regularly and the other to refrain from flossing, what do you think would happen? Would the flossing group experience significantly fewer tooth aches, fewer tooth extractions and fewer root canal surgeries in the short-term? Probably not; the flossing came too late in the day to change the course of existing disease.

A similar situation may exist with respect to vitamin E and heart disease. It is very possible that vitamin E, acting as an antioxidant over the long-term, may help to prevent atherosclerosis. Epidemiological research certainly supports this notion. However, vitamin E may be ineffective in preventing the rupture of existing atherosclerotic plaques (thus triggering a heart attack, stroke, or cardiovascular death). The HOPE trial and similar clinical studies support this notion. As such, vitamin E supplementation may be an effective long-term measure for the primary prevention of heart disease, while being an ineffective short-term secondary prevention measure or cure (Lewis, 2004). Clearly this hypothesis deserves attention, and the following study put it to the test.

B. Vitamin E and the Primary Prevention of Heart Disease

In 2005, the results of a clinical trial on vitamin E supplementation for primary prevention of heart disease and cancer were published in the *Journal of the American Medical Association* (Lee et al, 2005). This randomized placebo-controlled study involved almost 40,000 women at least 45 years of age who had no history of heart disease or cancer. Half of the women were assigned to the vitamin E treatment (600 IU natural-source vitamin E every other day). Half were assigned to placebo. Average follow-up was just over 10 years. As such, this trial differed from the HOPE study in that it was a true primary prevention trial. Moreover, it lasted a full decade, an improvement over HOPE's 4.5 year duration.

Results of the study indicated that vitamin E had no effect on cancer incidence or cancer mortality. However, there were notable benefits for cardiovascular health. Overall, vitamin E use showed a protective trend toward reducing the risk of total major cardiovascular events among all women in the study. While individual impacts on heart attacks and stroke were nil, there was a statistically significant 24% reduction in cardiovascular deaths among women in the vitamin E group. And importantly, when the data for women at least 65 years old were examined separately, there was a significant 26% reduction in major cardiovascular events, which included a 34% reduction in nonfatal heart attacks and a 49% reduction in cardiovascular death. These are very significant protective effects, and they are particularly relevant because women tend to suffer from heart disease in their senior years following menopause (Mosca et al, 1997). As such, if vitamin E were to have an effect, it would likely be most pronounced in this age group.

Despite these findings, the conclusions reported in the abstract of the study were as follows.

"The data from this large trial indicated that 600 IU of natural-source vitamin E taken every other day provided no overall benefit for major cardiovascular events or cancer, did not affect total mortality, and decreased cardiovascular mortality in healthy women. These data do not support recommending vitamin E supplementation for cardiovascular disease or cancer prevention among healthy women."

This despite the fact that vitamin E supplements reduced cardiovascular deaths by 24% across all women and by 49% among women 65 years or older. Why was this benefit largely ignored? Because cardiovascular death, while measured in the study, was not a specified clinical parameter – in other words, because the study was not specifically designed to report on this benefit. So instead the authors concluded there was “no overall benefit” and that the results of the study “[did] not support recommending vitamin E supplementation for healthy women.”

These conclusions appear less than objective, and they beg the question of bias against nutritional supplements, or primary prevention, or both in the medical community. Would it not have been more appropriate to conclude that vitamin E had an apparent primary preventive effect against heart disease in women, and that the benefits were most significant in senior women...the group at highest risk for suffering a major cardiovascular event? I will return to this point later.

