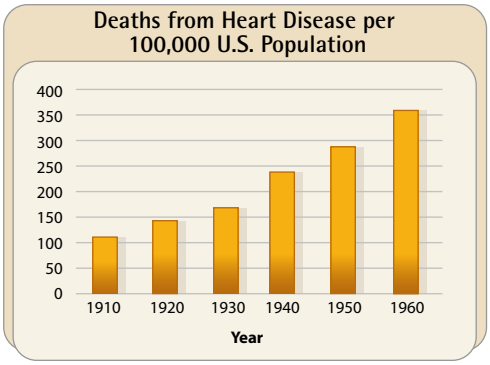
#5 HEALTH BULLETIN

nutriscan®

Micronutrient Supplementation

Obesity has become an epidemic (even among children). Diabetes and pre-diabetic conditions have also reached epidemic proportions. Depression, anxiety, memory declines, and fatigue affect more than 50% of the population. Heart disease, cancer, immune disorders...are more prevalent than ever before...yes, health is being replaced by chronic disease as our cultures 'norm'. The disturbing reality is that we are in the midst of a vast epidemic of poor health.

Do you think what we are eating (and not eating) might be somehow contributing to the epidemic of chronic poor health? Do you think that there is any possibility that we would be this unhealthy if our bodies actually had a full compliment of nutritional resources such as vitamins, minerals, essential fats, accessory nutrients, and phytonutrients (plant compounds)?



STANDARD AMERICAN DIET

The 20th century has a nutritional legacy. This legacy is "convenience", but the convenience has comes with a cost. Many of our foods are now high in sugars, salt, and hydrogenated fats. Supermarket items are packaged, refined, bleached, pasteurized, homogenized, chemically-preserved, artificially colored, artificially sweetened, and then selectively fortified/enriched. Do you think that all of these processes could possibly influence the nutritional quality of what we are eating?

Virtually all health organizations and health experts are in agreement on this issue – our current diet is directly contributing to the growing epidemics of chronic degenerative diseases. Whether it is heart disease, cancer, joint disease, diabetes, mood disorders, obesity, or any of a host of chronic disease conditions that has or is reaching epidemic proportions, our existing diet is contributing to the disease burden found in our society.

There are many reasons for this 'diet – chronic disease' connection. Experts are in agreement that the following factors all play a role:

- Too much of the wrong fats
- Too much sugar and sweeteners
- Too little fiber
- Insufficient fruits and vegetables
- Too many processed and fast foods

In this Issue

STATISTIC

The amount of sugars and simple sweeteners consumed in the U.S. each year averages about 152 pounds per person.

Add artificial food additives, colorings, sweeteners, and flavorings, genetic modifications to staple crops, mineral-depletion of our soil, nutrient losses occurring from food transportation and packaging, antibiotic and hormone residues in animal products, pesticide and heavy metal residues, and the picture gets even more bleak.

The jury is clearly in and has spoken: despite intentions to the contrary, the quality of what many of us eat daily is relatively poor. Not surprisingly, the results we are producing with our health, as a society, are also quite poor.

THE CHANGING TIMES

Let's examine several quotes in order to gain an appreciation for the changes in thinking that are occurring about the relationship between our nutritional status and our health outcomes.

QUOTE ONE:

"It is wholly unscientific to state that a well-fed body is more able to resist disease than a less well-fed body. My overall opinion is that there hasn't been enough experimentation to prove dietary deficiencies make one more susceptible to disease."

Dr. Elmer M. Nelson, Head of the FDA
Washington Post, October 26, 1949

This quote was in testimony given in federal court in 1949 by the head of the government agency whose mission is to safeguard the quality of our food supply and to protect us against commercial interests such as pharmaceutical companies. Fifty plus years have passed since this quote appeared. Today we know that vitamin supplementation in malnourished children decreases their susceptibility to infectious diseases. Today we know that increasing folic acid intake protects against heart disease and birth defects. Today we know that supplementing seniors' diets decreases their risk to infection. Today advertisements on TV discuss the research on positive health outcomes and the enhanced longevity of dogs fed diets supplementing vitamin and mineral content. Scarcely a week goes by now without a press release from a major study that has found further evidence of the relationship between our nutritional status and one or more chronic diseases. The opinion of the 'expert' just quoted from 1949 was absurd. Today, fortunately, this fact is broadly recognized. Experts agree that a well-fed and nourished body decreases our susceptibility to most disease states.

