Optimal Nutrition: A New Prescription

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This article reviews some nutrient interrelationships and cardinal rules for daily food selection including: foods to eat liberally, foods to eat sparingly, and foods to avoid. Lastly the use of nutritional supplementation is discussed. This is particularly important because the foods that are frequently eaten have lowered nutrient values as a result of handling and processing.

Introduction

"Today germs are not our principal enemy. Our chief medical adversary is what I consider a disturbance of the inner balance of the constituents of our tissues, which are built from and maintained by necessary chemicals in the air we breathe, the water we drink and the food we eat. For a generation we have worked on the concept that our cells are never static and that in time must be replaced in varying degrees by the nutrients obtained from food. More specifically, our working hypothesis has been that all disease is chemical and, when we know enough, chemically correctable."

These statements by Spies [1] epitomize the place of diet in health and disease; and they are as applicable in these areas today as they were when published in 1958.

Good nutrition together with good hygiene are the best weapons available in the prevention of disease. If one were bold enough to make a prediction, it would be that the most important measure for prevention of disease is the provision of good nutrition from conception to the grave [2].

Nutrient Interrelationships

There are over 40 essential nutrients that act in an interrelated fashion to sustain life. Each nutrient is linked to all

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the others; and, death is inevitable without any one of them. The biologic effects of a single nutrient will vary with the other nutrients consumed at the same time. Hence, there is a need to appreciate the complex dynamics of nutrient interdependency.

The vast number and complexity of nutrient interactions are described in a review of the literature by Harte and Chow [3]. They note that the most striking impression received from evaluation of the literature is that hardly any study undertaken with any pair of nutrients failed to show a significant interaction in terms of some nutritional or biochemical criterion. This is not surprising since each step in the chain of reactions through which a nutrient goes while following an appropriate metabolic pathway is mediated by at least one enzyme system. The functioning of every enzyme system is dependent upon the combined action of an apoenzyme, which is composed primarily of amino acids, and a coenzyme, which includes a vitamin and/or a mineral element.

Thus, the biological activity of carbohydrates, proteins, fats, vitamins and minerals is so interdependent that an imbalance of any one will likely affect most of the others. Because of this, consuming a variety of food is essential in order to provide a variety of essential nutrients. Sayers and co-workers [4-6] demonstrated that vitamin C can prevent or correct iron deficiency anemia by enhancing the absorption of iron present in foods. The potentiating effect of vitamin C upon iron absorption is determined to be directly proportional to the amount of vitamin C present at mealtime over a range of 25 mg. to 1000 mg. Iron absorption from food is enhanced from 1.65 to 9.57 fold over this range of vitamin C supplementation. Since the vitamin C and iron must be ingested at the same sitting in order to interact, vitamin C from orange juice or as a supplement at breakfast does not influence iron uptake from meals or snacks ingested later in the day. The daily iron absorption will more than double when the daily intake of vitamin C is divided equally over three meals rather than at one meal only.

Even persons deficient in iron who are taking iron supplements may not reach adequate blood levels of iron. But Sayers and colleagues found that when patients took 100 mg. of vitamin C along with meat meals, they absorbed 40% more iron. The same amount of vitamin C with vegetarian

meals doubled or even tripled iron absorption. Thirty to ninety grams of meat, fish or poultry and just 25 mg. of vitamin C at the same time would place such a meal in a high-iron availability category. Iron from meat, fish or poultry is more readily absorbed by the body than iron from vegetables, so the enhancing effect of vitamin C is stronger for vegetable meals.

Cardinal Rules For Daily Food Selection

Food processors, aware of the growing public concern in nutrition, continue to push high-profit foods. The advertising budget for most foods is indirectly related to the nutritional value. One should watch TV on Saturday morning and count the number of ads for nourishing foods such as fresh fruits and vegetables and whole grain breads and cereals. There are not any. The commercials are pushing highly refined foods including breakfast cereals that are stripped of vitamins, minerals, vegetable oils, protein and fiber; and, saturated with sugar. In other words, the depleted foods are more profitable.

It is best to avoid refined or processed foods containing food additives. The less one eats "doctored" foods, the less likely that person will need "doctoring." The nutritional value of a food is inversely related to the shelf-life, i.e., the higher the nutritional value, especially in vitamins, minerals, essential amino acids and essential fatty acids, the shorter is the shelf-life. Nourishing foods spoil quickly and depleted foods do not go bad for months or even years. Therefore, try to reduce the consumption of sugar, e.g., sugar cane, sugar beets and corn glucose or fructose, salt and over 2000 other additives by buying foods in the natural state and preparing them at home.

