

Chapter 1: Integrated Nutrition – Foods and Supplements

Introduction

The interest in the health benefits of nutrition from foods and dietary supplements has never been greater, but the confusion generated by much of the information available on the Internet and mass media is also at an all-time high. There has been a controversial and sometimes contentious relationship between foods and supplements, as each is portrayed as providing total nutrition.

On the one hand, foods claim to provide all the necessary nutrition in daily servings from the basic food groups. As nutritional science has advanced, it is clear that the modern food supply as ingested today does not provide an optimal diet. Dietary recommendations are issued to attempt to provide total nutrition through foods, but the necessary foods may be too costly or too difficult to prepare in the proper balance for the average consumer. Being obese and ingesting too many calories does not guarantee an adequate intake of vitamins and minerals. It is possible to take in too many calories and too few essential nutrients.

On the other hand, dietary supplements are sometimes recommended without regard to the nature of the diet, with the assumption that they provide benefits with any diet. It is true that dietary supplements don't make up for a poor dietary pattern but should be used in combination with a healthy diet. However, the ability of most consumers to track their intake of major nutrients, vitamins, minerals and phytonutrients from foods is poor. Therefore, supplements provide an additional source of vitamins, minerals and phytonutrients calculated to support an overall diet that incorporates the latest emerging nutritional science. As an option for nutrition-oriented consumers, safe dietary supplementation requires adequate knowledge of the usual and safe levels of intakes for specific dietary supplements as well as the elements of a healthy dietary pattern.

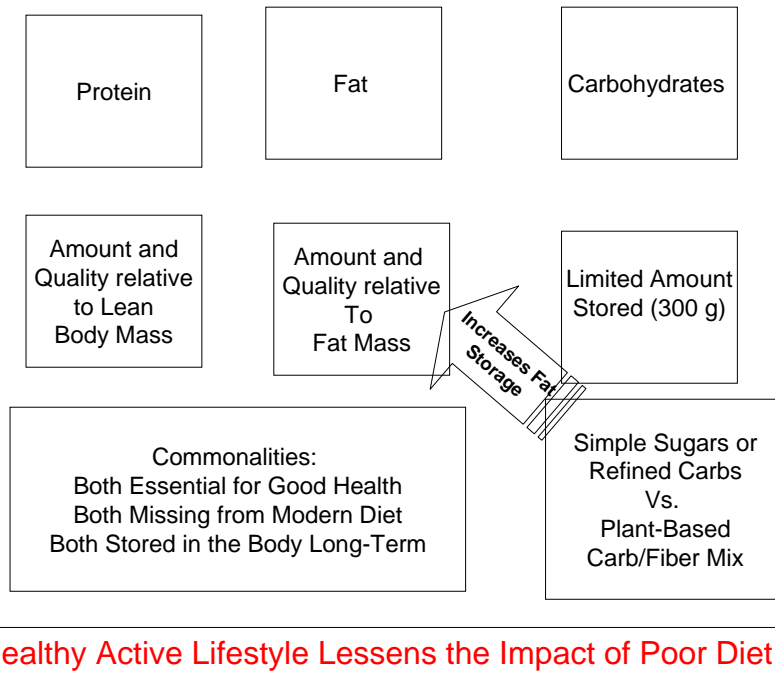
Total nutrition includes consuming both dietary supplements and a healthy diet to provide assurance that you are getting the protein, vitamins and minerals needed on a daily basis. The goal of this textbook is to provide you with basic information about nutrition, including both foods and dietary supplements.

Foods and Nutrient-Nutrient Interactions

A major nutrient (called a macronutrient) is a component of foods consumed in large amounts, as compared to vitamins, minerals or plant-derived antioxidant phytonutrients. The dietary macronutrients are carbohydrate, protein and fat, and they most often occur in foods in combination. Each of these classes of macronutrients plays a key role in human metabolism. However, these macronutrients are usually not ingested in their pure form but rather in a whole-food matrix. And, most foods contain more than one macronutrient. People may think of nuts, for example, as *fats*, but they also contain protein. And vegetables, which are primarily carbohydrates, also contain traces of fat. A vegetable contains carbohydrates and so does a candy bar, but the impact of these two foods on the human body is very different.