QUOTE TWO:

"Optimizing vitamin and mineral intake by encouraging dietary change, multivitamin and mineral supplements, and fortifying foods might therefore prevent cancer and other chronic diseases."

BN Ames BN and P Wakimoto
Are vitamin and mineral deficiencies a major cancer risk? Nat Rev Cancer 2002 Sep;2:694-704

The times have changed. This second quote is from a research abstract appearing in 2002. The authors are researchers at the Nutrition Genomics Center, Children's Hospital Oakland Research Institute, Oakland, CA. The quote is consistent with the majority of expert opinion that exists today in nutritional research. Today's experts are of the opinion that improved nutritional status pays dividends in decreasing susceptibility to disease. Our body needs nourishment. The need for nourishment is non-negotiable. In life there are things we can do and things we can't do. We can meet our needs or we can ignore them. But we can't ignore them and produce the quality of health that most of us desire.

BUT I EAT A GOOD DIET

Improving our nutritional status is critical if we wish to produce better long-term health outcomes. The question then becomes, can I do this by simply eating a "good diet"? Unfortunately, with few exceptions, the answer is "no". We could engage in all types of theoretical arguments as to why this is the case but reality is a preferred argument. With that in mind, let's explore several areas of nutritional status and gain a clearer picture of how we are really doing.

EFA INSUFFICIENCY

Essential Fatty Acids (EFA's) are special fats that our body cannot produce. We must get these fats from the foods we eat (or dietary supplements). In many respects, EFA's are analogous to vitamins. Similar to vitamins we need these essential fats to create health. Also similar to vitamins, we must consume them since we cannot make them in our body.

There are 2 primary categories of EFA's. They are most commonly designated as omega 3 and omega 6. An adequate amount of both of these families of fats is critical if we hope to arrive at our health goals. The vast majority of people get an adequate amount of the omega-6 family (found in greatest quantities in grains, nuts, and seeds);

however, deficiencies in omega-3 EFA (found in significant quantities, almost exclusively now, in cold-water ocean fish) are extremely common.

This is in part a result of cattle management practices during the past century. Estimates suggest a 53% increase in saturated fat and a 68% decrease in EFA's in domestic cattle. Similar is true of chickens and eggs nowadays ("Omega 3 eggs" excepted). It is in part a result of insufficient intake of the right types of fish in the diet of many Americans. It is in part a result of the increase in farm-raised fish (which are typically lower in omega-3 EFA's) in the marketplace.

It is in part a result of a relative deficiency that occurs when we consume hydrogenated oils and high-fructose corn syrup and sweeteners. These items were almost non-existent in the diet as recently as the mid-1960's. Today we would be hard-pressed to find a packaged food or beverage without one or both of these items.

Ultimately the dietary insufficiency of omega-3 EFA's is a combination of many factors acting together. The result is predictable and unfortunate. It is increased risk of heart disease, diabetic conditions, immune disorders, and a host of other disorders that occur as a direct result of our failure to meet our body's very real omega-3 EFA foundational needs.

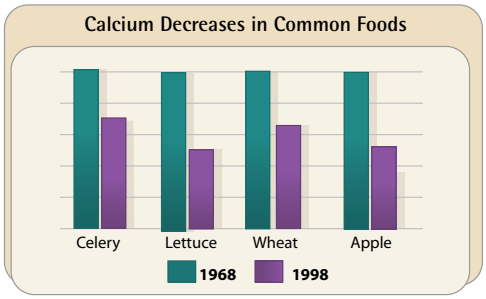
Nutritional research estimates that when we are healthy we need to consume between 350-400 mg every day of the EPA and DHA (long-chain omega-3 EFA's found in fish) just to get our cellular nutrient stores to the mid-normal range. What if we wanted to be better than mid-normal? What if we are pregnant or lactating? Sick? Elderly? Have impaired fat absorption? Are taking medications? Are eating a poor diet? I am sure you get the idea.