Home prepared foods in the natural state are both more nourishing and cheaper. Table 1 compares foods in a convenience form versus home prepared [7].

One should not try to get by on less than three meals per day; breakfast, lunch, and dinner. The first meal of the day or breakfast is critically important. It breaks the overnight fast and prepares the body for the physical and mental challenges of the day. Maintenance of ideal weight and general health is aided by eating breakfast like a "king", lunch like a "prince", and dinner or supper like a "pauper".

Table 1

Cost Per Serving of Ingredients for Home-Prepared and Convenience Foods, July 1978–June 1979 (4-city average)*

Product	*Serving Size (oz.)*	*Home Prepared (cents)*	*Convenience Forms (cents)*
Beef Lasagna	9.8	57.7	112.6
Beef Meat Loaf Dinner	9.1	37.1	91.4
Chicken A La King	5.7	27.8	47.4
Fried Chicken, batter-dipped	2.0	28.9	51.3
Chicken Salad, Spread	2.5	23.0	46.4
Pizza	8.3	37.8	73.2
Cooked Rice	3.4	2.8	4.2
Broccoli au gratin	5.1	35.5	51.6
Pork and Beans	6.9	8.0	17.5
Potatoes au gratin	4.5	10.7	35.8
Boiled Potatoes	4.0	4.1	14.3
Hash-Browned Potatoes	3.9	5.8	13.5
Potato Patties	3.1	4.9	15.9
Stuffed Potatoes	5.6	14.1	31.1
Scrambled Eggs	4.1	14.8	28.6
Angel Food Cake	1.7	6.3	15.5
Pound Cake	1.1	3.9	14.2
Orange Sherbet	3.2	6.2	13.4
Yeast Rolls	1.3	2.4	3.2

* Adapted from data by Traub and Odland [7].

Contrary to popular belief, between-meal snacking is not necessarily an undesirable habit. In food frequency studies of adults, weight, blood pressure, blood sugar, and blood lipids were all reduced toward normal in those who added nourishing midmorning or afternoon snacks to the three regular daily meal routine [8]. However, snacking late in the evening or after dinner was shown to prevent a significant decrease in these parameters.

Choose snack foods carefully. Restrict nibbling to such foods as raw nuts and seeds, fresh fruit, raw vegetables, unsweetened fruit and vegetable juices, milk, yogurt and cheese. These foods will satisfy body needs and help control appetite even at the next meal.

An optimal diet in one sense is not a "diet", but is optimal eating for optimal living. There should be no menus to follow, no calories or carbohydrate grams to count, and no need to measure or weigh food portions or servings. All foods can be categorized into three groups: *Foods To Eat Liberally, Foods To Eat Sparingly,* and *Foods To Avoid.* One should develop rational eating habits for the rest of your life by choosing foods according to these guidelines. Portions

Table 2

Cumulative Vitamin Losses
During the Processing and Cooking of Peas*

	cooked fresh	*frozen*	*canned*
fresh	0%	0%	0%
cooked	56		
scalded		25	30
sterilized			55
frozen		44	
diffusion in liquor			72
thawed		59	
reheated			94
cooked		83	

* Adapted from data by Marks [13].

should be adjusted to suit appetite and individual goals. Both the underweight and overweight, as well as those with special nutritional requirements, find that this pattern of food selection helps readjust the metabolic balance and eliminate a host of food-related problems, disorders or diseases.

Foods To Eat Liberally [9-12]

Foods containing nutrients that enhance defense against disease should compose the major portion of the diet. These resistance factors, which include protein, unrefined carbohydrates, fiber, essential fatty acids, vitamins and minerals, are found in a variety of wholesome foods. Since nutritional value is reduced during the processing of foods, choose fresh foods first, frozen foods second; and canned foods last. Marks has shown the cumulative vitamin loss for peas to be 56% when cooked fresh, 83% when frozen peas are cooked and 95% when the canned peas are reheated (Table 2) [13]. However, vacuum packed freeze-dried foods and dehydrated foods retain nutrients adequately for use in camping, hiking, during the seasons when the fresh sources are scarce, and in times of food shortage from strikes or crop failures. These foods can be stored for long periods of time up to several years.