Macronutrients Are Not the Whole Story

The simplification of foods into categories of proteins, fats or *carbs* can be misleading. Dietitians have traditionally used what is called an exchange system to classify foods based on the predominant macronutrient – so that foods are divided up into carbohydrate exchanges, protein exchanges or fat exchanges – which implies that all the foods within each list are interchangeable. But often the foods on these lists are not equivalent: A slice of whole grain bread provides more vitamins, mineral and fiber than a slice of white bread, but they're both considered to be a carbohydrate *exchange*. When using this system, if foods are selected without regard to other *non-nutrient* aspects such as fiber content or their content of phytochemicals, it could result in a rather unhealthy diet that could be low in fiber, high in refined carbohydrates and fat, and lacking key phytochemicals, vitamins and minerals.



Healthy Active Lifestyle Lessens the Impact of Poor Diet

Figure 1: The interaction of the major nutrients in the human body

Humans have evolved to avoid starvation but not to automatically reverse overweight and obesity. If you eat more calories than you burn on a given day, the excess will be converted to fat. Excess fat intake and excess refined carbohydrates are most easily converted to fat both biochemically and through their stimulation of certain hormones that optimize energy storage. Protein can also be converted to fat but less efficiently, leading many people to think that protein cannot be converted to fat. It can, but its primary role is to maintain lean body mass. Ignoring protein intake can be dangerous. In societies where there is little protein available, the lean body mass is reduced, leading to a reduced requirement for calories. Hormonal changes prior to birth can program short stature for individuals born into societies where food is scarce as a way to reduce the amounts of foods needed to maintain lean body mass.

The body stores major nutrients differently from the way they are consumed in the diet. The body stores only 300 grams or 1,200 calories of carbohydrate as glycogen in the muscle and liver, but stores between 130,000 and 160,000 calories of fat in about 13,500 grams of fat or more in overweight or obese individuals. The body also stores 54,000 calories of protein in about 13,500 grams of muscle and vital organs. However,

only half or 27,000 calories of this energy is available since depletion of more than 50 percent of body protein is incompatible with life.

The nutrient-nutrient interactions described above allow humans to survive in many different food environments, from Eskimos eating whale blubber to South Asians living in the Himalayas on a very low-fat, high-carbohydrate diet of beaten roots and vegetables. These adaptations allow survival to reproductive age, which is all that concerns our evolutionary nature. On the other hand, overweight and obesity due to excess calorie intake can contribute to the risk of developing age-related diseases including heart disease, diabetes, common forms of cancer, and Alzheimer's Disease.

Balanced nutrition, as concerns the major nutrients, involves the following principles:

1. Consume protein in the amount appropriate to your lean body mass.
2. Consume healthy fats in the proper balance, keeping in mind the calories carried by hidden fat. Increase the intake of omega-3 fats through supplements and foods, while limiting the intake of omega-6 fats by reducing the intake of processed vegetable oils by substituting olive oil – a source of healthy omega-9 fats, for omega-6 rich fats and oils used in cooking.
3. Consume healthy carbohydrates from plant foods with dietary fiber and minimize the intake of refined carbohydrates from breads, pastries, cakes, chips, snack foods and cookies.

Dietary Supplements

People who diet frequently and cut their calories quite low in order to lose weight, often take a multiple vitamin/mineral supplement for “nutritional insurance.” When calories are cut to a low level, it is often difficult to consume all the recommended levels of vitamins and minerals. It is important for persons who lose weight to monitor their diets, to ensure that they are consuming sufficient quantities of beneficial nutrients.

Premenopausal women represent another group that often will benefit from supplements. Iron and calcium are often lacking in the diet. Many women avoid calcium-containing dairy products in the belief that they are “fattening.” Women in this age group also tend to diet frequently and may cut their protein intake in the process, leading to

poor intake of iron and zinc. In the childbearing years, monthly iron losses need to be replenished through dietary sources and/or supplements.

Evidence That Vitamins and Minerals May Promote Public Health

There is still controversy about vitamins in newspapers and medical journals. Studies where vitamins are compared to drugs are publicized as showing that vitamins have no benefit, while many physicians and other health care providers are not familiar with the significant body of scientific studies supporting the use of vitamins and minerals.