Under these and other interacting circumstances even 350-400 mg a day is unlikely to keep our "Omega-3 EFA storage tanks" full. To absolutely ensure that we meet this critical nutritional requirement most of us either have to substantially increase our cold water fish intake or supplement the diet with an amount of EFA needed to close the gap between what our body needs and what our diet supplies.

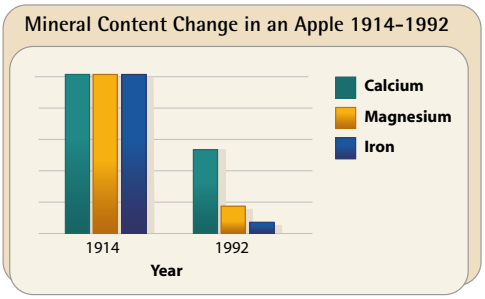
Depending on coldwater fish to provide our daily EFA requirements is less appealing, in light of growing evidence of both heavy metal and pesticide residues in the most common and available of these.

VITAMIN AND MINERAL INSUFFICIENCIES

Changes in food growing, harvesting, production, and transportation have resulted in substantial changes to the vitamin and mineral content of our food supply. Growing and harvesting practices have changed substantially since the introduction of chemical fertilizers in the 1800's and the movement to factory farms. Chemical fertilizers and forced growth techniques deplete multiple nutrients from the soil. The result is that minerals such as calcium, magnesium, iron, zinc, selenium, and copper are found in far lower amounts in our foods today than was the case even compared to the recent past.



Early harvesting prevents fruits and vegetables from reaching maturity. These foods do not have the opportunity to absorb and produce the quantity of nutrients that they otherwise might have. During transportation even more nutrients are lost. The end result is that, from a nutritional perspective, an apple is no longer an apple and that eating an orange is no longer a guarantee of getting a consistent dose of vitamin C.



Micronutrient Supplementation

Consuming a meticulous diet no longer ensures that nutrient requirements will all be fully realized. Tremendous variability exists in the vitamin content of our food supply even when we eat 'healthy' foods. As an example, cabbage can contain anywhere between 0 and 94 parts per million of iron and a tomato can have anywhere between 1 to 1938 p.p.m. While fruit (like oranges) are an excellent source of vitamin C, the amount of this vitamin in fruits can decrease substantially as more time elapses between harvest and consumption. The nutrition found in dairy products varies depending upon what the animal is fed. If the animal is pasture-fed, it also varies seasonally and with the quality of the soil. If the milk is pasteurized, vitamin B6 and B12 content is decreased. If the cow is given growth hormone, levels of vitamin A and B vitamins decline, while synthetic hormone levels rise.

In 1900, 98% of grain products consumed were whole grains and 2% were refined. Today, the percentages have flip-flopped with perhaps 2% of grain products consumed being unrefined. White bread came on the market in 1920. Processed meats were introduced in 1937. In 1940 less than 10% of our food was processed. Today it is greater than 90%. Processing removes minerals like calcium, magnesium, and potassium, and typically replaces them with sodium.

Mineral Content/Loss During Canning of Peas

Mineral	% Change	Mineral	% Change
Calcium	- 76%	Iron	-55%
Magnesium	- 41%	Zinc	-38%
Potassium	- 65%	Copper	-31%
Sodium	+		

The overall result of all of these interacting factors is that a 'good diet', while a very important part of the overall health equation, is far from a guarantee when it comes to ensuring that all of your vitamin and mineral nutrient storage tanks are full. With this as the case, it is not a surprise that in one study the scientists found that "More than 75% of women irrespective of ethnic group had usual intakes of calcium lower than the new Adequate Intake. More than 90% of the women had inadequate intakes of folate and vitamin E from food sources alone. More than half of smokers had inadequate intakes of vitamin C." Their conclusion was that "a high proportion of pre-menopausal U.S. women are under-consuming a variety of nutrients. Dietary intakes alone are not currently adequate to meet the new recommended intakes."

