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PROTEIN MALNUTRITION IN CHILDREN

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BIBLIOTECA

There are still many areas of the world in which the nursing infant is not given suitable supplementary food and in which the diet received by the infant after weaning is grossly deficient in protein of good quality. In such regions many young children are likely to develop a group of signs and symptoms referred to in Latin America as Infantile Pluricarenal Syndrome and in most other parts of the world as Kwashiorkor. The latter term originated in Africa and refers to the fact that the condition frequently develops in the first child soon after the second one is born and begins to claim the mother's milk supply and attention. In Kwashiorkor the young child suffers from a dietary deficiency of protein due to a combination of ignorance, poverty and an inadequate supply of animal products.

The Condition

Kwashiorkor is characterized clinically by the development of edema, pigmentation and often excoriation of the skin, changes in the color and texture of the hair, apathy and anorexia, a relative failure of growth and maturation and usually by diarrhea. The age of its onset depends on the methods of feeding young children in the area under study. In most of Latin America and parts of Africa weaning tends to be relatively late and gradual. In these regions the peak of Kwashiorkor incidence occurs between 2 and 5 years of age. Where weaning takes place earlier, as in Uganda and Jamaica, the syndrome appears more frequently during the second year after birth. It has been amply demonstrated that this syndrome can be cured through diet alone and that the most important factor in a satisfactory therapeutic diet is protein of good biological value.

The serum total proteins are generally below 4.00 grams per 100 ml. This decrease is proportionately greater for the albumin fractions. The globulin values especially for gamma globulin are relatively high. With adequate treatment both the total serum protein levels and the albumin/globulin ratios become normal within two to four weeks.

The activities of such enzymes in the blood serum as amylase, choline esterase and alkaline phosphatase are markedly lowered but rise rapidly to normal values with proper diet therapy. The activity of the duodenal enzymes amylase, trypsin and lipase are also depressed. The changes in blood and tissue vitamin levels are variable depending on the pattern of dietary deficiencies in the area, but vitamin A and carotene levels in the blood and liver are very low in many areas.

Some degree of anemia is always present although the hematological findings also vary with regional factors. In areas where hookworm infestation is not common, macrocytic or normocytic types of nutritional anemia prevail.

Where malaria and hookworm are endemic, part of the anemia encountered is likely to be of the microcytic hypochromic kind associated with iron deficiency.

When a child who has developed acute symptoms of Kwashiorkor fails to receive a diet with an improved content of protein, death occurs. At autopsy the liver is found to be infiltrated with fat and the total weight is usually below normal even when hypertrophied. The pancreas shows atrophy of the acini with interlobular fibrosis and may be either enlarged or atrophied. The wall of the gastrointestinal tract is usually markedly atrophied. The thyroid, at least in cases in Central America and Mexico and in some parts of Africa, shows interstitial fibrosis with atrophy of the follicles and lack of colloid substance. Even the skin shows atrophy of the epidermis, the sebaceous glands and the hair follicles, together with an exfoliative type of dermatitis.

Response to Therapy

The administration of protein of high biological value causes the serum protein and enzyme activities to return to normal and the edema to gradually disappear within about two weeks. During this same period the skin lesions show a marked improvement, hair of the normal color and texture begins to grow out, appetite returns, and the child again becomes interested in his surroundings. The recent work of Brock and his collaborators in South Africa shows that this initial recovery will occur, not only with dried skim milk alone, but also with an appropriate mixture of amino acids.

The initial response does not require the administration of vitamin supplements. However, after the initial recovery, further clinical improvement and the resumption of satisfactory growth requires a balanced diet. In some patients intermittent diarrhea may persist for weeks after the initial recovery has taken place. In these cases the growth of the

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ABOUT THE AUTHOR

Dr. Scrimshaw received his Ph.D. degree from Harvard and his M.D. from the U. of Rochester where he also worked in the Dept. of Vital Economics. Following internship in Gorgas Hospital, Panama Canal Zone, he returned to the U. of Rochester for a residency in obstetrics and gynecology. For two years he carried on an extensive study of nutrition in pregnancy in Rochester, N. Y. as a Merck National Research Council fellow.

