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Nutrition—

FOR YOUNG AND OLD

1946

NEW YORK STATE JOINT LEGISLATIVE COMMITTEE ON NUTRITION

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[1] Senator Campbell replaced Senator Parisi on the committee as of July 1, 1946.

Note to the Reader

By Senator Thomas C. Desmond

Chairman, New York State Joint Legislative Committee on Nutrition

THIS book is a call to action to smash the road-blocks that prevent our people from eating enough of the right foods. Whether these obstacles are ignorance, lack of public funds, or the stripping of essential nutrients from foods during the course of processing, they must be wiped out.

Many of the leading nutritional authorities of our country have contributed to this book the results of their years of studies. Their words sometimes are clear as well-water; sometimes they are flecked with the jaw-breaking jargon of the men of science. But no matter how expressed, the facts they present are of utmost importance to all of us. The nutritionists say, in effect: "We have the facts. All the facts we need to establish a sound nutrition program that will add strength to our bodies and years to our lives. What we need now is action. Action by our lawmakers and public administrators, on Federal, state and local levels, to translate our findings into public policy."

The goals are outlined distinctly:

A strong international nutrition agency

A vigorous permanent educational program instead of sporadic nutrition campaigns, so that each new generation will be taught the facts about food and health

An enlarged fortification program to cover cheap, basic foods robbed of their nutrients in processing

A permanent industrial feeding program

A permanent school lunch program to cover all children who need a nourishing noon meal

A vast maternal and infant nutrition program to help assure birth and growth of husky youngsters

A special educational program directed at the aged.

Good food means strong children.

Here then are the basic elements of a comprehensive nutrition plan. The details are charted in the 30 chapters which follow.

There are two main obstacles to the accomplishment of the objectives and program presented by the scientists. First, our lawmakers and public administrators are not convinced that nutrition is a lively "issue." The consumers have no effective lobby. Who will rise up and oppose a legislator who

School lunches build a stronger America.

votes against compulsory iodization of salt, for example, or against providing funds for educating workers in food eating habits? And yet, the nutrition problem provides a fertile field for joint action by farm organizations, labor organizations, women's clubs, food trade groups. On national and state levels there is urgent need for a nutrition pressure group representing these diversified powerful interests who are vitally concerned with nutrition.

The second great obstacle to adoption of a comprehensive nutrition program lies in the root fact that we have not ordered our basic resources, our labor, or our financial wealth so that every family can have the income necessary for an adequate diet. Until such goal is achieved, much can be done anyway; we need not wait for the millenium. We must start right now to demand of our officials a nutrition program that will answer the challenges presented in this report.

We wish to acknowledge the helpfulness of the United States Department of Agriculture and the Library of Congress in helping us to illustrate the book. To the various authors we are deeply indebted. A few of the chapters are taken from testimony presented at a public hearing of our Committee; two chapters are reprinted from the American Medical Association "Handbook of Nutrition" because of their timeliness and importance, the bulk of the material was prepared specially for this report. We hope nutritionists, food authorities, and public officials will find the book helpful in promoting a nutrition movement that will build a stronger America.

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Introduction

To the Governor and Legislature of the State of New York:

THE WORLD faces, in this first postwar year, an unprecedented food crisis. Hunger stalks many parts of the world. In Europe, more than 125 million people may have to subsist on less than 2,000 calories a day; 28 million may get less than 1,500 calories a day; and large groups there may receive as little as 1,000 calories. In contrast, we in the United States have been consuming about 3,300 calories per person each day.

Starvation, aftermath of the war, has struck a blow in disease and death from which the world will be long in recovering. Yet, the food problem is not merely war-born. Even in so-called normal times, well over two-thirds of the two billion people in the world are badly fed. In India nearly half of all deaths occur among children under 10 years of age and malnutrition is believed to be the chief cause of these deaths. In China, food deficiency diseases are general among a majority of the population.

There has never been enough food for the health of all the people, although we now have the knowledge to produce the quantity of food needed. The world needs twice as much food as it produces.

It needs:

50% more cereals

90% more meat

125% more milk and dairy products

125% more vegetable oils

300% more fruits and vegetables

A primary cause of malnutrition is poverty. Of what avail to produce more food unless men have the money to buy it? The purchasing power of all peoples must be lifted to maintain an adequate diet for all. This can be done if there is:

(a) Full employment in all countries.

(b) Enlarged industrial production.

(c) Absence of exploitation.

(d) An increasing flow of trade within and between countries.

(e) An orderly management of domestic and international investment and currencies.

(f) Sustained internal and international economic equilibrium.

The United Nations Conference on Food and Agriculture, meeting at Hot Springs, Va., in 1943, declared rightly:

"Adequate food should be placed within the reach of all men in all lands within the shortest possible time."

It called also for establishment within each nation of a "central authority with special competence and responsibility to interpret the science of nutrition in the light of national conditions and to propose to the appropriate authorities practical means for extending its benefits to all sections of society." So far we do not have in this country such an official agency, although such unofficial agencies as the Food and Nutrition Board of the Na-

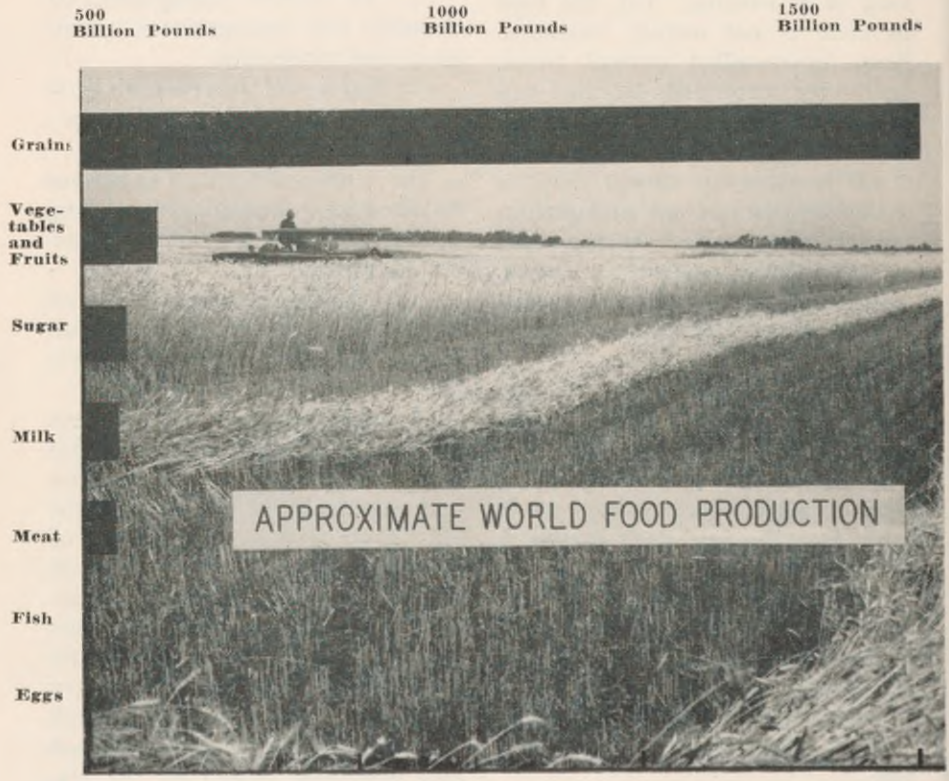
tional Research Council have done excellent work in this field.

The Hot Springs meeting was followed by the creation of the first permanent agency of the United Nations Organization, the Food and Agriculture organization. The F.A.O. convened in Quebec and the meeting will go down in history as a landmark in man's struggle to achieve freedom from hunger. Forty nations are now members of F.A.O., which is headed by a Director General, Sir John Boyd Orr, internationally famed nutritionist. It will be the task of the F.A.O. to help countries help themselves in improving the nutritional status of our own people. By pooling of the nutritional knowledge of the world, the F.A.O. holds forth the promise of someday attaining the goal of a decent diet for all.

Our Committee believes that the Federal Government should give full support to the F.A.O. If man is rid of the fear of hunger, if man secures a decent diet, one of the primary causes of war will have been eliminated.

U. S. Food Outlook

During this year of hunger for millions throughout the world, we in the United States will have as much or more to eat than ever before. Our cupboards will be stocked with food.



Our supply of poultry and eggs is expected to continue at the high wartime level. Civilians will be able to get more milk in 1946 than was available in 1945. Fruits and vegetables are expected to be in high production, and importation of wartime rarities such as bananas, pineapples, etc. will be considerably larger. There will be a more plentiful supply of fresh and frozen fish. Butter will continue scarce. Meat will be available in ample quantity, but will be scarce in various parts of the country at different times. Sugar, fats and oils will probably constitute the only real shortages during 1946.

In view of this tremendous output, and the needs of human beings abroad, it is no more than right that we should ship grains and other foods abroad to prevent mass starvation.

How Good Are Our Diets?

The facts available on the American diet are almost as inadequate as the diets themselves. One nationwide study was made by Miss Hazel Stiebling and her associates in Federal agencies in 1936, 10 years ago. While other studies have been made more recently they are of more limited nature. Nonetheless the over-all picture is fairly clear.

The Stiebling report indicated:

1. About one-fourth of the families of this country had diets that could be rated good.
2. More than a third had diets classified as fair.
3. About one-third of the families had diets rated as poor.

Further refinement of these findings showed that fewer than a fourth of the Nation's families had an excellent diet.

A more recent study of children at Seward Park High School on the lower East Side of New York disclosed that about one-third were suffering from malnourishment or showed a history of inadequate diets. In this study about 90 per cent of the students were found suffering from some physical defect requireing medical attention.

Another investigation made shortly before World War II indicated that more than 75 per cent of the children examined who came from low-income families in New York City showed some stage of avitaminosis, 75 per cent showed some degree of ariboflavinosis and about 50 per cent had less ascorbic acid than is deemed essential.

We know too that there is a high correlation between food consumption and family income. For example, we estimate that if all our city and village families normally ate as well as the families that earn $5,000 or more, they would consume:

55% more milk
74% more leafy green and yellow vegetables
125% of other vegetables and fruits
135% more tomatoes and citrus fruits
100% more meat, poultry and fish combined
40% more eggs

The potentialities of "decent diet for all our people" are tremendous. It would probably mean that our

people would consume about 38,000,000,000 more quarts of milk, 125,000,000,000 more pounds of leafy green and yellow vegetables, 400,000,000 more pounds of meat, poultry and fish, and 135,000,000 more dozens of eggs.

We know that in a typical family, the men eat better meals; while the women and older children fare worst. It seems that mothers tend to sacrifice for other family members.

We call attention to the fact that the teen-age "bobby-sox" set requires more nutrients than other age groups, but often gets less than enough for its needs. This is confirmed by both American and Canadian studies, which indicate that in a typical family the worst fed is the teen-age youngster, who, few people realize, needs more food than the average adult.

The number of people who eat out has more than doubled since 1940 and it is believed that 30 per cent of total food expenditures are made in restaurants, "coffee pots," cafeterias, etc. This is important because it is quite clear that our restaurants are losing a large part of the nutritional content of food by improper cooking practices.

The war brought forth the bread enrichment program, a vast nutritional education program, and higher wages, all of which probably have helped improve the diet of the average American. In addition, the school lunch program helped provide necessary foods to some 6,000,000 children.

On the other hand, the food stamp plan, which raised the diets of large numbers in the low-income group to a safety level insofar as vitamin A, thiamin, and ascorbic acid content were concerned, was allowed to fold.

If everyone in the U. S. followed during 1946 the moderate-cost diet laid out by the Human Nutrition and Home Economics Bureau of the U. S. Department of Agriculture, this country wouldn't have enough milk, citrus fruit and tomatoes, or green and yellow vegetables. And this is only the moderate cost meal. The Bureau's low-cost meal plan would at 1945 prices cost a family of four between $12–$14 a week and its moderate cost plan $14–$18 a week, assuming that nothing was bought in the black market. This is another statistical exercise. The fact is that the housekeeper who can keep out of the black market is the exception. To secure "hard-to-get" items for her family, the housewife was and is today forced to pay more for the items for which the grocer goes "under the counter."

Our Committee believes:

1. Any nutritional policy must be based on the fundamental reality that to a large degree the low-income groups are the ones who need nutritional help the most. We recognize that all people need nutritional education, advice and assistance, but the enormously high correlation between poor diets and low income is too pronounced to be minimized. It must be made the core of any sound nutritional campaign.