It is commonly assumed that Americans' intake of vitamins, minerals and phytonutrients is adequate. Classic deficiency diseases such as scurvy, beriberi, pernicious anemia and rickets are rare. However, it is clear from much recent scientific investigation that metabolic damage occurs at levels between the level that causes acute micronutrient deficiency disease and the recommended dietary allowances (RDA). The optimum amount of folic acid or zinc that is *truly required* is the amount that minimizes DNA damage and maximizes a healthy life span, which is higher than the amount needed to prevent acute disease. The majority of Americans do not meet through their diets the recommended daily allowance of many of the vitamins and minerals critical to health promotion. Vitamin supplementation with folic acid has been shown to prevent neural tube defects and improve immune function. (Ames BN. A role for supplements in optimizing health: the metabolic tune-up. Arch Biochem Biophys. 2004 Mar 1;423(1):227-34. Review. PubMed PMID: 14989256) [Please send us a copy of this study to review as substantiation for above claims.] Copy appended to the e-mail

There are three scientific arguments supporting the use of vitamins and minerals. First, they can help bring consumption up to recommended levels. Second, increasing total vitamin and mineral intake, possibly to levels exceeding current recommendations for adequate intake, may help achieve optimal nutrient status and function. Finally, adequate intake of some micronutrients can be beneficial in more striking ways, for example, the consumption of folic acid by pregnant women may reduce the risk of neural-tube defects in children.

Pregnancy and Birth Defects

One out of every 30 babies born in the United States has a serious birth defect. Each year, some 3,000 pregnancies are affected by what is called a neural tube defect (NTD), such as spina bifida (an opening in the spinal cord that does not close) or anencephaly (a baby born without a brain). Since 1980, more than a dozen studies have looked at the role of folic acid in reducing the incidence of neural tube defects. Perhaps the most important, the 1991 United Kingdom Medical Research Council randomized clinical trial, found that folic acid use could reduce the relative risk of NTD by more than 70 percent (MRC Vitamin Study Research Group, Lancet 1991). The U.S. Public Health Service drew on this data to issue recommendations on folic acid the following year. They said that women capable of becoming pregnant should take 400 µg of folic acid daily. The U.S. Food and Drug Administration followed this advisory with orders requiring all products made with *enriched* grain to contain additional folic acid, and the body approved the use of health claims for products that contain significant amounts of the vitamin. The Centers for Disease Control and Prevention (CDC) suggest that the consumption of supplemental folic acid could significantly reduce that number even beyond what has been achieved to date with the fortification of *enriched* grain products so that about 80 percent of these birth defects could be prevented.

Educational programs soon emerged, targeting women of childbearing years, health care professionals, women's groups and policymakers. Surveillance studies conducted in China, Canada and the United States have shown that fortification programs have dramatically lowered the prevalence of NTD. Knowledge of folic acid among younger women has increased as well. The percentage of those women between 18 and 45 who heard about folic acid grew by more than 50 percent between 1995 and 2000. However, only 10 percent knew the correct dose and only one-third actually consumed the vitamin daily. Thus, although at least part of the folic acid message is reaching targeted women, not all are benefiting from that information.

Immune Function

Diet and nutritional status are two of the key factors affecting the body's immune response. Recent studies show that multivitamin use, in concert with a good diet, is a cost-effective tool to maintain a healthy immune system and thus improve overall quality

of life. Immune status is relatively easy to test, for unlike in cardiovascular disease or cancer, validated biomarkers of immune function are available.

Conclusion

An integrated approach to nutrition considers the whole diet, including foods and dietary supplements. The myth that everything can be obtained by eating the basic food groups is simply that: a myth. Many individuals in modern society fail to obtain what they need from their diet and need dietary supplements.

The industrialization of the food supply has led to less diversity in the diet. The monotonous intake of a few food groups can easily lead to suboptimal intake of many micronutrients, even in individuals taking in excess calories of fat and sugar-laden foods. The suboptimal intake of fruits and vegetables is another factor making dietary supplements necessary.

The field of nutrition science is making new discoveries every day, and supplements are often where those advances are made available to the public. Through proper education, individuals can learn how to combine supplements that go beyond the multimineral/multivitamins listed above. Antioxidant supplements of various types as well as supplements that help to restore the balance of pro-inflammatory and anti-inflammatory fats in the diet and support immune function are becoming popular. Only an integrated approach to nutrition will enable individuals to obtain the full benefit of these supplements.

References

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