IS THE RDI ENOUGH?

In the U.S. the standard for micronutrient needs to avoid deficiency used to be referred to as the RDA. The RDA levels have been replaced by the newer standards called RDI (Reference Daily Intake).

The RDA was never intended to be all encompassing. They were never intended to estimate the needs of persons with health challenges or chronic disease. They were also never designed to consider the effects on nutrient status of common lifestyle habits, occupational exposures, or medications. For example, the Food & Nutrition Board acknowledges in the 10th edition of RDA's in 1989 that smokers require at least twice the intake of vitamin C as non-smokers. In other words, the RDA was never designed to be all encompassing in terms of even avoiding deficiency! What do you think the odds were of RDA levels of nutrients ensuring optimum health?

Similar problems exist with the newer RDI for micronutrients. RDI levels fail to address common lifestyle habits like dieting, higher alcohol intake, sleep deficiency, drug-nutrient depletions, or smoking, as examples. They do not take into account the effect occupational exposures to chemicals or metals play on micronutrient status. And, just like the RDA that they replaced, they are not designed to take into account the variations that exist because of genetics, disease states, and many other circumstances.

Roger Williams, Ph. D., a preeminent scientist, originated the concept of "biochemical individuality". He believed individual uniqueness (in terms of things like genetics, health status, & environment) greatly influenced micronutrient requirements. RDI-type recommendations are based upon a statistical norm, not the complexities and variations of real people. Real people can have nutritional requirements that under certain circumstances vary 1000-fold! As he said during an address to the Philosophical Society of Texas more than 1/2 century ago; "…real people are of very great concern to me and I think to all of us, but abstract man is only an idea. He doesn't have any particular job, he doesn't marry anyone in particular; he doesn't have any particular trouble or any particular aspirations".

Williams, R.J., Proceedings of the Annual Meeting of the Philosophical Society of Texas, December 10, 1949.

Like Williams, NutriScan® is concerned with nutrition for real people.

So if your goal is to simply prevent deficiency diseases like scurvy, rickets, etc: the RDI is very likely going to succeed more often than not. However, if your goal is to achieve a healthy, disease free life-span (in other words match your genetic potential for health), it is important to realize that the RDI are neither intended for this purpose nor particularly useful in ensuring this outcome.

TAKE HOME MESSAGE

The take home message is clearly that multiple vitamin and mineral inadequacies are the norm…even in the healthiest segments of the population!

It doesn't take a great imagination to see what the picture might be in the less healthy segments of the population. Evidence is overwhelming that the nutrient composition and quality of a 'good diet' has changed substantially (for the worse) over the past century. Evidence consistently identifies micronutrient deficiencies even in healthy people. Evidence that micronutrient deficiencies impact our short and long-term health outcomes is beyond solid. With this as the case, do you think that we might benefit from identifying and correcting micronutrient inadequacies? To answer this question, let's take a look at the research on behalf of broad-spectrum micronutrient supplementation.

NOTE:
The evidence presented will strictly focus on the research of multiple vitamin and mineral preparations and not explore the volumes of research on the benefits that come from supplementing a single (or several) appropriate micronutrients.

VITAMIN AND MINERAL SUPPLEMENTATION

Epidemiological Research

Epidemiological associations between supplementing the diet with multivitamin/mineral preparations and prevention of disease exist for the following common chronic diseases.

- Cancer (Breast, Colon, Prostate)
- Heart Disease
- Vision Disorders (age-related)

One of the interesting aspects that has come up again and again in these studies is that it was typically the people who took supplements for more than 10 years who appeared to have the disease prevention benefits (or at the very least the greatest benefits). Use of supplements for shorter periods of time was, in most of the studies either not protective or was much less protective.