In New York State, the average weekly earning of insured workers covered by unemployment insurance was $30.86 in 1940; $33.54 in 1941; $38.56 in 1942; $43.41 in

1943; and $46.90 in 1944, probably the best year in the history of the State. It is with realities such as this that we must deal. But even these figures are only indicative of the problem, for they are but averages. Mrs. John Smith, who feeds her two youngsters and her husband and herself, cannot feed them on averages. She may have to feed her family on an income less than the average. A random sample of 1,000 workers covered by unemployment insurance in this State showed that 48 per cent made less than $1,500 a year, and about 61 per cent made less than $2,000 a year.

The cost of food to the average housewife has probably exceeded official Federal estimates, because statistics fail to take into count black markets, quality deterioration, and the fact that more people are eating out in restaurants which have served smaller portions and increased prices.

Educational material in the field of nutrition should be over-whelmingly addressed to low and moderate income groups. Advertisers who during the war did such splendid work to promote the "Basic Seven" drive should continue during the postwar period their nutritional education activities. Large food manufacturers have contributed large funds for nutritional research of great value. They would do equally well to promote wider spread of nutritional information. We hope that this advertising will be directed not so much to the preparation of fancy, high-cost diets, but to diets in the reach of the masses of our people. Nutritionists also would do well to concentrate on the low and moderate income groups.

2. The Federal Government should establish a program to bring food demand in line with food production. Total effective demand for food in the near future may decline below the available supply while at the same time there may be widespread sub-clinical malnutrition among American families. The food stamp plan during the period of existence had practically the unanimous support of farmers, businessmen, and food experts. It served to supplement the food purchasing power of low-income families through issuance of food coupons. Although today we have a short-term food deficiency due to the needs of foreign countries, we may, in just a year or two, be plagued by food surpluses. A food stamp plan would improve the health of our low-income groups and serve to maintain fair farm prices and stabilize the effective demand for food. An effective food stamp plan might reduce the percentage of families suffering from malnutrition due to lack of purchasing power from the current estimated level 30 per cent to 15 per cent.

3. If the Federal Government drops its current food subsidies, it will hurt worst the people who can least afford it. Removal of the subsidies now would increase the price of milk, 1.3¢ a quart; bread, 1¢ a loaf; flour, 8.8¢ per 10-pound bag; pork, 4.4¢ a pound; and bring other substantial boosts in "pro-

tective foods." The impact of this price rise piled on top of the existing high prices would have an unfortunate impact on the nutritional status of our people.

4. To aid the masses of our people, more attention must be given to promoting use of low-cost, high-value foods. Dr. Robert S. Harris, Director of the Nutritional Biochemistry Laboratories of the Massachusetts Institute of Technology, has demonstrated to our Committee that in the high-income year of 1943, more than 50 per cent of our people had insufficient income to purchase a diet based on the "basic seven" diet. We need to encourage research and application of findings on high-powered soup bases, for example, which might provide one-third to one-half a person's daily nutritional needs. Agricultural research on wheat, corn, and rice might improve nutrition of our people without increasing food cost.

A National Nutrition Program Needed

Despite increased food production, despite increased wages, there are undoubtedly millions of our people who suffer from "hidden hunger." Yet today there is no national nutrition policy or program. The advances made during the war, in the form of bread enrichment, a large nutrition education campaign, a nutrition-in-industry program, and creation of nutrition agencies in all states and in thousands of communities, are in danger of being largely lost in the postwar period. The Federal Government's nutritional campaign, which began shortly before war broke out, has become stilled.

The postwar period needs a sweeping nation-wide nutrition program that will cover everyone from the bassinette to the rocking chair, from infants to oldsters. This should include:

A. A permanent Federal nutrition agency to coordinate the various agencies working in this field and to set up a specific program with definite objectives and goals.

B. A maternal nutrition program that will couple education of prospective mothers in sound diet habits with perhaps inexpensive vitamin and mineral supplements.

C. Pushing back the frontiers of nutrition by intensifying research, and by soil fortification, feed enrichment and seed improvement programs.

D. Organization of a special nutrition program for those over 40.

E. Channeling nutritious foods to low-income families.

F. Encouraging industry to step-up production and the health of employees through factory canteens, between-meal snacks, and a nutrition-in-industry educational plan.

G. A permanent expanded school lunch program that will not be at the mercy of Congress each year.

H. An expansion of the "enrichment" policy to cover not only bread, but also salt, margarine, evaporated milk, and other commonly used foods.

Nutrition Blueprint for the State

Today, there is no official State nutrition program, despite the State agencies whose activities are directly in this field or impinge on it.

Yet there are few functions of government more important than assuring that citizens have available adequate diets. Nutrition today is unfortunately accorded minor attention and negligible support. Our governmental officials must be made to realize that nutrition, although still a baby science, is rapidly paving the way to longer life, better health and improved morale. It is imperative that our State realize the value of setting up a central coordinating agency in the field of nutrition.

During the war, the State set up several temporary nutrition units; but nutrition is not a temporary or wartime problem. It should be treated as a permanent function of government and handled on a permanent basis.

1. The State should set up a Nutrition Council in the Executive Department. The Council should consist of the State Health Commissioner ex-officio, a representative of the School of Nutrition or School of Home Economics at Cornell University, and an outstanding non-state nutritionist appointed by the Governor.

This Council should be the policy-making agency in the field of nutrition. It will tend to eliminate conflicts inevitable in the coordinating of a large number of separate governmental bureaus. The Council should be appointed by the Governor in order that it may have the prestige and influence necessary to coordinate the activities of the various departments.

2. The State Nutrition Committee, organized in 1939 by State nutritionists working in various departments and at Cornell University, has rendered outstanding service to the State. This Committee held numerous state-wide nutrition conferences before the war and in May, 1941, it was recognized as a co-operating agency with the State Defense Council and operated with the assistance of some State funds. When war broke out, the Committee's work was taken over to some extent by the Office of War Nutrition Services, and later by the State Emergency Food Commission. Nonetheless, this Committee has continued in operation, encouraging local nutrition committees to set up, informally and unofficially working out ways of coordinating the work of the various State nutritionists. The State Nutrition Committee, because it has been composed of nutritionists who, to secure adoption of policy changes, must channel their recommendations through a host of superior officers, and who because they do not hold prominent State positions are handicapped in getting their recommendations to the Governor and Legislature. We believe the State Nutrition Committee should be granted official recognition by State law as the official advisory body of the proposed Nutrition Council. We believe that this Committee, acting through the three-man Council in the Executive Department, will thus have the prestige and authority it needs to effectuate its recommendations. The State Nutrition Committee has the "know-how"; it should be given an opportunity to put its broad ex-

perience and scientific knowledge to maximum use.

3. The proposed Nutrition Council should be granted an ample appropriation to (a) encourage nutrition research; (b) allocate funds to existing State agencies for carrying out specific nutritional programs; and (c) launch a wide-scale nutrition education campaign. The Council should encourage scientists in the field of nutrition to push back the frontiers of nutrition. An enormous amount of research work has been done in the nutrition field during the war; far more needs to be done. While the Council may deem it best to administer directly some of its programs, it will undoubtedly wish to use for the most part, the facilities of existing agencies. It should, therefore, be empowered to allocate its funds to such agencies for the attainment of specific objectives. One of the most important functions of the Council will be to spread the gospel of a balanced diet. A nutrition education campaign would help not only consumers but also producers, for there is a potential surplus of farm products facing us in the future, threatening a disastrous price collapse. Although the Federal Government is pledged to support farm prices at 90 per cent of parity for two years after the end of the war, the only satisfactory long-run solution is to find new markets for our increased food production capacity.

4. The State should recognize the special needs of such vulnerable groups as pregnant and nursing women, infants, pre-school and school children, adolescents, workers, individuals receiving low incomes, and families with numerous children in low-income groups.

5. The State should support and encourage the Federal Government in plans directly to supplement inadequate diets through the stamp plan.

6. The State should encourage research in the relationship between malnutrition and impaired bodily health and vigor, in the relationship between nutrition and long life, in the relationship between nutrition and maternal and infant health.

7. The State should train nutritionists in the recently evolved methods of mass assays and conduct such assays of the nutritional status of our people from time to time, so that the State will know at all times what the nutritional status of all segments of its people is.

8. The State should encourage the fortification nationally of such commonly used foods as salt, bread, oleomargarine, etc., and when the Federal Government cannot legally do so, the State should require the enrichment of these products.

9. The State should assume responsibility of ascertaining the food-consumption habits of its people, and the food expenditures of its families. At present, there is a lack of up-to-date, authoritative data.

10. The State, during the postwar period, should concentrate its nutritional attention on (a) improving the diets of expectant mothers; and (b) improving the diets of low-income groups.

11. The State should appropriate funds to encourage the expan-

sion of the school lunch program until all children have access to a well-balanced midday meal. The State should put this program on a permanent basis.

12. The State should review existing developments that enable us to improve our diets on a mass basis by improving crop seeds, fortifying the soil, and enriching animal feeds. There is evidence available that the nutritive value of our food can be substantially raised without increasing cost through improved crop management.

13. Nutritional standards in State institutions should be improved. The purchase, preparation and serving of food in all State institutions should be under the guidance of qualified nutritionists or dieticians. Food inspectors of the Bureau of Food Control in the State Department of Agriculture and Markets should be authorized to make periodic inspections of State institutions.

14. Full and continued support should be given to the 10-year Newburgh-Kingston fluoride experiment which holds forth the hope that through the fortification of drinking water dental decay may be cut in half.

In other parts of this letter of transmittal, our Committee elaborates on several of the recommendations which are part of the above blueprint.

Nutrition of Expectant Mothers

One of the greatest challenges that confronts the State is in the field of nutrition of expectant

An infant nutrition program is urgently needed.

mothers. Some of the most thrilling developments in the whole science of nutrition have been in this field.

Studies now being made at Harvard by Dr. H. C. Stuart, Mrs. Bertha S. Burke, and others, indicate that the prospect of an infant being in robust health is four times greater when the mother gets a good diet compared with results when diets are sub-optimal.

On the basis of existing knowledge it is safe to estimate that nearly one million babies are born without their legacies of top-notch health because their mothers failed to receive adequate nutritious, balanced diets. This new knowledge opens up the path for public action to secure a wide-scale maternal nutrition program that will show its dramatic results in the health of the next generation.

Research undertaken in recent years indicates that proper nour-

ishment before and during pregnancy reduces: (a) toxemia in pregnancy, (b) the time of labor, maternal mortality and morbidity rates, and the rate of neo-natal infant mortality.

In a study of 216 cases, a high correlation between "good" diets of mothers and "superior" infants was shown and also a high correlation between "poor" diets and "poor" infants. In these studies, every stillborn infant but one who died within a few days of birth, the majority of the infants with congenital defects, all premature and all "functionally immature" infants, were born to mothers whose diets were very inadequate. A good diet during pregnancy is far more important to the health of the offspring than previously has been recognized.

The evidence continues to pile up. A study of 5,022 pregnant women in England showed that feeding of supplementary nutrients to the expectant mother reduced the incidence by approximately 30 per cent.

In another experiment, women were placed in three groups: (1) those having poor diets and low incomes; (2) those having poor diets and low incomes but who were fed supplementary rations of milk, cheese, oranges, tomatoes, wheat germ, and vitamin D capsules; and (3) those women of fairly adequate incomes who were given instructions in the type of diet considered desirable for pregnancy. The researchers report that they could tell the diet group of the mother by the appearance of her baby at six months of age! Mothers on good diets and those taking the supplementary foods had a significantly lower rate of miscarriages, premature births, stillbirths, and deaths, and they had better health throughout pregnancy as well as few complications. Infants of mothers in poor diet groups showed a marked increase in the incidence of minor and major diseases.

Still another study showed that only 42 per cent of the women studied who had "poor to very poor" diets had a normal pregnancy. Dr. Bertha S. Burke reports that of the women with fair diets, 8 per cent had toxemia, and of the women in the poorest diet group, there was a 44 per cent incidence of toxemia.

Study after study tells the same tragic story of women suffering the pains of childbirth to produce infants consigned to ill health because of nutritional deficiencies of the mother.

Since one-third of our selective service rejectees failed to meet Army physical standards due directly or indirectly to nutritional deficiencies, is there not good reason to believe that a large percentage of women are unfit to bear healthy children?

The problem confronting the State is not only that of improving the nutritional status of pregnant women, but also of building up a backlog of health by improving the dietary habits of adolescent girls and of women of child-bearing age.