Compared to fresh produce vitamin losses in fruits and vegetables preserved by freezing, canning and drying have been shown by Roberts [14] to be quite extensive. Losses of vitamins A, B_1, B_2, niacin and C ranged from 0% to 90%. Mean canning losses were higher in every nutrient than mean

losses from preservation by freezing. Although all mean canning and freezing losses exceed 10%, that from freezing only ranged from 10% to 25%. Mean drying losses were 5% or less for A, B_2 and niacin; but were greater than canning or freezing for B_1 (55%). For vitamin C, the mean loss by drying was between the lower freezing and the higher canning value.

The category, "foods to eat liberally", includes: eggs, cheese, milk, meat, seafood, poultry, fruit, berries, vegetables, legumes, whole grains, whole grain flour (meal–cereal–pasta), nuts and seeds.

Because of losses of vitamins and minerals during cooking or other forms of processing for storage, several of these food groups should be eaten *raw* daily with meals and snacks, e.g., fruits, berries, vegetables, nuts and seeds. When practical to do so, the peelings of fruits and vegetables and the skins of the nuts and seeds should be eaten. These foods are the most neglected items in the average diet.

If fruits, berries, vegetables, nuts and seeds must be cooked, preserve as much nutritional value as possible by adhering to these guidelines:

1. Don't boil them in water.
2. Bathe them in steam (away from the water generating the steam) in a closed boiler or a pressure cooker.
3. Cover or wrap these foods properly and cook in a microwave oven.
4. Stir-fry for as short a time as possible. Use an unrefined oil rich in polyunsaturated fatty acids such as safflower, sunflower seed or corn oil.

Among the "foods to eat liberally" are the nutrient-rich, comparatively inexpensive energy-producing foods called *unrefined carbohydrates*. One or two servings as desired may be consumed with each meal. This food group includes brown rice, corn, whole corn meal, potatoes (Irish and sweet), peas (including dried peas), beans (including dried beans), other legumes and whole grain (wheat, corn, rye, oats, rice) flour, bread, cereal, pasta and other products.

The unrefined carbohydrate rich foods are the principal sources of insoluble or indigestible fiber. This important elimination regulator for both constipation and diarrhea also

aids in regulating appetite and blood sugar; and, plays a minor role in the regulation of blood lipids and blood pressure. An excellent source of insoluble fiber is unrefined wheat bran. One should not confuse this with the refined bran cereals. Bran can be added to a variety of foods to be cooked or mixed in water, milk, juice or cereal. The correct amount of insoluble fiber in your diet will produce two bowel movements daily. Even three would be okay for many people. Compared to the average, constipated American, these elimination habits may seem like diarrhea.

Soluble or digestible fiber from fruits, vegetables and oats plays a significant role in regulating the level of blood lipids. The unrefined bran from oats has been recently introduced by Quaker as "Oat Bran". This uncooked cereal requires only a couple of minutes to cook because it is very soluble in hot water. Pectin from apples is another excellent source of soluble, blood lipid-regulating fiber.

For those who wish to restrict meat, seafood and poultry, adequate high quality protein can be provided with eggs, milk, cheese, and the proper combinations of vegetables. Novey [15] gives this sensible advice for those who choose to be vegetarians. For protein of high biologic value, match up the following pairs of foods. What one food lacks, the other supplies in essential amino acids: dairy foods and grains; dairy foods and beans; dairy foods and seeds or nuts; beans and grains; beans and seeds or nuts; and grains and seeds or nuts.

One more guideline for the proper use of the "Foods To Eat Liberally", use a wide variety of these foods. If the suggestions given for this food group are followed, there is no need to be concerned about the number or size of servings.

Foods To Eat Sparingly [9-12]

Most people would benefit from reducing the intake of animal fat by trimming it from meat, giving preference to leaner varieties of animal flesh, e.g., fish, chicken and using low-fat or skimmed milk. Whenever fat is used for frying, seasoning, incorporation in various recipes, or as a salad dressing, use a highly unsaturated vegetable oil such as safflower, sunflower seed or corn oil. An excellent combination of saturated and unsaturated fat for use as a spread on bread

or potatoes or for seasoning food is an equal mixture of unsalted creamery butter and unrefined safflower oil. For one pound of this spread, blend two softened sticks of the butter with 8 ounces of oil. Then place in a covered container and refrigerate. This mixture has the consistency of a tub margarine. One-half cup of cold water blended together with the oil and butter results in less calories per serving.