C. The Safety of Vitamin E is Questioned

In January 2005, a research article entitled “Meta-Analysis: High-Dosage Vitamin E Supplementation May Increase All-Cause Mortality” was published in the *Annals of Internal Medicine*, a respected medical journal (Miller et al, 2005). This study called the safety of vitamin E supplements into question. It was conducted by scientists at Johns Hopkins Medical Institutions who pooled the results of 19 clinical trials involving vitamin E supplementation at doses of 16 to 2,000 IU per day. In total, the 19 trials included almost 136,000 subjects. In none of the individual trials was a statistically significant increase in mortality observed from vitamin E supplementation. But when the 19 trials were examined together, there were weak but apparent trends towards decreased mortality in subjects taking low doses of vitamin E (< 400 IU/d) and increased mortality in subjects taking high doses of vitamin E (≥ 400 IU/d). The overall conclusion of the statistical analysis was that high-dose vitamin E may increase the risk of all-cause mortality by about 5%, and therefore, should be avoided. Could the results be real? Yes, it is possible. At high doses, some essential nutrients can produce imbalances and adverse effects (Hathcock, 1997a). Nevertheless, three important points argue against the conclusions of this study. First, the toxicology and safety of vitamin E have been extensively reviewed, and experts agree that tolerable upper intakes are on the order of 1000 mg per day (about 1500 IU per day) (Hathcock, 1997b, Food and Nutrition Board, Hathcock et al, 2005). Second, several large epidemiological studies that identified and followed groups of people consuming high doses of vitamin E (>400 IU/d) over the long-term, did not show increased risk of mortality. In fact they generally showed a reduced risk of dying relative to those people consuming the least amounts of vitamin E (Stampfer et al, 1993; Rimm et al 1993; Losonczy et al, 1996; Meyer et al, 1996; Kushi 1999).

Third, while it is possible that high-dose vitamin E could have adverse effects for certain groups, the Johns Hopkins study did not provide conclusive evidence of harm. The study suffered from several important weaknesses. As noted by the authors themselves, all of the studies included in the meta-analysis were conducted on subjects who were chronically ill. They included patients with heart disease, cancer, Alzheimer's disease, type 2 diabetes, or related disorders. In short, the subjects were at high risk for dying to begin with. In addition, many of the studies included in the analysis were small, containing several hundred as opposed to several thousand subjects. And in fact, the smaller studies were the ones that typically showed the larger deviations from normal mortality rates. Given these issues, the authors concluded that "the generalizability of the findings to healthy adults is uncertain".

Moreover, a third and critical weakness of the analysis was largely overlooked. In all, the authors identified 36 studies involving vitamin E supplementation that fit the primary criteria for review. Of these, 19 were included in the final meta-analysis, five were excluded because mortality data was not available or was insufficiently reported, and 12 studies were excluded because not enough people died in them. This latter exclusion is suspect. The authors suggest that mortality data was available, but close to zero in both the vitamin E and control treatments. I would argue that this is not a sufficient and rational reason for excluding the studies from the analysis. And given the weak nature of the trends as reported in the paper, it is highly likely that no effect of vitamin E on all-cause mortality would have been seen had the 12 additional studies been included in the meta-analysis. As such, I believe that the results and conclusions of the study are seriously flawed and biased. I would be less critical if the title of the paper had been "High-Dosage Vitamin E Supplementation May Increase All-Cause Mortality in Very Ill Subjects at High Risk for Dying"; and if the conclusion had been that high dose vitamin E should be used cautiously by chronically ill people in that high risk group. But these distinctions were not evident in the paper or the press.

The Need for a Broader Healthcare Perspective

Our current approach to healthcare, with its almost singular focus on reactive acute-care medicine, presents challenges for the study and implementation of long-term primary preventive healthcare measures, including nutritional supplementation. As the cases discussed above illustrate, nutritional supplements are often tested inappropriately, results of studies are interpreted less than objectively, and valid but non-clinical evidence of benefit is often ignored or discounted.

Do these studies constitute bad science? Clearly, some of the methodologies are flawed. The criteria for exclusion of studies from the Johns Hopkins meta-analysis are questionable, and they likely biased the results and conclusions of this research. However, the real challenge is not so much one of poor science as it is one of inappropriate approach and trial design. The majority of studies on the health benefits of nutritional supplements have tested supplements as though they were acute-acting therapeutic agents expected to provide dramatic health benefits over the short-term in acutely ill people. This is a fundamentally flawed outlook.

The principal value of nutritional supplementation lies in primary prevention; that is, in approaches to keeping healthy people healthy. Importantly, primary prevention is also a lifelong undertaking. We suffer heart attacks and hip fractures as seniors, but the roots of heart disease and the beginnings of osteoporosis are evident in childhood and adolescence. As such, the prevention of these diseases needs to begin in childhood and progress lifelong. The timeframes of primary prevention are measured in decades and lifetimes, not in hours, days, months, or years.