Our Committee is convinced:

1. **Our State can progress no farther in the next 40 years than the vigor of its children who constitute the next gen-**

eration, and that, therefore, it is the duty of the State to set up a vast educational program of preconceptional and maternity nutrition. Who needs this program? Among others, the wife of the farm laborer bearing her child in a makeshift bed in a shack on a lonely upstate farm, attended only by her neighbor's wife. The wife of the garment worker in The Big City, bringing forth her infant in a crowded tenement. The well-to-do debutante, who to retain her sylph-like form virtually starves herself and when she marries and becomes pregnant finds that her high-priced specialists and attending nurses can help her little to undo the damage she has done to her unborn child. Rich and poor alike need this program.

2. **The excellent work of the Division of Maternal and Child Health in the State Health Department must be given increased financial support to enable its expansion to cover all the mothers of the State.**

Nutrition of Workers

Today we are in danger of losing many of the benefits derived from the industrial feeding program promoted so effectively during the war. Although plant cafeterias and canteens had been established in many factories and offices long before World War II, the war gave tremendous impetus to in-plant feeding. In addition, wholesome "Victory Lunches" were widely publicized. Educational leaflets were distributed in pay envelopes. Some concerns even provided free in-between meal snacks; others resorted to providing vitamin tablets.

In New York State, the War Food Administration encouraged factory owners to improve the diets of workers. The Office of War Nutrition Services, during its short existence, and the State Nutrition Committee developed helpful programs. If we permit this drive to lag; if we permit the Federal Government to fold up its industrial feeding program, we shall indeed be short-sighted.

During the war, when wages reached new highs, a study of aircraft workers indicated that:

56% failed to get enough green or yellow vegetables
49% failed to get enough citrus fruits or tomatoes
33% failed to get enough milk

Another survey showed that only eight per cent of the workers studied were choosing adequate lunches. Still another study disclosed that 92 per cent of the women and 82 per cent of the men carrying lunches to work were not getting an adequate midday meal. A fourth survey showed that one out of five plant workers did not have breakfasts before going to work.

This clearly indicates that a great deal of educational work must be maintained.

It is estimated that the number of workers in manufacturing plants in the country who could obtain food on the job more than tripled

War workers found nourishing meals in factory canteens.

during the war. Before the war ended, food authorities estimated that 9,000,000 workers used in-plant feeding facilities. Of all plants employing more than 1,000 workers, 95 per cent have some type of food facilities; about 30 per cent of all plants employing fewer than 250 workers have such facilities. Despite the large number of cafeterias and canteens set up during the war, only about half of all workers in plants with such facilities were accommodated.

It is encouraging to find that a survey made showed that 100 out of 101 plants plan to continue their cafeterias and canteens during the postwar period. Yet much work remains to be done. So long as large numbers of our workers receive low incomes, the need for an industrial feeding program must be maintained. So long as large portions of our workers do not know the elements of a sound diet and its importance to health, long life and vigor, an industrial feeding program must be maintained.

While the helter-skelter conditions of wartime, with swing-shifts, migration of workers, and employees living in crowded quarters with inadequate cooking facilities, will diminish in peacetime, there is little in the postwar picture to support an optimistic forecast of postwar industrial nutritional conditions.

Our Committee is convinced that:

1. It is "good business" for plants to set up plant cafeterias, provide adequate supervision of meals served, co-operate with governmental agencies in educational programs on nutrition. Better nutrition of workers means more output, a decrease of accidents and a reduction in absenteeism.
2. In-between feeding of milk or other nutritious, inexpensive foods is a sound business investment. A New Jersey concern that provided 1,500 employees with a free pint of milk during a five-minute recess found that production went up, accidents slumped 30 per cent, and absenteeism took a dive.
3. It is essential that the Federal Government continue its industrial feeding program in the postwar period. The problem of improving the diet of workers is not an emergency, wartime proposition, but a permanent one. Money spent on such a program is a productive dividend-yielder, an investment in the health of our people.
4. The State Labor Department should be granted the employees necessary to maintain a permanent industrial feeding program to supplement Federal activities, to provide technical advice to companies, and to set up a large-scale educational program directed at workers.

So long as large portions of our working population do not receive a wage sufficient to purchase diets adequate for vigor and health, there will be an industrial nutrition problem, no matter how much educational material is brought to their attention.

The School Lunch Program

The school lunch situation in this country is in a mess and has been in a mess since it was first started during the depression years.

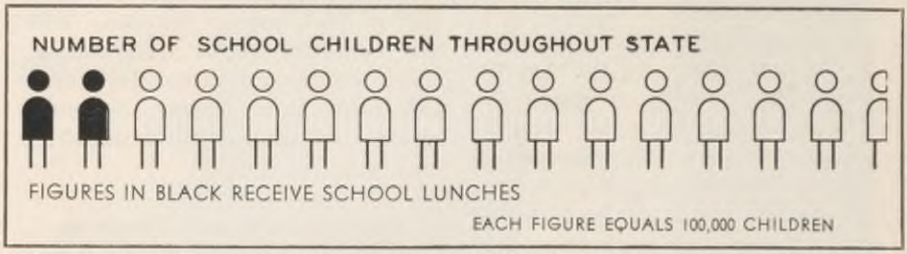
It began not primarily as a means of improving the health of our children, but as a way of disposing of surpluses of farm products and "surpluses" of labor. Thus the program got off on the wrong foot.

Ever since its inception, the program has been confronted with crisis after crisis. Congress failed to establish the school lunch program as a permanent program; thus each year, the lunch system has been in danger of being abolished. Last year, the bill appropriating funds to keep the school lunch program in operation passed the House of Representatives by the slim margin of one vote!

When the WPA was abolished, many schools lost the assistance of valuable cooks and other necessary help; the lunch program staggered on like a boxer who had been hit too hard and often. Teachers took money out of their own slender purses to help finance the lunches; mothers and fathers volunteered to help cook and serve meals; somehow the program kept on.

But this was not all. Schools were shipped surplus commodities

Estimated number of children receiving "A" lunches in New York State in 1945



that were often not only surplus but also decaying. Schools received moldy apples, eggs of ancient vintage, etc. Despite all the heartaches and disappointments that have been the lot of teachers and parents who know the value of the lunch program, it has continued and even has been expanded.

The time has come to overhaul the school lunch set-up.

We know that large numbers of our children are not receiving diets adequate for vigor. We know that large numbers of our children cannot, for one reason or another, receive an adequate lunch at home or return home for lunch. The school lunch program is at present reaching only a small fraction of the children who need it.

In New York City, only 11 per cent of the children are receiving hot lunches at school, and 20 per cent receive only one-half pint of milk. Upstate, only 20 per cent receive either a hot lunch or one-half pint of milk.

The Federal Government pays schools nine cents for each complete meal served. A complete lunch is sold in New York City elementary schools for 12 cents; upstate the cost to the child is slightly higher because upstate schools cannot take advantage of centralized cooking on a mass basis. However, it can be understood that if the Federal Government takes away the nine cents per meal, schools will either have to shut down their cafeterias or boost prices, either of which would result in denying balanced meals to large numbers of children.

Survey after survey shows conclusively that the children need the school lunch. In one study of 428 school children of families receiving $2,500 or less in salaries a year, only 70 per cent failed to get an adequate amount of essential nutrients. Of 225 children studied in two non-metropolitan areas of families having salaries of $10,000 incomes down to less than $1,000 a year, only half of the children of the medium income group received satisfactory nutritional ratings. In another survey, 53 per cent of urban children received low nutritional scores. In one railroad city which had suffered economic depression for many years, 99 per cent of the children failed to meet a satisfactory nutritional standard. In New York City, an examination of 500 high school students from low-income families disclosed, for example, that about 50 per cent were getting insufficient ascorbic acid.

One of the foremost nutritionists in the country, Dr. L. A. Maynard, Dean of the School of Nutrition at Cornell University, advises:

"The State should actively foster and help support a program which

will provide all children, regardless of economic status, with an adequate school lunch containing one-third of a quart of milk. This is the age group in which malnutrition is most serious. It represents the time of life when food habits are largely formed. A school lunch program is a practical and objective method of nutrition education, the influence of which carries back into the home. I believe that no State activity would accomplish as much in terms of nutrition education and better health as a statewide, adequately supported school lunch program. Certainly such a program would also result in the increased consumption of milk and other New York State products."

Our Committee believes:

1. There is no one nutritional step of greater importance than to set up a permanent, comprehensive lunch program in this State and Nation. The vigor and health of our citizens during the next 30 years are being determined in large measure in our schools today.

2. Every school child should have access to a well-balanced noon meal, furnishing at least one-third of the child's daily nutritional needs.

3. Congress should make the school lunch program a permanent part of the Federal Government's activities, and provide adequate funds so that the program will not be faced with year to year struggles for existence.

4. The State should set up a school lunch program to supplement the Federal Government's activities in this field. Funds should be provided to encourage local schools to provide low-cost nourishing meals.

5. The work of the State School Lunch supervisors who, with limited funds have done an excellent job in providing local school systems with the know-how in establishing lunch programs, in the proper purchasing and preparation of foods and training of lunch personnel, should be made a permanent part of the responsibilities of the State Education Department. The supervisors have been operating under State War Council funds which now are being eliminated.

6. Lunches now being served to school children are in a few cases below desirable standards of attractiveness and nutritious content. Any school caught serving food sloppily and selling cold, unappetizing sandwiches, and watery soup, should be promptly made to meet satisfactory standards, or lose financial assistance.

7. The school lunch program is primarily intended to improve the health of our children. It should not be used as a dumping ground for all kinds of surplus food stocks. However, with proper planning, the school lunch program can be of tremendous assistance to farmers of New York State in disposing of surplus milk, meat, vegetables and fruit, and in providing a stable market for such foods.

8. The nutritious quality of school lunches can be substantially improved by the use of brewer's yeast, and fortified soup concentrates. Schools would do well to inquire into the use of these low-cost supplements.

Iodized Salt

Our Committee finds that medical authorities are deeply concerned over the increased number of goiter cases. The American Public Health Association, through its executive secretary, Dr. Reginald N. Atwater, has emphasized to our Committee the need now, for requiring that all table salt be iodized.

"The situation is not as favorable now as it has been, quite largely because a new generation of mothers has grown up who are not sold on the idea of iodine in salt," Dr. Atwater points out. "We feel we ought, once and for all, to solve this problem of simple goiter due to lack of iodine in the diet, by governmental regulation. It is too costly a matter to depend on having to sell each new generation with the idea of using iodized salt."

Endemic goiter was one of the first nutritional deficiencies to be attacked successfully on a broad front. About a quarter of a century ago, a vast educational drive resulted in the distribution of iodine tablets in many schools. Surveys were made to determine the prevalence of endemic goiter and some efforts were made to have iodine added to table salt.

Dr. Frank G. Boudreau, Chairman of the Food and Nutrition Board of the National Research Council, states: "Now education on this subject is neglected: iodine tablets are no longer distributed and only about 50 per cent of the table salt sold now contains added iodine. It would seem that while we may have gone forward on many parts of the nutritional front, we have not been successful in preventing the enemy from filtering into our rear."

Although New York State is not as badly afflicted with goiter as many other states, nevertheless we should not be complacent. We do have many goiter cases. And we do know that an adequate amount of iodine is an effective way of keeping the thyroid gland in good working condition and maintaining physical well-being. While New York State is not in the so-called "goiter-belt," authorities believe all states would be wise to protect their citizens from goiter. Significantly, the Army requires that all salt for the armed forces be iodized.

Dr. O. P. Kimball, noted goiter authority, has recommended that the American Medical Association, the American Public Health Association, and the Federal Food and Drug Administration co-operate to give the entire country a natural salt containing 0.01 per cent potassium iodide or its equivalent.

Our Committee recommends:

1. The State Health Department renew the educational campaign so that there will be a demand for iodized salt.

2. If legally feasible, the Federal Government should require that all table salt contain 0.01 per cent of potassium iodide or its equivalent. If the Federal Government cannot legally adopt such regulation, then the State of New York should enact legislation to put such a requirement into force here.

Bread

Before the war, the common American loaf of white bread was seriously deficient in several important nutrients which are naturally present in whole wheat. However, our people, despite the pleadings of nutritionists over a long period of years, would not eat whole wheat bread. Less than 1 per cent of our entire bread output is entire whole wheat.

Then came a milestone in modern applied nutrition. War Food Order 1 required the enrichment of all bread. This was truly the birthday of a new world, for it held out the hope that man in the future would utilize his scientific knowledge to build a stronger, more vigorous people. Results proved swift and dramatic, and are most noticeably visible in clinics and public hospitals which noted that cases of pellagra diminished markedly after the bread enrichment got under way.