Since 1944 he has been Regional Advisor in Nutrition to the Pan American Sanitary Bureau and Director of the Institute of Nutrition of Central America and Panama (INCAP).

Dr. Scrimshaw has written extensively on nutrition in pregnancy, nutritional problems of children, endemic goiter, proteins and vitamins in blood sera and variations in the nutritive value of basic food crops, vitamin assay methods and nutritional changes in embryonic development.





A dehydrated steak, which is said to have a shelf life of two years when stored in a air-tight container, has been developed at the University of California. The dehydrated meat is prepared readily for cooking by soaking it in water for a few minutes.

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The growth of children's leg bones can apparently be affected by very excessive amounts of vitamin A. An overdose of vitamin A may interfere with normal growth, causing the leg bone to be shorter than normal.

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The reduction of infantile rickets almost to the vanishing point in the United States may be due almost entirely to the fortification of milk with vitamin D.

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National Baby Week is April 28 through May 5, 1956. The week is planned around Child Health Day, May 1.

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Since 1939 births in the United States have risen about 65 per cent, but retail dollars spent on baby food have mounted many times that figure. This gain represents largely an increase in volume, since wholesale prices of baby food have risen only 31 per cent in that period, compared with a jump of 145 per cent in wholesale food prices in general.

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Emotionally stable people have four times as much chance of dieting successfully, is the report based on research at the Cornell School of Nutrition. Tests on 29 students who undertook a supervised diet show a high relation between emotional balance and ability to reduce.

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Nutrition Pot-Pourri . . .

Atherosclerosis Research Reviewed

In cases where atherosclerosis is produced experimentally it is necessary to find a method of elevating the serum cholesterol and the other serum lipids for a certain length of time. It is a general clinical opinion that atherosclerosis is more prevalent in individuals with elevated serum lipids, particularly cholesterol, according to Dr. Fredrick J. Stare, professor and chairman of the department of nutrition, Harvard University.

Nutrition research findings indicate that sudden weight gain in man, even on a low-fat, low-cholesterol diet results in elevation of serum lipids. Serum lipids, including cholesterol, will not be increased on a high calorie, high fat diet, if weight gain is prevented by vigorous exercise, said Dr. Stare. He has stated that the present studies in nutrition should soon prove most worthwhile in providing help for the problem of atherosclerosis, the main cause of death among the adult male population of this country.

Minerals for Health — Not Wealth

Bound up in the complex body chemistry are more than twenty different minerals. At least fifteen of them perform essential functions, according to a report in a recent issue of *Today's Health*. It is stated that the estimated total mineral content of a person weighs six and one-fourth pounds and that it is worth only 97 cents.

Iron is the key substance by which the red cells transport oxygen throughout the body. The whole body contains only about one-tenth of an ounce of iron, but without it we might smother to death. When iron resources fall short of needs, iron deficiency or nutritional anemia results. Good sources of iron mentioned are pork liver, lean beef, eggs, potatoes, cabbage, oysters, apricots and whole grain cereals. Proper iron utilization depends largely on copper and adequate diets provide several times as much copper as the body requires.

According to this report, calcium and phosphorus are the body's chief framework materials. The body contains about three pounds of calcium, 99 per cent of which is in the bones and teeth. Calcium from milk is best used by the body, although many vegetables also provide this mineral. Generally a diet adequate in calcium will also be adequate in phosphorus. Although proper thyroid function depends on iodine, the amount required is unbelievably small. Sea foods and vegetables grown in coastal soils are the principal natural sources of this mineral.

An average of six pounds of salt per person each year is used. This compound is essential to the blood and other body fluids. The rarer minerals perform many important functions. An adequate diet should include these minerals in sufficient quantities for good health, according to this report.

Dangers of "Tea and Toast" Diet

A special challenge to both the general practitioner and surgeon is presented by elderly people because they have had time to develop many variations of the standard foibles and phobias in regard to food, according to Dr. John R. Ibberson of Calgary, Alta., Canada, in a recent issue of *Geriatrics*.