Restrict the intake of hydrogenated or chemically hardened fats from margarine, peanut butter, shortening, coffee whitener, and a variety of convenience foods. The hydrogenation and refining of vegetable fat changes the molecular configuration of the fatty acids, i.e., cis linkage to trans linkage. This altered fat may lead to the formation of defective cellular walls and intracellular membranes and unfavorably influence metabolism in a variety of ways.

Almost everyone would benefit from a significant reduction in salt intake, especially those with high blood pressure or a tendency to retain fluid. The craving for salt is an acquired taste and a difficult one to reverse. However, by gradually reducing salt in food, taste buds can detect smaller quantities. All foods will come alive tastewise when they are not laden with salt.

The nutritional value of coffee and tea is negligible so consumption should be sparingly and only with meals. There is increasing evidence that caffeine and other drugs in these beverages are causally linked to some emotional disorders, stress, hypoglycemia, and cystic breast disease. The major dietary sources of caffeine other than coffee and tea are a variety of soft drinks, cocoa and chocolate. Also, caffeine occurs in many over-the-counter and prescription drugs. One should not sweeten coffee or tea with sugar. A low-calorie sweetener can be used frugally for coffee and tea, but try to avoid using it for other foods.

Substituting honey for table sugar may be advantageous. Since honey is almost twice as sweet as sucrose, smaller quantities would likely be used. Although this may be true for cold liquids and foods, honey has about the same sweetening power as sucrose in hot liquids and foods. A distinct advantage in using honey to replace sucrose relates to the chemical composition. The principal sugar in honey is fructose. Since the utilization of this simple sugar does not cause much change in the blood glucose level, little insulin is required. Even

diabetics and hypoglycemics can consume modest amounts of fructose in honey, fruit or in a pure, granulated form.

Foods To Avoid [9-12]

Obviously, foods that increase the likelihood of disease should be avoided as much as possible. This group includes alcohol, foods made principally of sugar and products made from highly processed or refined grains, e.g., wheat, oats, rye, corn, and rice. Many food preservatives, artificial flavorings, and artificial coloring agents should also be avoided whenever it is reasonable to do so. While it is virtually impossible and not even practical to eliminate *all* these undesirable substances from the diet, it is possible to cut the intakes as much as 75% by substituting foods from the "liberal" category.

Here is a partial listing of foods that supply most of the "hidden sugar": sweetened breakfast cereals, cakes and icings, cookies, pies, bran muffins, graham crackers, sweet rolls, coffee cakes, doughnuts, ice cream, ice milk, sherbet, canned or frozen fruit in syrup, sweetened apple sauce, candied sweet potatos or in syrup, chocolate, chocolate sauce, other sweetened sauces, syrups, candy, mints, lozenges, cough drops, Instant Breakfast, Breakfast Squares, Pop Tarts, sweet pickles, sweetened yogurt, Jello, puddings, custards, hot chocolate, chocolate milk, milkshakes, Ovaltine, Kool-Aid, Hawaiian Punch and other punch varieties, sweetened breakfast drinks like Tang, canned or frozen fruit drinks, athletic beverages such as Gator Ade and Quick Kick, soft drinks, popsicles, dessert wines and cordials.

Only about one-fourth of the sugar consumed is in the form of granulated sugar purchased by the pound in grocery stores. The remaining three-fourths of the 140+ pounds of sugar consumed annually by the average American is hidden in the foods just listed. Twenty-five percent of the total sugar consumption is from soft drinks.

If there is doubt about sugar content, carefully examine the label. The principal ingredient is listed first, the next most prevalent ingredient is second, and so on to the ingredients present in extremely small quantities. The word sugar is one among many terms for the simple sugars used in sweetening foods. Look for other terms signifying sugar content such as sucrose, invert sugar, turbinado sugar, brown sugar, dextrose,