The British, however, did not follow our enrichment policy. Instead they adopted a uniform wheat flour of 85 per cent extraction of the whole grain compared with the 72 per cent extraction rate in our own white flour. The British added two pounds of skim milk powder, seven ounces of calcium carbonate and at various times, barley and a mixture of dehulled oats and barley. The addition of calcium was found necessary because otherwise the National Loaf caused a loss from the body of about a tenth of a gram of calcium daily. The National Loaf unquestionably helped pull the English through their difficult times. Nonetheless, it contained less niacin, riboflavin and iron than our own enriched bread. It did contain more calcium and protein. The National Loaf was brown and tasteless and our soldiers who went to England did not like it and would not eat it.

Canada too did not follow our enrichment policy. Canada instead adopted a program calling for use of "Canada approved flour." It represented approximately a 78 per cent extraction rate and did retain much more of the vitamins and minerals than unenriched patent flour. The flour is nearly white and made an excellent bread.

Since War Food Order 1 was limited only to the duration of war emergency, New York State adopted last year a law recommended by this Committee which required permanent and mandatory enrichment of all white bread and rolls, guaranteeing that the nutritional advances made in bread during the war, will remain in peacetime to benefit our 13½ million people.

However, President Truman called upon the Nation's millers to extract a minimum of 80 per cent flour from wheat, compared with the current 72 per cent extraction rate. He asked for this regulation in an effort to conserve 25,000,000 bushels of wheat during the first half of 1946.

Our tastes and our advertising over many years have led us to consume white bread, despite the fact that such authorities as Lt. Commander Clive M. McCay, famed Cornell nutritionist, have informed us that "nations like Russia that have stuck to the dark breads are ahead of us in many phases of their nutrition program."

Our Committee believes that the increase in extraction rate of wheat recommended by President Truman does not obviate the need for continuing our enrichment program, although it may require modification of some of its details.

We should maintain through years of peace the same high standards of bread we set up during war. In fact, we believe that in the future our bread can be still further improved by use of soya flour, dried skimmed milk and dried brewers' yeast.

Consumer's Service

Many upstate cities could render a valuable service to their people by employing a qualified home economist to advise consumers on plentiful, seasonable and reasonable foods in the market-places each day. Since economy is most important to large numbers of families, a service that helps consumers to get the best food "buys" would be enormously valuable not only in saving money for families but also in improving their diets. Radio stations and newspapers upstate would undoubtedly cooperate in spreading such information. New York City has already established an excellent consumers' service, as have other large cities. But the principle can be applied to smaller communities. In some cities, existing public and private agencies are already doing a satisfactory job along these lines. However, we believe:

All cities in the State should review the services, if any, they are rendering in advising their people of the best buys in food from a price and nutritional point of view, in telling housewives of surpluses that are available at moderate prices, of the proper methods of cooking, etc. Such work should be integrated with the activities of the local nutrition committee. Cities which do not have a full-time nutritionist or home economist might well consider making an investment in such a worker and have such employee act as executive secretary of the local nutrition committee.

Correction Department

In the 1946–47 budget submitted to the Legislature by the Governor there were requests for a total of $1,169,740 for the purchase of food in the 14 institutions of the State Department of Correction.

At present, there is not a single nutritionist or dietician in the entire department.

Our Committee believes that the Department of Correction could save a substantial sum of money, eliminate food wastage, improve the nutrient content of food served and use food as an instrument of rehabilitation of criminals suffering from malnourishment, if it employed a nutritionist as adviser to the State Commissioner of Correction.

Continuation of the Committee

Our tastes and our advertis- close interest, the development by Dr. Otto A. Bessey, of the Public Health Research Institute of New York City, of a simple blood test

that for the first time enables nutritionists to run off mass nutritional assays. This test is simple, quick and relatively inexpensive. It offers us for the first time, an effective way of determining quite precisely the nutritional status of our people.

Our Committee believes it to be of utmost importance that our State have authoritative data on the nutritional status of (a) its school children; (b) its expectant mothers; and (c) its industrial workers. Such data is fundamental to the success of a nutritional program. Our Committee has consulted with Dr. Bessey and has worked out the broad outlines of a survey of 1200 school-children in this State.

We recommend, therefore, that our Committee be continued for the purpose of conducting this nutritional assay, and with an appropriation sufficient to cover the expenses of such an assay. The continuation of the Committee would prove valuable also in that it would permit us to launch a study of means of conserving valuable nutrients now thrown down the drain as waste products.

The Ives Commission

Our Committee has worked in close co-operation with the Temporary Agricultural Commission, headed by Majority Leader of the Assembly Irving M. Ives. Representatives of the Ives Commission attended our public hearing; our Committee's chairman conferred with the Commission's chairman, and a representative of our Committee attended the January meeting of the Commission.

Between our two groups there has been mutual understanding. Each of our groups, recognizing that we are working in fields closely allied, has delineated its fields of studies not only so that we shall not duplicate our efforts, but so that the activities of one shall strengthen the effectiveness of the work of the other.

The problems of agriculture and nutrition are so numerous and complex that each group could labor for years without probing far beneath the surface of any of them.

Hearings

The Committee's work has embraced four public hearings, which attracted wide attention and obtained for the Committee a large quantity of valuable and important information. Among these heard at the various hearings were: Mrs. Franklin D. Roosevelt; Mayor F. H. LaGuardia of New York City; Dr. L. A. Maynard, Dean, School of Nutrition, Cornell University; Dr. Frank G. Boudreau, Chairman, Food and Nutrition Board, National Research Council; Professor Emeritus Samuel C. Prescott, of Massachusetts Institute of Technology; Dr. Robert S. Harris, Director, Nutritional Biochemistry Laboratories, Massachusetts Institute of Technology; Dr. Margaret Mead, formerly Executive Secretary, Committee on Food Habits; National Research Council; Dr. N. E. Dodd, Chief, of the Agricultural Adjustment Agency; Dr. Roy F. Hendrickson, former Director of Food Distribution, War Food Administration; Professor F. A. Harper, Department of Agricultural Economics, Cornell University; Mr.

Daniel P. Wooley, OPA Regional Administrator; Dr. William C. Ockey, Associate Director, Food Distribution Programs Branch, Production and Marketing Administration; Dr. E. R. VanKleeck, State Deputy Commissioner of Education; Dr. Bertlyn Bosley, Associate in Nutrition, Teachers College, Columbia University; Dr. David B. Ast, Chief, Dental Bureau, State Department of Health; Dr. Reginald M. Atwater, Executive Secretary, American Public Health Association; Dr. Lionel B. Pett, Chief, Division of Nutrition, Department of National Health and Welfare, Canada; Mrs. Francis F. Gannon, Director, Division of Consumers Service, New York City Department of Markets; Mr. Ole Salthe, Executive Secretary, Nutrition Foundation, Inc.; Mr. Chester A. Halnan, New York Area Officer for Marketing, Production and Marketing Administration; Mr. Charles E. Kellogg, Chief, Division of Soil Survey, U. S. Department of Agriculture; Mr. Paul S. Willis, President, Grocery Manufacturers of America, Inc.; Mr. H. H. Rathbun, President, Dairymen's League, Cooperative Association; Miss Sarah Gibson Blanding, former Dean, New York State College of Home Economics, and now President of Vassar College; and Miss Frances Hall, Office of Food Programs, Foreign Economic Administration.

To all these authorities, our Committee owes a debt of gratitude.

Acknowledgments

To the many other nutritionists, food experts, scientists, physicians, and food experts who assisted and co-operated in the work of our Committee, we wish to express our appreciation. The Committee wishes to acknowledge also the generous co-operation of newspapers and radio stations in publicizing various phases of the Committee's activities and related aspects of nutrition. We wish especially to thank Mr. Herbert Apgar, artist, for his aid in illustrating our reports.

Nutritional research must be supported.

Committee Staff

The staff of the Committee has conferred with many of the leading nutritional authorities in the country, has investigated many aspects of the State's nutritional activities, and has laid the foundation for this report.

Committee Report

The reception accorded the various reports of our Committee has

indeed been gratifying. "The Nutrition Front" (1943), "Food in War and Peace" (1944), and "Nutrition in Review" (1945), have received high praise from doctors, nutritionists, food experts, women's organizations, schools and colleges, and the scientific and lay press. Due to the overwhelming demand for these books, the supply has been exhausted.

Our present report is in two parts: Part I consists of this Letter of Transmittal. Part II contains numerous articles prepared by some of the foremost nutritional authorities in the world.

Respectfully submitted:

NEW YORK STATE

JOINT LEGISLATIVE COMMITTEE ON NUTRITION

Senator Thomas C. Desmond, Chairman
Assemblyman Myron D. Albro, Secretary
Senator Seymour Halpern
Senator Joseph E. Parisi
Senator Roy H. Rudd
Assemblywoman Gladys E. Banks
Assemblyman Frank J. Sellmayer
Assemblyman William J. A. Glancy

Landmarks in the Progress of Nutrition

By Dr. Frederick F. Tisdall

Department of Paediatrics, University of Toronto

From the standpoint of public health no branch of medical science has made such rapid advances during the past 35 years as has the science of nutrition. A study of how these discoveries were made makes reading as fascinating as that of any mystery story.

Studies in the 19th century disclosed that food consists largely of fat, carbohydrate and protein. The chemical composition and the part played by these substances in human nutrition constituted the most notable discoveries during the 19th century and the first decade of the 20th century. During this period little attention was paid to minerals although it was taken for granted that certain minerals were required, such as calcium and phosphorus for bones and iron for haemoglobin. Vitamins were unknown.

Calories

In the early years of this century a great deal of work was done to determine the total amount of food from the standpoint of its energy value required by man under different conditions. As a result of this work and subsequent observations, the calories required by children at different ages, by males and females under different conditions of activity, such as sedentary occupations, moderate activity and conditions of heavy work, are now known with a reasonable degree of accuracy.

Observations in Europe during the past two years and observations conducted with military personnel have shown that it is absolutely essential for the individual to receive sufficient calories for the work that is being done. Military observations have shown that where perfectly trained men in excellent physical condition received a diet inadequate in total calories during severe field trials, they degenerated so rapidly that at the end of four days they were not a match for an army of 14-year old boys.

Mineral Needs

During the past 25 years extensive work has been done on the minerals necessary for health. In addition to the ones that are obviously necessary for life, such as calcium, phosphorus, iron, sodium, potassium, chlorine, magnesium, iodine and sulphur, the discovery of the need of traces of other minerals has furnished dramatic chapters in our nutrition story. Some of these discoveries have been of great economic importance. For instance, a serious disease of cattle and sheep known as "coast disease", "bush sickness" or "wasting disease" which occurred in Florida and in certain Atlantic States as well as elsewhere in the world were found in 1935 to be due to a lack in the soil of cobalt. Only minute traces of this mineral were required to change these thin, listless, rough-haired cattle and sheep with retarded sexual development into normal healthy animals. It is now known that traces of other minerals, such as copper and manganese are necessary for life. Fortunately most of these minerals are so distributed in foods that care need be taken to insure an adequate supply of only three: calcium, found in large amounts in milk and cheese; iron, found in many vegetables, fruits, eggs and meat, and iodine, found in seafoods, products grown in iodine-rich soils and iodized salt.

Vitamins

In 1881, an investigator by the name of Lunin reported that animals fed fats, carbohydrates, proteins and minerals died and concluded that small quantities of unknown substances were essential for life. We now know that these "unknown substances" were the vitamins. Our present knowledge of vitamins date largely from 1912. In that year a worker by the name of Casimir Funk isolated a substance from rice polishings which cured the disease beriberi. He realized that this substance was important for life (Latin "vita") and thought it had the chemical characteristics of the "amin" group and thus coined the word "vitamin". The following year McCollum, Mendel and other workers found that certain fat soluble substances were essential for life as well as the water soluble extract from rice polishings. To differentiate between the two, the names vitamin A and vitamin B were suggested, thus initiating the alphabetical nomenclature of the vitamins.

It was soon discovered that there were more than two vitamins. Chemists also found that they were definite chemical substances and in most instances were able after years of work not only to determine their exact formula but also in many cases actually to synthesize them. It is now known that there are between 20 and 25 vitamins, although not all of these have been shown as yet to be necessary for human nutrition.