He finds that elderly patients, particularly candidates for gastrointestinal and genitourinary surgery, are often nutrition derelicts. They have eaten poorly for some time before seeking medical advice, and, as a result, often present a picture of protein and vitamin deficiency. The "tea and toast" diet is actually a reality in many cases. This diet may be due to uncomfortable dentures or lack of dentures.

Dr. Ibberson reports that supplements of the vitamin B complex and vitamin C are of maximum assistance when taken daily during the period before surgery and continued postoperatively.

Fat in Diet for Health

Eating fat needn't mean getting fat. It is shown to be an essential factor in the well balanced diet designed to combat certain physical failures.

A major nutrition study undertaken by Texas State College for Women at Denton, Texas, in which four groups of girls followed the same basic menu except for amount and kind of fat showed that not a single girl on the high fat diet became overweight. The amount of fat consumed varied from a low of 12.2 per cent up to 35 per cent of total calorie intake. In fact, some overweight students actually lost weight, and some underweight girls developed to proper weight range.

In contrast, 70 per cent of the heavy students on low fat diets stayed overweight.

Girls on greater fat diets showed improved skin beauty and more energy.

American Institute of Nutrition Meeting

April 15 to 20, 1956, are the dates for the 40th Annual Meeting of the American Institute of Nutrition. This year the meeting will be in Atlantic City, New Jersey.

*Nutrition and Health Series . . .***Underweight Is A Problem, Too**

by RITA CAMPBELL

Director, Department of Nutrition

For some time considerable attention has been directed to the problems of the person who is overweight and to the dangers to which the obese may be exposed. Insurance companies which have compiled data on body weights have also found that underweight occurs more often than is generally recognized. At least 7 million persons of 30 years of age and over are said to be 10 per cent or more below the desirable weight. In the entire population as many as 15 million may be underweight. As with the person who is overweight, the underweight person may be at a disadvantage with regard to appearance and may have clothes fitting problems as well as not feeling up to par.

Reasons for Condition

One who is seriously underweight should consult his physician

for a careful medical examination and dietary advice. Underweight may be due to excess activity plus an inadequate calorie intake or possibly to a stomach disorder. This "Jack Spratt" type probably has a stomach and digestive tract of small capacity and also may prefer the lower calorie foods. Underweight adults may have been underweight in childhood and have had certain emotional problems.

Underweight occurs more frequently in younger persons. This condition may result in reduced resistance to infections, less insurance against emergencies and decreased emotional stability. The person who is seriously underweight may tire more readily and also be of a nervous temperament.

In addition to dietary treatment more rest is advocated for the thin person. Often 10 hours of sleep per night will be recommended along with rest before and after meals if possible. Relaxation before meals may improve the appetite and aid digestion.

Dietary Advice

In order to assure permanent weight gain added calories which carry body-building protein are recommended. The "gaining" foods, like the "losing" foods, are the foods high in protein—meat, milk and eggs. For the person who wants to gain weight, the daily protein intake should be higher than normally recommended—up to 100-120 grams of protein is suggested by certain authorities.

Meat is one of the best foods for the person who needs to add pounds because in addition to high quality protein, it supplies important B vitamins, minerals and fat. The B vitamins and calories help provide needed energy.

Minerals such as iron and copper combine with protein to build blood. This is valuable in the treatment of anemia which sometimes occurs in this condition. Meat which is well marbled and contains an outer layer of fat may be recommended for the too slender person whereas in obesity, lean meat may be preferable.

Calorie intake should be increased gradually in this condition. In order to gain one pound, 3,500 calories above the total recommended daily is suggested. Frequently the underweight one may prefer five or six small meals rather than three larger ones. Between meals and bed-time snacks are other times when extra calories and protein should be included.

For the underweight whose appetite is generally poor, food must be appetizing and attractively served. Sometimes excess coffee or tea and smoking may lessen the appetite. If so, they should be avoided.