As an example, in one study on colon cancer, no reduction in risk of this type of cancer was found in persons taking multiple vitamin/mineral supplements for less than 4 years. A slight (but not statistically significant) reduction in risk was found for persons taking supplements for between 5-14 years. However, after 15 years of taking multiple vitamin/mineral supplements risk for colon cancer was markedly lower.

The second interesting thing that has been found in some of these studies is that what we do today appears to be much less important than what we have done in the past when it comes to supplementing the diet.

As an example, (again looking at colorectal cancer), regular multivitamin use at the time of enrollment in the study was not associated with any reduced risk of colorectal cancer. However, regular multiple vitamin/mineral use 10 years before enrollment was associated with reduced risk. This was true even if the previous users had stopped taking vitamins!

While epidemiological research can't pinpoint cause and effect relationships, so it is not possible to draw conclusion like 'supplementing the diet with multiple micronutrients prevents heart disease', these studies point towards two equally important possibilities with respect to long-term health.

(1) What we have done consistently over many years may be far more important than what we are doing today.

(2) The benefits of micronutrient supplementation in terms of disease prevention might require a decade or more of use to accrue substantial benefits.

BIOMARKER RESEARCH

In health and medicine, research tends to focus on one of two main areas -- clinical endpoints and biomarkers. A simple way to think of biomarkers is that they are measures that:

(1) have a relationship with our long-term health

(2) are early warning signs of degeneration or potential disease

As an example, a heart attack would be considered a clinical endpoint while cholesterol levels would be considered a biomarker that serves as a warning sign of eventual higher risk for a heart attack. Because of this, biomarkers are routinely monitored within medicine in attempts to prevent disease (or avoid falling victim to a clinical endpoint).

Research has consistently found that supplementing the diet with multiple vitamin/mineral preparations positively influences several important biomarkers. These include:

- Homocysteine (Biomarker linked to increased risk of many chronic diseases including heart disease, stroke, dementia, bone disease, etc.)
- C-reactive Protein (Biomarker of systemic inflammation associated with risk for heart disease, arthritis, etc.)
- Oxidative Stress (Biomarker of accelerated aging and tissue damage)
- Glycosylated Hemoglobin (Biomarker of long-term blood sugar regulation)
- Cytokines (Biomarkers of immune system and inflammatory response system communications)
- Indices of B- and T-cell Immunity (Biomarkers of immune system performance and resistance to infections)
- Rate of new bone growth (Biomarker of bone health)

MEDICAL QUESTIONNAIRES

Standardized questionnaires are used to track many health outcomes. For things that are hard to measure on a lab test like stress, mood (depression or anxiety), quality of life, or intelligence, they are a preferred method of tracking the benefits of interventions such as the response to medications or vitamin supplements. Some of the areas that have been studied include:

Study One

Probiotic + Multivitamin/mineral Preparation

Reported benefits included:
(1) 40.7% improvement in stress
(2) 29% decrease in the frequency of infections
(3) 91% decrease in gastrointestinal discomforts

Study Two

Multivitamin/Mineral (alone or with Ginseng)

Reported benefits included:
(1) Multivitamin/mineral – increased quality-of-life score by 6.4 points
(2) Multivitamin/mineral + Ginseng – increased quality-of-life score by 11.9 points

Study Three

Multivitamin/Mineral

Reported benefits included:
(1) Use associated with consistent and statistically significant reductions in anxiety and perceived stress.
(2) Participants in the active group also tended to rate themselves as less tired and better able to concentrate

Study Four

Multivitamin/Mineral

In persons with high stress - benefits included:
(1) A statistically significant mental/emotional improvement
(2) Beneficial effect increased over the course of the day

Study Five

Multivitamin/Mineral

In children - benefits included:
(1) A significant increase in non-verbal intelligence

Study Six

Multivitamin/Mineral

In children - benefits included:
(1) An average increase of 2.5 points on IQ test
(2) An increase of 16 points or more in IQ in some of the supplemented children

OCCUPATIONAL HEALTH

Occupational health has to do with job-related factors. Work environments expose many to unique stresses, including: noise, chemicals, metals, and many other factors. Nutritional requirements (and the chances of functional inadequacies) can change dramatically depending upon our work environment and its unique stresses. The result can be impaired immunity, lower quality-of life, disease, increased disease risk, and more.