A marked lack of any one of the vitamins necessary for man results in the development of well-known deficiency diseases. For instance, a lack of ascorbic acid results in the disease scurvy, a lack of vitamin D results in the disease rickets, a lack of thiamine, or vitamin B_1,

results in beriberi, and a lack of niacin, another member of the vitamin B complex, results in pellagra. However, these well-marked deficiency diseases are comparatively rarely encountered in the United States and Canada. So one might conclude that a lack of vitamins is not an important health factor. Further studies in recent years, however, have shown that the food may supply sufficient of these vitamins to prevent the development of the well-marked deficiency diseases yet at the same time may not supply an amount adequate for "optimum health." These comments apply not only to the vitamins but also the minerals, protein and the total calories of the diet.

What evidence have we that a diet that is already good but still not "optimum" will adversely affect the health of the individual—not by producing an outstanding deficiency disease but just by interfering with the individual's efficiency? In looking for this evidence one would naturally conduct studies during the periods of stress and strain throughout life.

Pregnancy and Diet

It is well known that the period of pregnancy is one of great strain. Studies conducted at the University of Toronto, and confirmed at Harvard and elsewhere, show that when women received a perfect diet during the prenatal period in place of just an average diet (this perfect diet was obtained by making sure each woman obtained each day in addition to whatever else she wanted 1 egg, 1 orange, 4½ ounces of tomato juice, 1½ pints of milk, 1 ounce of cheese, 2 tablespoonfuls of wheat germ and 2,000 I.U. of vitamin D) the number of complications before the baby was born, during labor and during convalescence was only about one-fifth the number which occurred in less well-nourished women.

The most striking thing, however, was the effect of this good diet on the health of the offspring. People dealing with animal husbandry have recognized that the health of the offspring is definitely affected by the food given to the pregnant animal, but in the past little attention has been paid to this effect in the human. It was found that during the first year of life the infants born of well-nourished mothers were definitely healthier and had fewer colds and other illnesses than were the infants born of the less well-nourished mothers. The fairy story of the whole study, however, was that of the 14 babies lost during the course of the study every single baby came from the mothers who were comparatively poorly nourished. We can therefore conclude that a good diet is essential for the normal and efficient functioning of the pregnant woman in carrying her through this period of stress and strain and in the production of a healthy offspring.

Studies conducted in Cincinnati have shown that by making the diet of pregnant animals deficient in certain nutrients the number of offspring born with congenital defects is markedly increased. Similar nutritional deficiencies are

found in many human diets. The importance of this from the standpoint of national health is obvious.

Impact of Diet

The period of growth is one of stress and strain, in fact most animal studies on nutrition have been conducted during the growing period. It is now well known that we can take a diet for children which is already good and by further improving it so that it comes up to the recommended nutritional standard the children will grow more rapidly. At the University of Toronto the 19-year old freshman of 1937 was 1½ inches taller and 5.2 pounds heavier than the freshman of the same age in 1920.

Any infection produces an added strain. There is an extensive series of studies which shows conclusively that a diet low in any one of the nutrients necessary for life will lower the resistance of the individual to infection. In other words, one of the ways to lower one's resistance to many diseases is to consume a diet which is not "optimum." The lowered resistance of large groups of people in areas in Europe and elsewhere gives striking evidence of this fact.

As already mentioned, the importance of an adequate diet for physical exertion has been emphasized. If the diet does not contain sufficient calories during periods of severe exertion, the effect becomes evident in two to three days. If it does not contain adequate amounts of some of the vitamins, the efficiency of the individual is impaired in the course of one to two weeks. In setting up the various rations for the armed services all this information was applied in a practical manner.

The effect of an inadequate diet on the mental capacity of the individual has been demonstrated during the past five years. It has been found that if the diet is deficient in calories or other nutritional factors, particularly some of the members of the vitamin B complex, the individual tends to become morose and irritable. And along with these mental changes his capacity for physical work is markedly reduced. On overcoming the nutritional defect these very undesirable mental changes and decreased capacity for physical work disappear in almost a matter of hours. The importance of this from the standpoint of industrial production and industrial relations is obvious.

Better Diet and Longer Life

There is evidence that a good diet affects one's longevity. Twenty-five years ago, Professor McCollum fed animals highly milled wheat and corn, potatoes, peas, beets, turnips and dried beef. Animals at 10 months of age, comparable in the human life to between 18 and 20 years, had all the appearance of old age. It is true that the diet fed these animals was not very good; but similar diets are being used today by many millions of people in certain parts of the world. Sherman's work, reported in 1930, illustrates the effects of a diet that is excellent. He took a diet (Diet A) that was already good and consisted of a mixture of one-sixth dried whole milk and five-sixths

ground whole wheat, table salt and distilled water. Families of experimental animals, rats, were still thriving at 21 successive generations on this diet. Diet B had the proportion of milk powder in the food increased to one-third. The two groups of animals were of the same heredity and were kept under identical conditions. On Diet A the rats lived an average of 590 days, while on Diet B they lived an average of 654 days, an increase of 64 days, or 10 per cent. From further investigations it seems probable that the increased intakes of calcium, vitamin A and of perhaps vitamin B_2 all contributed to the higher degree of health and the increased length of life. The most significant conclusion is as follows: "Hence it may be regarded as established beyond any reasonable doubt that starting with a diet which is already clearly adequate, it may still be possible to induce a very significant improvement in longevity by enriching the diet in certain of its chemical factors."

It is thus evident that a diet that is not adequate in all respects but still does not produce any well-marked clinical diseases can adversely affect the health and efficiency of the individual. One might well ask, are diets that are not adequate in all respects commonly encountered in the United States and Canada? There is ample evidence from dietary surveys and other studies conducted in both countries that a considerable percentage of the people are consuming a diet which cannot possibly result in *optimum* health. Improvement in the health of both nations through better feeding is a great public health problem.

Food Supply Ltd.

By Dr. John D. Black

Professor, Graduate School of Public Administration
Harvard University

NO MORE challenging question now presents itself to the world in general, and to this country in particular, than how good a diet it is possible to have. The report of the Hot Springs Conference on Food and Agriculture of May 1943 contained a solemn declaration to the effect that the food-producing resources of the world are sufficient to provide a good diet for all peoples. This declaration seems to have aroused opposition from several groups, and even vituperation in a few instances.

One attack on it is from the standpoint of population growth and primitive Malthusianism—the amount of productive land is definitely limited, and population tends to increase geometrically, etc. This group observes the intense population pressure in southeast Asia and the East Indies, and only less severe pressure in some parts of the New World, like maritime Canada, our own South, and Puerto Rico and other parts of Latin America, and assumes either one of two things, (1) that it is only a question of the time until the population of the rest of the world will multiply to the same pressure level as prevails in southeast Asia; or that (2) the United States and other countries with relatively good diets will have to eat less well in order to provide the food needed by the growing populations of the rest of the world. In either case, the diets of the world will get progressively poorer rather than better. The world must therefore look forward to eating more and more cereals, and less rather than more meat, dairy, and poultry products.

The other attack is from the standpoint of possibilities of expanding production. The groups rotating in this orbit point out that nearly all of the potentially arable land is now in crops, and yields per acre can be increased only within limits, and beyond a certain point only at higher costs.

Usually this second attack is combined with the first one—the difference is only in the placing of the emphasis. Together, they add up to the conclusion that Malthus was right after all, and **that the world has been fooled into thinking he was wrong because of the accident that when Europe discovered America it proved to have vast undeveloped food-producing resources.**

Food Supplies and War

In the most exacerbated of the attacks on the Hot Springs pronouncement, a book by the sage of Mount Hope Farm, Massachusetts, Mr. E. Parmalee Prentice, entitled "**Food, War and the Future,**" this period of export of food from the New World to the Old is referred to as "a century of grace." We are told in this book that pressure of the population in Europe on the food supply

is what caused World Wars I and II, and that the decline in the rate of population growth in Europe, and presumably in the United States, has been due to the growing scarcity of food.[1]

Milder only in slight degree is the language of the recent book published by the Cornell University Press, "**World Hunger,**" by F. A. Pearson and F. A. Harper. Here we are told that "The current ideas of great world surpluses contradict the laws of nature, the history of mankind, and the realism of Malthus. . . Although most of man's existence has been blighted with food shortages, there have been occasional periods when there was a relative abundance of food in some regions. Soon after the western hemisphere was opened up, immigrants flowed to North and South America and relieved somewhat the pressure of population on the European food supply. These immigrants produced increasing amounts of food and had a sharp rise in their standard of living even though the population expanded rapidly. For about a century, half the world had what might be called a relative abundance of food. Man ate well, ate white bread instead of black, and ate increasing amounts of animal products.

"About 1900 this period of relative abundance began to draw to a close. The population was increasing faster than food supplies, and the consumption of the highly prized meats was decreasing. A world-wide campaign was initiated to make two blades of grass grow where one grew before. This period of scarcity was *temporarily* (italics mine) arrested by World War I, which reduced the number of European consumers with no diminution of food production."

The next to the last sentence in the foregoing no doubt refers to the generally accepted hypothesis that improvements in the arts of agriculture, growing out of the application of science, and out of mechanical invention, enabled agricultural output to catch up with population growth by 1915 perhaps, and that farm products have been in surplus since, except during the two wars and immediately thereafter, with the terms of trade relatively against agriculture. The authors, however, do not state the hypothesis in quite this way. It was not so much science as World War I, they say, that relieved the scarcity. It did it by killing off large numbers of people. And low food prices in the "late twenties and early thirties" were due to the world-wide collapse in prices, not to any surpluses.

Pearson and Harper blame food shortages for the two wars just as does Prentice: "Hitler stated the fundamental causes of war very simply and clearly—more *lebensraum*. Since there are so few of the good things of life and they are so unevenly distributed, there is plenty of incentive to attempt to redistribute them. Past history does not indicate that this equality will be established by voluntary or peaceful methods. It is more likely that the stronger groups of

[1] E. Parmalee Prentice, "Food, War and the Future," Harper & Brothers, 1944.

men will seize, or attempt to seize, fertile valleys, plains, or countries from their weaker neighbors, if they feel that they do not have adequate food supplies. World War I and II were attempts at redistribution, and, as the pressure of population on the food supply increases, there will be more wars. The more integrated and interdependent the relationships between continents become, the more likely it is that trouble will arise."

Then they go on to say that tariff and immigration barriers set up in the 1920's added to the pressure of population in Europe. "This was a perfect setting for a gigantic struggle by nations for their 'place in the sun.' The blame, however, was laid on those areas or persons that made strenuous efforts to correct the real or presumed inequities. The Kaiser was generally believed to be the cause of World War I just as Hitler was blamed for World War II. They merely personified the underlying causes."

World Totals

As I shall indicate later, there is very little purpose in analyzing the problem of food supply and population in terms of *world totals*, but since some are always wanting to do this, let us proceed along these lines for a few minutes. Pearson and Harper undertake to evaluate the possibilities of expansion of food production. They think that the estimate made by the German Penck that the earth could support nearly four times its present two billions at present levels of food consumption, is "optimistic."[2] But they finally come out with a possibility of increasing the arable land of the earth to 7 per cent as compared with its present 4 per cent, and say that increasing the output from present acreage seems to "hold more promise for increasing the world's food supply than does an expansion of acreage." If the acreage increase could be counted as 50 per cent, assuming that the new arable land even when improved would not be as productive as the present arable land, and the increase in output per acre is 75 per cent, this would mean more than a doubling of the food output. Allowance must also be made for increase in acreage and yield of grass lands from pasture improvements. Pearson and Harper, however, expect this increase in food output to be slow, and "probably less than the growth of population," and hence the threat of future wars.

The best analysis of the population phases of the issue is in the study made by the Office of Population Research of Princeton University and published as *The Future Population of Europe and the Soviet Union* by Notestein and Others. They conclude that the population of all of Europe except Russia will level out in 1960–65, and of Europe including Russia, not long after 1980.[3] What happens to population and food supply in Asia has in the past affected only a little the situation in Europe and

[2] A. Penck, "Das Hautproblem der physischen anthropogeographie," *Zeitschrift fur Geopolitik*. Halbband I, Heft 5, Blatter 330–348, May, 1925.

[3] Also see Notestein's article in *Food for the World*, published in 1944 by the University of Chicago Press.

World's standard of eating (prewar) is reflected in this map, which was prepared from the studies of Professor Merrill K. Bennett of the Food Research Institute of Stanford University. It is based on the fact that poor diets contain a high percentage of cereals and potatoes.