Table 3

Sucrose Induced Defects In Metabolism [16-17]

metabolic defects induced by dietary sucrose	*disorders influenced by metabolic defect*
increases dental plaque	caries, periodontal disease
increases candida albicans	oral and vaginal moniliasis
decreases phagocytosis	all infectious disorders
increases blood uric acid	gout, diabetes, cardiovascular disease
increases blood cholesterol	cardiovascular disease
increases bile cholesterol	gallstones
increases blood triglycerides	cardiovascular disease, gout, diabetes
increases platelet stickiness	cardiovascular disease
increases blood sugar	diabetes, cardiovascular disease, periodontal disease, gout, others
increases blood insulin	reactive hypoglycemia, diabetes, periodontal disease
increases body fat synthesis and storage	obesity, diabetes, cardiovascular disease, gout, others
limits ability of bombesin and cholecystokinin to induce satiety and inhibit eating	obesity, bulimia, anorexia nervosa
increases intestinal transit	disorders of colon and rectum, varicose veins, hemorrhoids, cancer of colon and rectum, constipation
increases urinary calcium excretion	urinary lithiasis, osteoporosis (including alveolar bone loss)
increases urine ph	urinary lithiasis, geuitourinary infections
increases gastric acidity	indigestion, peptic ulcer
encourages malnutrition	all diseases
increases blood pressure	hypertension, cardiovascular diseases
increases tissue lactic acid during circulatory arrest	brain and CNS damage

glucose, corn syrup, and corn sweeteners. When several of these terms are used on a label, the food can be predominately sugar, even though the word sugar in the label is not near the top.

Of all the foods to be avoided, sugar is the most harmful. Table 3 presents a panoramic view of the disease potential of sucrose [16-17]. Alcohol also produces many of these problems.

The second large category of foods to avoid are those composed primarily of refined wheat flour; or, white flour as many call it. Foods made from white flour include white bread, pancakes, rolls, muffins, hamburger buns, English muffins, biscuits, crackers, pretzels, macaroni, noodles, spaghetti, plus all of the sweetened baked products listed earlier as examples of sugar-rich foods.

The label enriched-flour can be deceiving. Of the twenty-odd vitamins, minerals and essential amino acids removed during the transformation of wheat into white flour, only 4 are added back. These are vitamin B_1, vitamin B_2, niacin, and iron. In other words, practically all the nutrients are extracted when the bran and germ are removed and only 4 are added back to white flour so that the term enriched may be used. Further losses occur during the processing of flour into the variety of products listed above.

Although not usually recognized, considerable protein destruction takes place as foods are heated [18-20]. It has been postulated that dry heat processing of proteins produces a new lysine linkage which is either not digestible by enzymes or is so slowly digested that lysine enters the blood stream too late to participate with the rest of the assimilated amino acids in tissue formation [21].

More severe heat damage to proteins results when moist heat is used. When reducing sugars, e.g., glucose, are present, complete destruction of amino acids has been repeatedly corroborated. This destruction may account for a loss of 50 percent of the lysine, arginine, tryptophane and histidine content [21].

A startling example of protein destruction during the cooking of food was revealed by Longenecker and Sarett [22] in survival biscuits and crackers. These were developed and stockpiled by the Office of Civil Defense for use in catastrophic emergencies. Both products were found to be significantly deficient in essential amino acid content. Actually two thirds of the lysine was destroyed during the baking of these foods.

N-nitroso compounds or nitrosamines are formed by the combination of amines or amides with nitrite. They are carcinogenic in lower animals. Therefore, the ingestion of foods preserved with nitrate or nitrite should be restricted. These foods include bacon, hot dogs, luncheon meats, sliced sandwich meats, ham, salami, bologna, liverwurst, smoked fish, and corned beef. Although vitamin C has been shown to prevent nitrosamine formation in the body, it is safer to avoid ingesting these preservatives as much as possible.

Hardly a month passes without the news media reporting on the detrimental effects of artificial flavors and colors. In most instances, the reports announce research results linking

these chemicals to cancer in lower animals. The admirable concept of "innocent until proven guilty" cannot be applied to most of the food colors, flavors and preservatives. One should look on food labels for sodium nitrate, sodium nitrite, artificial flavor, or artificial color and, where possible, avoid these foods. The foods previously listed as high in sugar and white flour contain much of the ingested artificial flavors and colors. Although some foods will not be labelled as containing these chemicals, these two lists will weed-out most of them.

Nutritional Supplements [9-12]

If the dietary suggestions in this article are followed, would this provide an adequate supply of all the essential nutrients? An adequate supply, perhaps; but not an optimal supply. Extra vitamins and minerals are needed for a number of reasons.