The dietary principles underlying weight gaining are similar to those in weight reduction and in good nutrition generally. In both conditions quick improvement will not be of lasting value. Emphasis needs to be placed on a moderate amount of exercise, rest and strict adherence to dietary advice. Building the diet around protein foods in both instances is a sound policy because protein is the key constituent of body tissue and adding or cutting calories may best be accomplished when the protein intake is high. Fruits and vegetables, cereals and bread are needed in addition to meat, milk and eggs. Bulky foods should be avoided when they tend to reduce the appetite for the foods which are more nutritious and higher in calories.

The meal pattern below might be followed after the gradual addition of food to the underweight person's customary meals.

Breakfast

Half Grapefruit	
Cereal with Cream	
Fried Egg	Sausage Patties
Toast	Butter Jam Milk

Lunch

Barbecued Lamb Riblets on Rice	
Buttered Broccoli	
Roll	Butter
Baked Custard	
Milk	

Mid Afternoon

Ice Cream

Dinner

Roast Beef (Cream Gravy)	
Baked Potato	
Green Beans in Mustard Sauce	
Green Salad (Sour Cream Dressing)	
Roll	Butter
Strawberry Shortcake	
Coffee	

Bedtime Snack

Hot Chocolate

books . . .

Potluck Cookery, by Beverly Pepper. Doubleday & Co., Inc., Garden City, N. Y. 1955. Pp. 284. \$3.95.

This book is unique in that it begins with the food that you have on hand and suggests a variety of things to add that will please the family or guests. There are 320 answers to the problem of "leftovers" and answers of what to prepare for the unexpected guest when there is "nothing in the house." Also included are menu suggestions with each of the recipes which are numbered from one to 320 for handy reference. A section entitled "Cook's Helper" explains and simplifies use of the book which is really a companion to all other cookbooks.

The Peasant Cookbook, by Marian Tracy. Hanover House, Garden City, N. Y. 1955. Pp. 224. \$3.50.

One hundred and sixty-five authentic recipes from 39 countries are collected in this book. Almost all of the dishes are complete meals in themselves. Exact time of preparation is listed at the beginning of each recipe, along with a suggested complete menu. There is no table of contents and the recipes are not listed by countries or foods.

The same recipes that are suitable for buffet entertaining are also simple enough for daily family meals.

The Molly Goldberg Cookbook, by Molly Goldberg and Myra Waldo. Doubleday & Co., Inc., Garden City, N. Y. 1955. Pp. 320. \$3.95.

The recipes included in this book are easy to follow and show much variety, as they are from many lands. There is an interesting section on the history of kosher food and Passover, and the clever comments by the author at the beginning of each section add interest. In addition to sections devoted to appetizers, soups, fish, poultry, meats, vegetables, salads and relishes, noodles, breads and pancakes and desserts, there are sections on holidays, menus and cooking terms and hints. All recipes in this book serve six.

The index has the foods listed in both English and foreign names.



POLING, C. E., W. D. WARNER, F. R. HUMBURG, E. F. REBER, W. M. URBAIN, and E. E. RICE. *Growth, reproduction, survival and histopathology of rats fed beef irradiated with electrons*. Food Research 20:193, 1955. The effect of beta irradiation upon the wholesomeness of beef as a food was determined by experiments in which albino rats, through three generations, were fed raw ground irradiated beef and raw ground non-irradiated beef. About two-thirds of the diet as fed was composed of meat, equivalent to about 45 per cent

of the diet solids or 60 per cent of the calories.

The survival of both control and experimental animals was very good, although the life span of the experimental group was five to seven per cent shorter than the life span of the control rats of both sexes in the parent generation. None of the parent generation animals was supplemented with DL alpha tocopherol at any time.

The unusual rate of growth of the experimental animals, as well as the trend toward better growth and food utilization in subsequent generations, rather than a cumulative decline, would seem to remove any real question regarding the wholesomeness of the irradiated beef.