The white areas derive only 30–50% of their calories from cereals and potatoes, the black areas more than 90%. Actual famine does not occur regularly anywhere except in northern China. But other large areas suffer occasional famine and the world as a whole is badly undernourished.

the New World, and it is likely to remain very largely an Asiatic problem in the future. The main link is through the sugar and the vegetable oils of the East Indies that in the past have contributed to the food supplies of both Europe and North America. The essential problem is therefore whether the food supply of the Americas and Europe, with a little help from Africa, Australia and New Zealand, will keep up with the population growth of these regions. With our own population and that of Europe expected to level out by 1980 or soon thereafter, and growing more slowly between now and then, population pressure on food supply promises, we must conclude, to be no large threat to future peace. On the contrary, the trend in improvement in diets that set in after 1800 is likely to be continued. The most critical situation will be in the countries of southeastern Europe which are largely agricultural and offer no great chance for industrialization. W. E. Moore in his recent book *Economic Demography of Eastern and Southern Europe* anticipates a population increase of around 20 per cent in these countries by 1970.[4]

The "temporary" phase in the developments outlined appears not to have been the period of "surpluses" between the wars, but rather the period from 1900 to 1915 when food production was indeed not keeping up with population, and prices of farm products were rising faster than other prices. The explanation of this suggested by the Notestein studies is that industrialization was at that stage in several important countries in 1900–1915 when it is accompanied by rapid population growth. Notestein points out that the population grows rapidly in the first half of a period of "industrial revolution" in a country, but that presently birthrates begin to decline, and finally fall to a level that may not even keep up with the population. Russia is now in the first phase of such a revolution. Much of Western Europe was still in this phase in 1900–15.

Country by Country Analysis

Let us now consider our problem more realistically country by country. Another of the pronouncements of Hot Springs Conference was that achieving a good diet was a task for each country by itself, and that all that a world food and agricultural organization could do would be to help particular countries achieve such a goal more expeditiously. **There is no suggestion in the report that any nation will need to degrade its diet to make possible a better diet in other countries.** All remarks to the effect that the people of this country will need to eat less meat or milk if the people of Europe or Asia or Hottentot Africa are to have more, are *beside the point.* The United States can have better and better diets, and it can at the same time export all the food and fiber that the rest of the world is in a position to buy from it—all this with a population reaching a peak of possibly 165 million in 1980.

[4] Office of Population Research, Princeton, 1945.

Similarly for all the significant food-exporting countries of the world.[5]

The problem in these food-exporting nations is mainly going to be of another nature—it is to get enough workers to shift out of agriculture, and to substitute enough power and machinery for human labor on farms, to increase output per worker on farms enough to give farm families good incomes while keeping food prices at moderate levels. This will require high levels of employment in cities—in the United States, urban job opportunities for a million farm boys and girls each year for the next decade or two. If this is not done, the people who produce the food and fibers will not be able to feed and clothe themselves as well as those who buy them in the cities.

The food-deficit countries of Europe—such as the United Kingdom, Holland, Belgium, France, Switzerland, and Italy—will not all be able to better their diets in the next few decades. In the first place, the ravages of war have destroyed too many factories, railroads and homes. In the past, these countries have depended more or less on exports of manufactured products for the income with which to buy their food. They will need to have these export markets restored not only to their pre-1939 levels, but to their pre-1929 levels. They will also need to restore their import duties on foods to their pre-1929 levels so that their peoples can buy their breadstuffs and sugar at moderate prices, and shift their food production from these to locally grown protective foods — vegetables, fruits, milk and meats which they can more advantageously produce. **If they are not able within a decade to start their diets on their upward course again, it will not be a lack of food-producing capacity in their own countries and those with whom they trade.** It will be because for political reasons the nations in this group do not utilize their resources well. A major task of the United Nations Food and Agricultural Organization is to facilitate a return to a normal distribution of production *within* and *among* these countries.

The task in the Asiatic countries is largely one of adjusting population to resources. This is a task, if we may judge from the experience of Japan, for the next hundred years at least. The best prescription we now have for it is industrialization, accompanied at first by an increase in population because of a decline in deathrates with no falling off in birthrates, but in due time by a decline in birthrates also. It will be good business as well as wisdom to assist these countries with their industrialization; also, with the development of their food-producing resources.

The total picture that the foregoing analysis presents is that of a whole world going forward together with a bettering of diets, markedly in countries like our own, only after a delayed start in Western Europe, haltingly in south-

[5] Technically, of course, the United States is a food-deficit country—its food imports normally exceed its exports. But its imports are largely products not produced here—coffee, tea, chocolate, etc.

eastern Europe, and very slowly in Asia for the next 50 years, perhaps not at all in India in the first 50 years, although this is difficult to conceive with all the foment now in that country. Other parts of the world not mentioned fit somewhere within this wide range. The total result is a bettering of diets the world over, but at widely varying rates. This is what the Hot Springs declaration was meant to affirm. Those who challenge it when thus elaborated are suffering from one of several sorts of complexes.

It should be obvious that implementing such a world program does not mean that the food-surplus countries will play Santa Claus to the underfed people of the world. There will be years, and in some cases, short series of years, when the rational temporary arrangement for dealing with a maladjustment in production—like too much wheat in the world—will be to put surplus stocks in a world pool for distribution at reduced prices in distressed countries. The usual forms of international collaboration will be of altogether different sorts—pointed toward readjustments and not temporary relief.

There will continue to be "ill-fed and undernourished" people at the same time that there are surpluses. They will co-exist within the same country—and some countries will have many more of the ill-fed than others. I shall have to say, for the benefit of Professors Pearson and Harper, that there is nothing "incompatible" about this. And also that there is no mystery about it. The explanation is so obvious. It is a necessary part of the system of free enterprise prevailing in this and other countries—under the rules of which the well-to-do and strong are permitted to take from the poor and weak and to hand down their wealth to the next generation. If all children born in this country in just one generation were given an equal chance at health and education, and a job, or some capital to start in business, or a piece of good farm land, a good part of the inability to buy a good diet would disappear. But by no means all of it, for some in each generation are born weaklings and must have some form of charity or public relief if they are to have enough to eat. Why some countries have more ill-fed than others also should be no mystery.

It is true that getting more food into the mouths of the ill-fed in times of temporary "surpluses" or big depressions will reduce these surpluses. But the food supply might still press on the market and depress farm prices and incomes unduly year-in and year-out because of rapid improvements in the agricultural arts or failure of farm populations to migrate fast enough.

You may say that all this is a long way from the problem of food and nutrition here and now. I shall now undertake to show you why it is not. If Mr. E. Parmalee Prentice and Professors Pearson and Harper are right, the world should be pointing its agricultural production programs toward growing more cereals and less meat, milk and eggs. Even in the United States

we should be at least looking in that direction. If, on the other hand, I am right, the nations should look in the other direction. Take first, the extreme case of China. China needs first of all to grow all the cereals that it can, because many of her people are not getting enough calories and cereal proteins. But it should also convert all the grass it can grow on nonarable land to milk and meat. It should get its fuel whenever possible from coal, and its power from petroleum rather than from work animals. The diet can include a little more of animal foods while increasing the cereal consumption. When industrialization is well advanced, the Chinese diet can change still more to animal products.

European diets shifted strongly to animal products in the 19th century. This trend will continue if Europe gets on its feet again. But the change will be at greatly varying rates in the different countries.

As between beef, milk and eggs, milk is of course the most economical of grain. Pork is more economical of grain than milk only if calories are more important than proteins and calcium. Grain fed to milk cows as a *supplement* to roughage is in any case more economically used than grain fed to hogs. On some of the very small farms of Asia and Europe, however, chickens and hogs may fit in better than cows.

If this country finds itself plagued with food surpluses again after two or three years, as is confidently predicted, one way to handle these is to feed to livestock some of the wheat and corn now consumed by humans directly. The surpluses of meat, dairy products and eggs created in this way can at relatively small cost be distributed among our ill-fed people and improve their diets greatly. Yet when I proposed this in a paper read at Cleveland late in January, 1946, Dr. Helen Farnsworth of the Food Research Institute at Stanford took me to task for advocating a wasteful use of resources. And several others have done the same thing. The analysis presented in this paper should make clear that the diets of this country are pointed toward more animal products. This is especially true in the areas where diets are poorest, as in our South. To point the use of surpluses in that direction cannot be wholly wrong.

Neither should the dairymen and poultrymen of New York find it necessary to shift to cereal production to keep this country from going on a starvation diet. They can even fulfill their obligations to the Hottentots by producing more and more milk and eggs even if the Hottentots never see any of them.

Although we must conclude that a better diet is possible in this and other countries, we can never be sure that it represents the best use of a nation's resources. For a large fraction of the population a choice is available between a better diet and better housing, clothing and the like—for many in this country, between better diets and more use of automobiles, more movies, more dining out, and the like. Given such a choice, the issue becomes in part not how good a

diet is possible, but rather one of whether income and effort is most advantageously directed toward eating better or toward these other items in the family budget—and this is a problem in the economics of consumption as well as of production.

The Food and Agriculture Organization of U.N.

By Dr. Frank G. Boudreau

Chairman, Food and Nutrition Board, National Research Council

THE FIRST permanent United Nations Organization was set up in October 1945 at a conference held in the city of Quebec, attended by about 300 statesmen, legislators, officials, experts in health, nutrition, agriculture, forestry, fisheries, and farm and other group leaders. This event may well be a landmark in history, for it holds out the promise that governments will work together in attempts to raise the standard of living of the world's people, and it deals with food, a basic necessity of life.

We have just come out of a war in which food was one of the most important weapons. Victory might not have been ours had the Allies not decided to share their food resources. Food for the Allies was planned, produced, allocated and distributed jointly. More food was produced in this country than ever before; enough to feed one and a third times as many people as we have in this country. To plan, produce, allocate and distribute food many kinds of joint agencies were set up which resembled the joint chief of staff and its agencies for the conduct of military affairs. We have had practical experience under war conditions in cooperating with other nations in matters of food and nutrition; our experience has been successful, and now in FAO we have an international agency which will build upon what we have already accomplished, and from this foundation go on to wider co-operation and more effective action.

Background of FAO

I have been in touch with the international food and nutrition movement from its beginning. It will be remembered that after the last war and particularly during the economic depression, many farmers lost their farms and many farm banks failed, while huge quantities of food could not find a market. At the same time millions were hungry and malnourished here and indeed throughout the world. About 12 years ago the League of Nations tried to do something to solve these problems. At that time governments were isolating themselves behind tariff walls and other barriers to international trade in a vain effort to help their own people. Many authorities believe that this economic war which used the weapons of high tariffs, import quotas, exchange restrictions and dumping, was one of the most important factors in bringing on the war.

League committees believed that by co-operation in matters of food and nutrition which would benefit health, a way could be found out of this morass. Governments respond-

ed enthusiastically and the international food movement was making good headway when the war broke out. Then during World War II, we learned that our own safety depended upon the closest kind of co-operation with our Allies, and that it was just as necessary to co-operate in food as in our military or naval effort. The first conference of the United Nations was the Conference on Food and Agriculture at Hot Springs, Va., in May 1943, where a food and agriculture charter for mankind was adopted. Then a United Nations Interim Commission worked to prepare the plans and programs for FAO, and the organization itself was set up at the Quebec Conference in October last. Forty United Nations are now members of FAO, which consists of a Conference, an Executive Council and a Secretariat.

FAO Operation

The Conference which will meet at least once a year, consists of representatives of the governments. The Executive Council of 15 members will meet several times a year to carry on the duties of the Conference when the latter is not meeting. The head of the Secretariat, known as the Director General, is Sir John Boyd Orr, a Scot who is a farmer, an expert in animal nutrition and an expert in human nutrition as well. Presently he will be surrounded by experts in nutrition, agriculture, forestry and fisheries, for all of these will come into the work of FAO. The headquarters of the organization will be in Washington until the United Nations have selected the site for UNO and its social and economic council. It will be the task of FAO to help nations to help themselves in improving the nutrition of their people, in contributing to the welfare of farmers, and in co-operating with each other so that levels of living may be raised throughout the world.

Let me illustrate one of the ways in which FAO may work. A backward country asks FAO for help in improving its agriculture so that its people may be better fed. FAO gets together a group of experts in the different fields of agriculture from the advanced countries, and this group visits the backward country and advises its government. FAO also arranges for a constant interchange of information and experience between the different countries.

Every country, no matter how advanced, may learn something from the experience of its neighbors. You will remember that the atomic bomb was made possible by contributions from Australian, English, German, French, Polish and other scientists. No country has a monopoly of scientific talent. By a world pooling of scientific knowledge, the world can advance faster.