Significant nutritional value is lost between the time food is harvested and the time it is eaten. Thus, the garden-to-the-gullet transit of food reduces the nutrient content by about 40 to 90%. Transportation, storage, freezing, thawing, canning, cooking, time lapse after cooking and a host of other processing techniques are all nutrient destroyers. To make a wide variety of foods available to everyone, these food-experiences are unavoidable. Even ideal food selection according to the Basic Four food groups has been shown to provide 60% or less of the *adult* Recommended Dietary Allowances for vitamin E, vitamin B_6, magnesium, zinc, and iron [24].

An excess of each nutrient is desirable as a hedge against the nutrient deficits that result even from eating as we have suggested. Extra nutrients are also needed to offset increased nutrient requirements caused by individual biochemistry, psychological stress, surgery, physical trauma from accidents or other causes, all kinds of diseases, physical inactivity, pollution, aging, several hundred medicines, and other factors too numerous to mention. Food alone cannot assure this important nutrient excess.

When choosing a dietary supplement, remember that the product should provide all of the essential vitamins and minerals as well as the nonessential elements. The supplement should be taken before or during each meal; certainly no less

Table 4

Optimal Adult Daily Nutrient Intake From Dietary Supplementation

Beta Carotene	6,250 I.U.	12,500 I.U.
Vitamin A	12,500 I.U.	25,000 I.U.
Vitamin D	500 I.U.	1,000 I.U.
Vitamin E	300 I.U.	600 I.U.
Vitamin C	750 mg.	1,500 mg.
Bioflavonoid Complex	400 mg.	800 mg.
Rutin	50 mg.	100 mg.
Hesperidin Complex	50 mg.	100 mg.
Folic Acid	0.4 mg.	0.8 mg.
Vitamin B_1 (Thiamine)	12.5 mg.	25 mg.
Vitamin B_2 (Riboflavin)	12.5 mg.	25 mg.
Niacin	50 mg.	100 mg.
Vitamin B_6 (Pyridoxine)	12.5 mg.	25 mg.
Vitamin B_{12}	125 mcg.	250 mcg.
Vitamin K	5 mcg.	10 mcg.
Biotin	75 mcg.	150 mcg.
Choline	100 mg.	200 mg.
Inositol	100 mg.	200 mg.
Pantothenic Acid	100 mg.	200 mg.
PABA	50 mg.	100 mg.
Calcium	350 mg.	700 mg.
Phosphorus	100 mg.	200 mg.
Magnesium	175 mg.	350 mg.
Zinc	25 mg.	50 mg.
Potassium	90 mg.	180 mg.
Iodine	0.125 mg.	0.250 mg.
Iron	15 mg.	30 mg.
Copper	0.1 mg.	0.2 mg.
Manganese	5 mg.	10 mg.
Selenium	50 mcg.	100 mcg.
Chromium	50 mcg.	100 mcg.
Molybdenum	50 mcg.	100 mcg.

than twice daily. This assures that all the 40+ nutrients are present at the same time in the digestive tract, a condition essential for optimal growth, maintenance, and repair of the cells, tissues, organs, and systems. A good vitamin-mineral supplement for adults and older teenagers would provide daily amounts of nutrients approximating those in the left column of Table 4. The higher figures in the right column of Table 4 may be necessary to offset markedly increased nutrient requirements. A complete supplement for younger teens and preteens should provide about one-third of these nutrient quantities. Children younger than these age groupings would be assured of adequate vitamin-mineral supplementation with approximately one-fifth of the nutrient amounts in the left column of Table 4.

For those who suffer from indigestion, digestive aids may be helpful. The two supplements most likely to relieve indi-

gestion of the non-acidic variety are digestive enzymes and hydrochloric acid. Several teaspoons of vinegar with each meal will determine in a day or so if one does or does not need more hydrochloric acid. If it relieves digestion, a physician should be consulted about taking hydrochloric acid. If vinegar worsens or does not relieve indigestion, stop using it.

If milk produces indigestion, there is either an allergy to milk protein or a reduced ability to digest lactose. The latter can be alleviated by consuming fermented milk products, e.g., cheese, yogurt or buttermilk. Milk and milk products must be eliminated if an allergy is verified. If the ingestion of milk and milk products is reduced, a separate supplement of calcium and magnesium should be taken.

Finally, research and clinical experience over the past thirty years has convinced us that you can improve your health by improving your nutrition; so that every body cell receives optimal amounts of every essential nutrient everyday. Our advice is to get-on with good nutrition if you want to get-well and/or stay-well!