KASIUS, RICHARD V., ALEXANDER RANDALL, IV, M.D., WINSLOW T. TOMPKINS, M.D., and DOROTHY G. WIEHL. *Maternal and newborn nutrition studies at Philadelphia Lying-In Hospital*. Mil-

bank Mem. Fund Quarterly 33:341, 1955. This study reveals that the addition of nutritional supplements to the diets of pregnant women may have little effect upon the physical condition of infants at birth.

The mean values of weight, length and chest circumference by race and sex at birth, and at one, two and three months of age are presented for 1,335 white and Negro infants. The average weight for males is always larger than the mean for females of the same race. There is little difference between the mean weight of white and Negro infants of the same sex at any of the four ages. The largest average gain in length and chest circumference occurs during the first month.

Apparently the mother's pregravid weight status influences the baby's weight during these three months, primarily at the extremes of overweight and underweight, and the effect of this factor is more apparent for male infants than for females.

Protein Malnutrition In Children

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child is usually delayed despite a high intake of both calories and protein.

As soon as the amount of mother's milk is no longer adequate for the needs of the infant, his growth and maturation are markedly slowed unless supplementary protein containing food is given. In the areas in which Kwashiorkor is prevalent the diet after weaning is usually grossly deficient in protein so that growth retardation and some atrophy of the organs and tissues begin to occur at this time. This is likely to be true of nearly all children in rural and poor urban areas. A large number of these children then experience some further stress which worsens their nutritional situation. Among the most common are diarrhea of infectious origin, generalized infection, death of a parent, desertion of the family by the father and loss of work by the parent principally responsible for support of the child. In such cases the acute symptoms appear gradually over a period of several weeks beginning with edema, skin pigmentation, apathy and anorexia. In countries where weaning is done abruptly and the infant placed largely on a carbohydrate containing diet, Kwashiorkor may also develop very rapidly in a child previously nourished satisfactorily by breast milk.

Those children who survive the critical years after weaning without developing Kwashiorkor usually begin to resume more or less normal growth and maturation at six or seven years of age, probably because they are better able to thrive on an adult type diet and their competitive position for food in the family has improved. Their capacity to scavenge for fruit and some other foods probably also contributes to their apparently better nutritional status. It should be noted that children in poor areas do not regain the height and weight which they have lost during the pre-school years and are likely to be smaller in size when they reach adulthood than if they had been well-nourished

throughout their life.

Reconstituted powdered skim milk has proved to be a simple and effective treatment. Preliminary work designed to demonstrate a satisfactory response with carefully prepared mixtures containing only protein of vegetable origin shows promise. As many as 4.0 grams of protein and 150 calories *per kilo* may be required for a satisfactory response. Special vitamin preparations are not needed and may actually impair recovery by producing or accentuating imbalances. However, all of the essential nutrients should be present in the diet in physiological amounts as early as possible in the therapy. When microcytic anemia is present initially or develops in the course of therapy, supplementary iron is indicated.

Any measure which will induce mothers to give their young children more food of animal origin will reduce the incidence of Kwashiorkor. However, where milk, meat and eggs are relatively costly and in short supply, cereal mixtures can be valuable when they are inexpensive and locally available. Improved environmental sanitation, by reducing the frequency of intestinal parasites and infectious diarrhea, will also help reduce the amount of Kwashiorkor in a population.

Educational measures are of major importance. Parents must be taught that good food is necessary to keep their child well and that the main cause of the syndrome is the lack of proper food. They must learn to give supplementary food to the nursing infant whenever the mother's milk supply becomes inadequate for his total needs and to pay especial attention to the diet of the young child at the time of weaning and during the following two to three years.

At present meat and other beneficial protein-rich foods may be deliberately withheld from a child as unsuitable even when they are available for other members of the family. It is obviously of first importance to correct such misconceptions about proper foods for the young child and to encourage families to distribute their available food more nearly in accord with the relative needs of their members. It is safe to conclude that whenever children in the susceptible age are given significant amounts of meat, milk and eggs in their diets, Kwashiorkor will not occur.