Need for FAO

Safety demands that the world do something, in its own interest, for the backward areas of the world. For it is in backward areas that malnutrition, hunger, and disease flourish; such regions breed unrest, revolution, and war. In an age when it is possible to reach any part of the world in a few hours, epidemics in any part of the world are a danger to the whole world,

for the carriers of disease in addition to man are insects and rats. Mosquitoes and lice may travel by plane; so may the louse; rats usually travel by boat. Hence the only way to be safe from epidemics is to wipe them out at their source, by public health work, medical care, and better nutrition.

FAO is the first of a series of United Nations social and economic agencies. There will soon be others in fields of transportation, trade, finance, health, labor, education, and politics. Working together they can do much to make decent living and working conditions possible in the world as a whole. Looking at the problem from a purely commercial point of view, a backward malnourished disease-ridden people are not good customers, they cannot buy our goods. But by applying scientific knowledge the natural and human resources of any people can be developed and their standard of living raised.

It is in our own best interests and in the interest of the world as a whole to work together through FAO to improve the food and nutrition of the world's people.

The success of FAO and of all other United Nations agencies depends upon the governments. With the full support of governments they can accomplish miracles, without that support virtually nothing. These agencies need financial support as well as moral and technical support. After its first year FAO is expected to have a budget of five million dollars a year. Congress must appropriate our share of that sum. When the time comes, I hope that the New York State Joint Legislative Committee on Nutrition will urge Congress to act promptly.

Immense sums are spent in waging war. Infinitely smaller sums are needed for the United Nations agencies which, with proper support, will lay the foundations of peace.

The New Zealand member of the Quebec Conference had this to say about FAO:

"At this vital time the opportunity is given to few organizations to contribute more directly to human welfare, and, in so doing, to make more permanently secure the foundation upon which world peace must ultimately rest; for neither political alliances nor military commitments, nor atomic bombs, nor regional arrangements can guarantee security for long in a world that is afflicted with poverty, pestilence and famine."

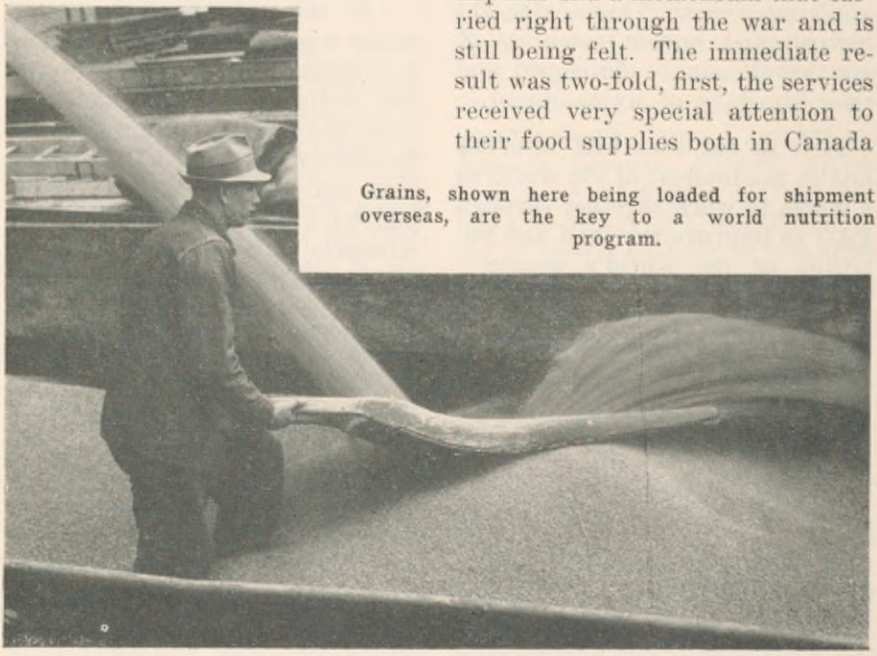
Canadian Nutrition Policy

By Dr. Lionel B. Pett

Chief, Division of Nutrition, Canadian Department of National Health and Welfare

PRIOR to the war nutrition work in Canada was relatively unorganized. There had been formed in 1937 a Canadian Council on Nutrition which sponsored a few dietary surveys on a total of about 1,500 people across Canada. There was also a certain amount of research work going on in relation to foods and nutrition, largely assisted by grants from our National Research Council. There was some research related to fisheries and fish products carried out chiefly in Government experimental stations. Information about food was largely dependent upon a few interested individuals and a few writers for newspapers. Fairly rigid control of food standards and advertising claims is exercised by the Federal legislation on food and drugs. In spite of all this the field of nutrition was uncoordinated.

With our entry into the war in 1939 there was a great outburst of activity in nutrition. The Canadian Medical Association, The Canadian Red Cross Society, The National Council of Women and many others greatly increased their activities; interested people in several cities established campaigns of popular education. These efforts gave an impetus and a momentum that carried right through the war and is still being felt. The immediate result was two-fold, first, the services received very special attention to their food supplies both in Canada



Grains, shown here being loaded for shipment overseas, are the key to a world nutrition program.

and abroad, and second, the whole field of civilian nutrition received more attention and became better organized.

Lack of Trained Personnel

One of our problems in Canada has been lack of trained personnel for nutrition work. Six years ago no one in all Canada was called a nutritionist or a nutrition expert; then suddenly every person who knew a little about food and nutrition or thought they did was besieged with requests to make speeches and participate in campaigns. In 1941 the Federal Division of Nutrition Services was established at Ottawa. Since Canada is a federation of provinces, each with its own parliament and its own authority, Federal work in this field has to depend to some extent on the establishment of Provincial nutrition workers. At the present time six out of the nine provinces have organized nutrition work to collaborate with the Federal division. It is still not possible to state clearly all the phases of the Canadian Nutrition Program because they differ considerably from one section of the country to another. It will give a better general idea for me to concentrate on a brief description of the work of the Federal Division of Nutrition.

Canadian Nutrition Work

The Federal Division of Nutrition is in the Department of National Health and Welfare which corresponds to a limited extent to the United States Public Health Services. The Nutrition Division has had four clear fields of work:

1. **Consultation Work:** Provides expert advice on numerous nutritional matters both in Ottawa and elsewhere. The Division may give the advice directly or may serve as a clearing house obtaining the advice from experts and from committees. This work will continue into the future as required and promises to demand a great deal of time.

2. **Industrial Work:** The great expansion of war industries in Canada demanded measures to protect the health of employees, and these measures included the establishment and supervision of factory cafeterias by the Nutrition Division. At the peak of war employment the supervision given influenced the meals of more than 60 per cent of all Canada's war workers. The Government gave some authority to this work so that it was possible to require the recommendations to be followed. Repeated inspections were carried out in order to make sure the desired standard was maintained. This work is being taken over to some extent by each province and is being extended now on a voluntary basis not only to those industries who are interested but also to some hospitals, orphanages, residential schools, penitentiaries, military and police barracks and other places. In fact, this advisory service will be extended directly and through the provinces to as many places as possible where groups of people must be fed, and where an interest is taken in doing the feeding properly in the interests of health.

3. **Food propaganda and information:** The Information Service is divided into two types, those that are of a national scale for the general benefit of everyone in the country and those that are in support of specific provincial needs such as by the provision of free posters, films, pamphlets, speakers, demonstrations, displays, etc. Many agencies are working in this field and it cannot be claimed that coordination has greatly improved during the war but the experience gained and the present trend is toward greater cooperation than ever before.

Food information from the Federal Division of Nutrition is developing in two other directions: (a) the sponsorship of special propaganda efforts for short periods of time and (b) the study of food patterns and habits and the basis on which people develop food habits and also change them. An example of the former procedure is the sponsorship in each province of a competition for the design of a Place Mat in which the design is based on Canada's Food Rules. These Place Mats will be awarded prizes in each province and may be further developed by the Division in connection with School Lunches.

4. **Research:** The Research Section of the Division is becoming the largest section of all and this is a trend which will continue for some years. Research at the moment centers on food composition, especially the compilation of figures, and on the assessment of nutritional status of sections of the Canadian population. This latter function is not only to provide an indication of where our nutritional problems lie but also to guide the information section in how to carry out its work on the basis of what is really needed. The Research Section is also very much interested in studying dietary standards and their relation to national food supplies. We have participated in the Food Consumption statistical studies of the Combined Food Board in association with the United States and Great Britain.

In many ways Canada is a favored land in respect to food supplies, nutrition problems, and general welfare. Our food supplies throughout the war have been ample for health even though they have been curtailed in certain directions. The statistical studies just referred to show that we do not need to worry so much about the amount of food that can be made available in Canada but rather about its quality especially when finally eaten. Our nutrition problem is not one of hunger or even of classical deficiency diseases. In fact one of our common nutritional problems may be obesity.

The only disease of nutritional origin that can be considered common in Canada in a severe form is rickets, and rickets caused less than one death per one hundred thousand people in the population per year. We have some cases of scurvy but we rarely find a case of pellagra or beri-beri. This means that our nutritional problem lies in that zone that must be examined by these vague and elusive signs of optimal nutrition that are mentioned in current research.

The fact that we do have a few deaths every year from scurvy and from rickets which are classical nutritional diseases shows that there is a nutrition problem in Canada. The fact that we have found definite improvement in the health of groups that have been fed extra quantities of certain foods means that we have a definite need for the consumption of some desirable food in Canada. Work is progressing vigorously along this line so that we may understand more clearly where the problems lie and how to deal with them.

The war has given rise to considerable work in nutrition which appears likely to continue and expand for some years to come.

Essentials of a Post-War Nutrition Program

By Dr. Robert S. Harris

Director, Nutritional Biochemistry Laboratories, Massachusetts Institute of Technology

A POST-WAR nutrition program should be designed to satisfy the three hungers of the people: hidden hunger, hollow hunger and humdrum hunger. This means that the people must be supplied with enough vitamins, minerals and amino acids to prevent malnutrition, enough calories to fill their stomachs and prevent undernutrition, and enough palatability to make eating enjoyable.

In a recent book, "The World's Hunger", Pearson and Harper point out that a least 500 pounds of foods (dry basis) yearly are needed to prevent hollow hunger and that a diet of 600 pounds will result in too much weight. Thus, the difference between undernutrition and overnutrition is relatively small. Statistics show that the average per capita consumption of food is over 540 pounds yearly and that there is adequate food for the people of the world. The problem is distribution and economics and not production.

Attack on "Basic Seven"

For several years I have been criticizing our national nutrition program because it was formulated on a food pattern that the people cannot afford. In a report I prepared for "Food—In War and Peace"[1] I demonstrated that more than 50 per cent of the people in 1943 had insufficient funds to purchase a diet based on the "Basic Seven" pattern. Certainly, the situation will not change markedly during the postwar period for food prices rise and fall with wages.

This "Basic Seven" philosophy assumes that it is necessary to eat foods of animal origin to be well fed. While it is easier to be well-nourished on such a diet, animal tissues are not necessary. I fear that our national nutrition campaign was devised by people who have always enjoyed this type of diet, who appreciated how well this diet prevents humdrum hunger and who generously wished to share it. But is such a diet practicable?

Approximately 25 per cent of the dry weight of the American dietary is animal products. Suppose we should want to provide a quart of milk per capita daily to our people. This does not seem to be asking much, yet such a program would require that the grain production of this country be doubled, and economists are wondering where the necessary acreage can be found.

Some are dreaming of feeding the world. We think that the average diet in the United States is unsatisfactory. But let us suppose

[1] Report of N. Y. S. Joint Legislative Committee on Nutrition (Leg. Doc. 73, 1944).

that we want the world's diet to be at least as good as ours, that we want the world's diet to contain 25 per cent animal products. Such a program would necessitate a five-fold increase in the consumption of animal foods, for the world now consumes only 9 per cent animal foods. This would require a tremendous increase in grasslands and cereal acreage. Such changes in world agriculture are neither practical nor necessary.

Our laboratories have succeeded in producing food mixtures which give complete and balanced nutrition for about $15 per capita yearly. Of course, no one would want to live on this fodder, but these mixtures do demonstrate the real cheapness of good nutrition through a vegetable dietary.

High marks and good feeding go together.

Low-Cost School Lunch

Five years ago we were commissioned to prepare a basic food for our Federal school lunch program. At that time the children were being fed with "surplus" foods, foods which failed to supply a balanced meal. Furthermore, the program was not permanent, for the school lunch program would end when "surplus" foods disappeared. As a result of this research, a soup base was developed and tried out for several months on 800 children. It was sufficiently palatable, taken day after day, and it improved the nutritional status of the children. It was economical, costing only two cents per child daily. It was nutritious, supplying one-third or one-half the child's needs of minerals and vitamins, some protein and calories. It was practical, since it complemented the inexpensive foods commonly available for school lunch feeding. This soup was modified and used for feeding millions of civilians in Europe during the war. It is hoped that this idea will find application in the post-war school lunch program.