REFERENCES

1. Spies, T.D. Some recent advances in nutrition, J.A.M.A. 167: (6) 675-690, 1958.
2. Krehl, W.A. Factors affecting utilization and requirements; vitamins and minerals. Am. J. Clin. Nutr. 11: (5) 389-399, 1962.
3. Harte, R.A. and Chow, B. Dietary Interrelationships. In Wohl, M.G. Goodheart, R.S., Editors. Modern Nutrition in Health and Disease. Third Edition. 1964. Philadelphia, Lea and Febiger. pp. 534-544.
4. Sayers, M.H., Lynch, S.R., Charlton, R.W. and Bothwell, T.H. Iron absorption from rice meals cooked with fortified salt containing ferrous sulphate and ascorbic acid. Br. J. Nutr. 31: (3) 367-375, 1974.
5. Sayers, M.H., Lynch, S.R., Jacobs, P., Charlton, R.W., Bothwell, T.H., Walker, R.B. and Mayet, F. The effects of ascorbic acid supplementation on the absorporation of iron in maize, wheat and soya. Br. J. Haematol. 24: (2) 209-218, 1973.
6. Sayers, M.H., Lynch, S.R., Charlton, R.W., Bothwell, T.H., Walker, R.B. and Mayet, F. The fortification of common salt with ascorbic acid and iron. Br. J. Haematol. 28: (4) 483-495, 1974.
7. Traub, L.G. and Odland, D.D. Convenience food cost update. Natl. Food Rev. 9: 17-20, 1980.
8. Fabry, P., Fodor, J. Hejl, Z., Braun, T. and Zvolankova, K. The frequeney of meals: its relation to overweight, hypercholesterolaemia, and deereased glucosc-tolerance. Lancet 2: #7360, 614-615, 19 September 1964.
9. Cheraskin, E., Ringsdorf, W.M., Jr., and Clark, J.W. Diet and Disease. 1968. Emmaus, Pennsylvania, Rodale Books. pp. 324-347.
10. Clark, J.W., Cheraskin, E. and Ringsdorf, W.M., Jr. Diet and the Periodontal patient. 1970. Springfield, Illinois, Charles C. Thomas. pp. 269-322.
11. Cheraskin, E., Ringsdorf, W.M., Jr., and Brecher, A. Psycbodietetics. 1976. New York, Bantam Books. pp. 155-194 (originally published by Stein and Day).

12. Cheraskin, E., Ringsdorf, W.M., Jr., and Sisley, E.L. The vitamin C connection. 1983. New York, Harper and Row. pp. 220-234.
13. Marks, J. The vitamins in health and disease; a modern reappraisal. 1968. Boston, Little, Brown. page 162.
14. Roberts, T. Food preservation and nutrition. Natl. Food Rev. #20, 2-6, February 1983.
15. Novey, D. Mixing and Matching Vegetable Proteins. Nutrition For Optimal Health Association Newsletter 4: #3, Summer 1979.
16. Cheraskin, E., Ringsdorf, W.M., Jr. and Sisley, E.L. The vitamin C connection. 1983. New York, Harper and Row. Page 231.
17. Herbert, W. Modeling bulimia. Sci. News 123: #20, 316, 14 May 1983.
18. Butterworth, M.H. and Fox, H.C. The effects of heat treatment on the nutritive value of coconut meal, and the prediction of nutritive value by chemical methods. Br. J. Nutr. 17: (4) 445-452, 1963.
19. Clarke, J.A.K. and Kennedy, B.M. Availability of lysine in wholewheat bread and in selected breakfast cereals. J. Food Sci. 27: (6) 609-616, 1962.
20. Gates, J.C. and Kennedy, B.M. Protein quality of bread and bread ingredients. J. Am. Diet Assoc. 44: (5) 374-377, 1964.
21. Editorial. Present status of heat processing damage to protein foods. Nutr. Rev. 8: (7) 193-196, 1950.
22. Longenecker, J.B. and Sarett, H.P. Nutritional quality of survival biscuits and crackers. Am. J. Clin. Nutr. 13: (5) 291-296, 1963.
23. Cheraskin, E., Ringsdorf, W.M., Jr. and Sisley, E.L. The vitamin C connection. 1983. New York, Harper and Row. pp. 117-120.
24. King, J.C., Cohenour, S.H., Corruccini, C.G. and Schneeman, P. Evaluation and modification of the basic four food guide. J. Nutr. Educ. 10: (1) 27-29, 1978.