Such long timeframes are beyond the purview of acute-care medicine, in part because they pose significant operational challenges for clinical research. How does one manage a double blind, placebo-controlled clinical trial, the gold standard of medical science, over a period of decades? Epidemiological studies more easily embrace long timeframes, and as such are useful in studying preventive measures. However, they also tend to be less well controlled and less precise. This troubles many in mainstream medicine who then discount or disregard epidemiological science altogether. Does this constitute tunnel vision? I believe it does. Our understanding of the link between a balanced diet and long-term health is largely based on epidemiology. Our understanding of the link between smoking and lung cancer is largely based on epidemiology. In short, good epidemiological research constitutes sound science and should not be discounted or ignored (Kushi, 1999; Potischman and Weed, 1999). It was a mistake in 1964 when the American Medical Association refused to endorse the Surgeon General's Report on Smoking (the AMA was the last public health organization to do so), claiming that the research was inconclusive (Weiner, 1996). And it is a mistake today to overlook epidemiology in assessing the role of nutritional supplements in preventive healthcare. In short, advances in primary prevention will require healthcare scientists to review and give serious consideration to a broad body of scientific evidence that extends well beyond the clinical trial paradigm.

It will also require a more open-minded and objective interpretation of results. The finding that vitamin E supplementation, over a 10 years period, reduced cardiovascular deaths by 24% in women over 45 years of age, and by 49% in women over 65 years of age (Lee et al, 2005) may have been disappointing to those steeped in acute care medicine (although I don't understand why). But these are significant and positive findings within the context of primary prevention. In short, vitamin E worked. Why then did the authors conclude that it "provided no overall benefit for major cardiovascular events" and refrain from recommending vitamin E supplementation for the primary prevention of heart disease? And why did the popular press lead their coverage of this study with headlines stating "Vitamin E Gets and 'F'"? Simply put, the findings did not fit the paradigm.

Poor reporting and bias in the press is easy to understand. Most journalists are not trained scientists, statisticians, or healthcare professionals. As such, they are not qualified to interpret medical studies objectively and competently. Moreover, Job One at major news organizations involves selling more newspapers and capturing more viewers, and they accomplish this by crafting controversial headlines and scary sound bites. If you want the masses to listen, frighten them. Unfortunately, the delivery of objective and complete information appears to be a distant Job Two.

This is an unfortunate situation, in that many Americans rely on the popular press for their health information. As such, the sensational and controversial coverage given to nutrition news has generated confusion, doubt, and skepticism in the public's mind, turning many against the diet and health message (Patterson et al, 2001).

Why would medical professionals have a negative bias against nutritional supplements? Several reasons come to mind. Most doctors receive no more than a few hours of nutritional training during their medical education. They know little about nutrition and the important role it plays in human health. Second, many express concerns that their patients might use supplements as an excuse to eat poorly. This concern has proved to be unfounded. Surveys show that supplement users tend to be health-conscious and to follow generally healthy habits. Third, many doctors have a low opinion of the nutritional supplement industry - and rightfully so. Too many supplement companies sell substandard products that fail to meet pharmaceutical standards for potency, purity, and efficacy. Too many companies fail to pay sufficient attention to safety. And too many companies make false and outrageous health claims for their products. Clearly this industry needs an overhaul to win the respect and confidence of doctors and the general public. But just as clearly, there are very reputable supplement companies in business today; companies that have adopted pharmaceutical standards for product quality, safety and efficacy; companies that deserve the public's trust.

These issues aside, I believe that the most significant barrier to the open consideration of supplement use in mainstream healthcare is the closed mind. Primary prevention, the focus of keeping healthy people healthy, lies outside the acute-care paradigm, and so it is ignored. Some in the mainstream pay lip service to prevention, but few base their practices or research careers on it. And sadly, because primary prevention is "alien", it is often derided as "ineffective", "too slow", "unreliable", "clinically unproven", and "only partially effective".

Unfortunately, these attitudes carry over to nutritional supplements. As tools of primary prevention, nutritional supplements also lie outside the acute care paradigm. When they are evaluated within that paradigm for short-term treatment / curative benefits, one or two nutrients at a time, on chronically ill people, they often fail. These failures, in turn, are judged as evidence that supplements have no benefit whatsoever.

Clearly it's time to challenge these notions and views. Change may begin at the grass roots level, as rising healthcare costs threaten to close the doors of access to good medical care. Today, too many Americans literally can't afford to get sick. Our alternative is primary prevention. We can choose to take charge of our health by adopting prudent lifestyle strategies and habits for staying healthy long-term. Nutritional supplementation can play an important role in this endeavor. The science, when approached broadly with an open mind, is convincing on this point. As components of healthy living, nutritional supplements can help people add years of health to their lives.

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