As an example, in one study of people employed in the metal industry, a deficiency of more than one vitamin was found in 88.6% of workers evaluated! Most of these workers experienced poor immune system function.

Light Industry Workers

2 month supplementation with a multivitamin/mineral formula resulted in:

(1) Biochemical and functional markers of vitamin status improved.

(2) Measured parameters of working capacity improved.

Petrochemical Workers

Multiple micronutrient supplementation for 40 days resulted in:

(1) Measured parameters of antioxidant status and chemical detoxification capabilities improved and normalized.

Female Workers of Poultry Factory

Multiple vitamin/mineral supplements for 3 years resulted in:

(1) Normalization of measured parameters of vitamin status

(2) Reduction in toxic and allergic effects to chemical substances

(3) Decreased incidence of chronic disease.

MULTIPLE MICRONUTRIENTS AS THERAPEUTIC INTERVENTIONS

Studies introducing multiple vitamin/mineral supplements (and in some cases other accessory nutrients) as a therapy have shown positive results in the following circumstances

In several children with chronic sinusitis the combination of a multiple vitamin/mineral + Cod Liver Oil decreased:

(1) sinus symptoms
(2) episodes of acute sinusitis
(3) doctor visits

Children with chronic ear infections who were given a combination of a multiple vitamin/mineral + Cod Liver Oil required fewer days of antibiotic treatment.

Children with a history of juvenile delinquency were given a daily vitamin-mineral supplement for 4 months. Compared to the children given a placebo, the 40 children who received vitamins and minerals had:

(1) a 47% lower mean rate of antisocial behavior,

(2) lower rates of antisocial behavior including: threats/fighting, vandalism, being disrespectful, disorderly conduct, defiance, obscenities, and refusal to work.

In women with symptoms of PMS, a multiple vitamin/mineral supplement was shown to improve symptoms of premenstrual tension.

Multiple vitamin mineral supplements have been found to have benefits on bone density and growth. While calcium typically gets the lion's share of the attention for bone issues, one study monitored bone growth of healthy women given either:

(1) 600 mg of calcium + "all known micronutrients" at RDA levels or

(2) 700-800 mg of calcium (with no added micronutrients)

Periodic x-ray assessments indicated that within 9-11 months, the rate of bone density increase was 2-3X greater among the women taking the calcium + micronutrients when compared to women taking calcium supplements in isolation!

Several studies have found that supplementing the diet with a multiple vitamin/mineral preparations can positively influence immune system performance resulting in:

(1) better resistance against bacteria and viruses
(2) improved responses to vaccinations
(3) fewer infections

In one of the more noteworthy studies, diabetic persons were given a multiple vitamin/mineral preparation for 1 year. 93% of the participants receiving the placebo reported an infection compared with only 17% of those receiving the micronutrient supplements!

CONCLUSION

The idea that great health can be achieved and sustained by simply eating a balanced diet is rife with holes. The days when this might have been true are long since gone. Evidence is clear that supplementing the diet with micronutrients can positively impact our health and performance over the short-term of months to a year or two. Of potentially even greater importance, supplementing our diets with micronutrients today and during the decades while we are enjoying good to great health, might actually provide insurance against degeneration and disease that otherwise awaits us decades down the road. If the existing research is correct, waiting until the arrival of degeneration to begin supplementing the diet with multiple micronutrients looks to be too little too late. In many respects, it looks to be analogous to insuring your car after an accident…an approach not likely to do much in terms of affording your car and pocketbook the protection needed.

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