Recent nutrition research has taught that malnourishment is more serious in its effects than undernourishment. If too little food is eaten, man's growth is arrested, activity is decreased and weight is lost, but he does not develop pathologically. On the other hand, if man eats an abundance of food which contains insufficient proportions of one or more nutrients, his growth and development will seem normal but pathological conditions will appear. Thus, balanced starvation is preferable to unbalanced

plenty. Thus, undernutrition is preferable to malnutrition. In the feeding of destitute populations and of needy children, we must remember that "a thing worth doing is worth doing well," and that it may be better to do nothing than to give people unbalanced dietaries. The real problem is not in quantity nutrition but in quality nutrition, not in getting more diets but better diets.

South of the Border

Our laboratories have been helping Mexico to establish a federal school lunch program. Because a practical program must use the least expensive and most nutritious foods available and because little was known of the composition of Mexican foods, it was first necessary for us to analyze the important foods of the Mexican dietary. On the basis of these data, a number of lunches were formulated and fed for a year to a thousand children in the poorest section of Mexico City.

From this experience we have made several important observations. We found it possible to give the children a balanced lunch for 12 centavos, whereas a similar lunch based on the American "Basic Seven" pattern cost about 55 centavos. People can be better and more cheaply fed by native foods, and we should not impose our foods or food habits upon others. This may be just as true in various sections of the United States as in the various countries of the world.

We observed also that the poverty-stricken children of Mexico showed no more evidence of malnutrition than middle-class children of Michigan. The Mexican children were poverty-stricken for they came from families averaging seven members and living on about 35 cents daily. Yet, they were no more malnourished than the children of automobile workers, dwelling in clean country towns, in families averaging perhaps four individuals and living on an income of more than $10 daily. This similarity in the condition of the children was not due to economic status. It may be partly due to a superiority in the composition of Mexican foods. We think it is chiefly due to the fact that the Mexican diets are as well, or as poorly, balanced as American diets. Diet balance is of critical importance. We in the United States are not the best fed nation of the world, we may be the most fed. It is likely that the primitive peoples of the earth are better fed than we.

In the post-war period, we should not be so concerned that everyone should secure his "daily allowance" or his "minimum daily requirement" of nutrients. The tables which have been formulated appear to be of no use to an individual, the estimates seem to apply to "Mr. Average" and he does not exist. Human beings are perverse critters who refuse to conform to diet tables. There is no one to consult so that you as an individual may determine what your exact daily dietary needs are.

These tables were developed for use by mass population groups.

In 1944, we published data to show that less than 20 per cent of the population of the United States was receiving good nutrition according to the National Research Council standards. Does this show that our people are undernourished or malnourished or are the estimates of requirements too high? Certainly 80 per cent of the population is not badly nourished for clinical studies do not reveal a high incidence of nutritional pathology. Possibly the estimates are too high. We believe that the answer lies in the fact that undernutrition does not cause nutritional deficiency lesions and that these lesions may only arise from unbalanced dietaries.

I have indicated that the quality of our diets needs improvement. For years our farmers have improved their crops in terms of yields per acre, resistance to disease, appearance and taste, but they have given little or no attention to the nutritional quality of these foodstuffs. This seems odd at first glance, because in the last analysis we eat these foods for the nutrition which they give. Even though the fickle consumer will perhaps always choose his diet in terms of appearance, taste and flavor, plant breeders give consideration to the nutritive quality of the foods they develop. In tests of a series of 130 strains of corn, we have found that one strain had more than 15 times as much niacin as another. Could the niacin content of the dietaries of peoples consuming large quantities of corn be significantly improved by plant breeding? Eighty per cent of the diets of mankind consists of wheat, corn and rice. Agricultural research on these three grains alone might do much to improve the nutrition of the people without increasing food costs.

If our people would only eat whole grain cereals, the nutrition problem would be much simpler. In the manufacture of cereals and flour, the food industry has removed or destroyed important quantities of vitamins, minerals and amino acids. Is it not the moral duty of this industry to replace all these nutrients so that their products will have whole grain qualities? And I might add that the Federal agencies in their laudable efforts to enforce food laws should not define or identify these food products in any way that would hamper their improvement.

Summary

In formulating a post-war nutrition program we should be concerned with the quality of the diet. The adequacy of diets is measured in the relative quantities of vitamins, minerals, amino acids and calories. There is no indispensable food. Some foods may be more satisfactory than others, but even the unsatisfactory foods may be combined to give a good dietary. Foods from animal sources may be more palatable and desirable, but these foods are so expensive that but few of the people of the world can afford them. We are doing the people of the world a disservice by implying that ours is the only good dietary and that our food pattern is essential to good nutrition. It is definitely not so. The evidence indicates that ours is not the best diet and that other nations are

better fed than we are on diets which bear little similarity to ours.

Federal and local school lunch programs must not be based on luxury standards. Less expensive lunches of staple foods are more practical and allow the program to include all children.

There is need for a realistic approach to nutrition problems. Those who formulate policies should collaborate with agriculturalists, food economists, economists, psychologists and nutritional biochemists. If we as a nation continue to tell to our people that they must eat "country-club diets" if they are to be well fed, we will run into economic and agricultural chaos. If, instead, we tell our people that good nutrition is attainable by simple, cheap, staple foods—and it is—then all may be well fed.

Nutrition Policy

By Dr. H. C. Sherman

Department of Chemistry, Columbia University

NUTRITION policy has many aspects. At the time that this is being written the combined national-international aspects constitute an extremely acute problem. Yet it might with entire truth be said that the tragically acute food problems of today are, essentially, war's exaggerations and extensions of the chronic underproduction and maldistribution of food, and lack of effective nutrition policy, which have existed in the past.

For even in the between-wars period of economic depression when agriculture was unable to find sale for the food-crops in hand, the rates of production of some important foods were insufficient to have fed all consumers at the levels recommended by the science of nutrition.

The importance of nutrition to life history is such that individuals and families need nutrition policy as much as they need financial policy.

Whoever decides upon the kinds and amounts of foods for one's-self or one's family either profits by the guidance of a policy of underlying principles of nutrition and food values, or is handicapped and more or less frustrated by the lack of such a policy.

Moreover, the sum of the purchases of individuals and families is the consumer demand which, felt through the market, is the most potent influence in determining the levels of production of the different kinds of food. And furthermore, this consumer demand is usually the main index of public opinion (of "what the people want") which in a democracy of the type of ours must always support the efforts of policy-making legislators and executives.

Yet, while the law-makers and office-holders need the support of public opinion, it is also a part of their function to give leadership and to provide effectively for such adequate and widespread public education in the principles of nutrition and the facts of food values as are foundational to sound public opinion in food-and-nutrition matters.

Education Is Fundamental

Provision for universal nutrition education is thus fundamental to any sound and permanent nutrition policy in this country, both for the direct betterment of the public health by the prompt diffusion of guidance to better food habits, and to provide an informed public opinion to support governmental action of an economic kind.

While it has been said before, it deserves frequent repetition, that to extend the benefits of the newer knowledge of nutrition as promptly and as widely as possible is both an educational and an economic problem.

All will agree, at least in principle, in support of the educational program; whereas proposals for

governmental "action programs" for direct promotion of better nutrition by seeing to it that better-balanced food supplies reach the mouths of the low-income consumers have sometimes been questioned. **But growth of knowledge shows that what might formerly have appeared "paternalistic" is now a part of the public health responsibility.**

For, as anyone who has time to study recent evidence can verify for himself, food is much more important to health and to growth and development, mental as well as physical, through nutrition, than anyone could know, or than science itself conceived, even a few years ago.

Thus the science of nutrition, having within a generation conspicuously outgrown even the most far-reaching of its previous ambitions, has recently been so evaluated by the world of medicine and public health as to make it influential also in the world of affairs.

Sir John Orr has said that the new knowledge of the influence of nutrition on health and physique coming at the same time with great advances in food production and distribution constitutes such an opportunity as to call for a new kind of statesmanship. And he has also suggested that, while promoting increased trade to bring the world's food to its people, we should also learn to think of food not so much as a trade commodity but rather as the "first essential for the better life."

And precisely so! The first world gathering of representatives of the United Nations (even before the one on money and credit) was the Conference on Food and Agriculture in the early summer of 1943.

This 1943 Conference appointed an Interim Commission whose Committee on Nutrition and Food Management prepared a general background document for the formal organization meeting in Quebec in 1945. In that document the opinion was expressed that:

"In the present state of knowledge, the most important potential instruments for food management programs available in Western countries are:

"(1) Production and trade policies that provide food adequate in kind and quantity for good nutrition.

"(2) Improved marketing efficiency.

"(3) Increasing national purchasing power and measures to diminish poverty among lower income groups.

"(4) Education to encourage food habits consistent with nutritional knowledge and to make the best use of food resources.

"(5) Improving social distribution of food supplies, with special reference to vulnerable groups.

"(6) Improving and conserving the nutritive quality of foods.

"(7) Protecting the consumer against unwholesome food and undesirable trade practices."

Obviously they seem to provide the basis for thoughtful consideration by the State, and since some of the suggestions involve Federal as well as State responsibility they call for Federal-State coordination of effort as well.

Our Nutrition Goals

By Dr. M. L. Wilson

Chief, Nutrition Programs, Food Distribution Programs Branch, United States Department of Agriculture

AT NO TIME in the world's history has there been such intense preoccupation with food and nutrition considerations as at the present time. The famine emergency has developed and the world is appalled at the current world-wide food shortage. At this moment, the question for many millions of the world's population is not now one of reaching a status of optimum nutritional adequacy, but how to stay alive under *any* level of nutrition above starvation. All of this simply emphasizes again, in an even more serious way, the eternal job civilization has always been facing on the food and nutrition front.

During the war, in the United States, we moved further than ever before toward a level of general nutritional adequacy. Our per capita food consumption was considerably above the pre-war level, and analysis of nutritive values shows a pattern of better balanced diets. Such conditions, of course, may shift under many circumstances, both for nations and for the world as a whole. But whatever the fluctuations in food supply from one time to another, or the dislocations in distribution among individuals and world populations, a nutrition goal itself can and must remain fixed as something constantly to be worked toward.

This goal, I believe, is self-evident: that to the fullest extent possible each individual understand and be able to put into practice the rules of good nutrition in the interest of maintaining himself at his highest level of physical and mental health.

To move on toward this goal as a long-range purpose, two fundamental questions have to be faced: (1) How can it be insured that the world food supply itself will be adequate to meet world nutritional needs? (2) Granted an adequate world food supply, how can it be assured that this supply can actually be used to the best nutritional advantage?

These questions are simple to state, but they pose the whole situation that the world must meet. The United Nations Relief and Rehabilitation Administration is now working desperately to find some temporary and emergency answer to the immediate crisis. The Food and Agriculture Organization of the United Nations is thinking ahead to the establishment of long-range bases for coping with these problems. Anyone who pauses to think of the age-old struggle for existence (basically a struggle for food) knows that decades, or perhaps centuries, of continuing effort are still ahead. But the hopeful thing is that the problem has been isolated, a social diagnosis has been made, and an organized search for remedies has been begun on a world-wide scale.

The United States is one of the fortunate countries of the world in respect to its nutritional status. But even with its favorable economic level, the struggle toward better nutritional levels has been one of slow, practically evolutionary, cadence. The record, however, is encouraging for the long-term prospects. This record needs to be reviewed periodically to freshen our appreciation of the progress that has been made, and it is pertinent to restate it here.

The record has two lines of progress: first, the development of the science of nutrition and, second, the development of community interest and social action. In sketching the first I want to draw heavily from a paper given some time ago by my associate in the national nutrition program, Dr. W. H. Sebrell, of the U. S. Public Health Service and an outstanding scientist in the nutrition field. In this statement Dr. Sebrell pointed out that although food has always occupied a position of primary importance in mans' existence, it is only recently that biochemical studies of man's food needs have been dignified as the "science of nutrition." He went on to discuss some of the implications of this thesis, saying that from early times, man's foods were governed by the substances available that had been found to be edible, and that since then there have been many experiments to find out what could be eaten with safety and satisfaction. With the growth of civilization, the list of edible foods increased. In addition, substances were found that enhanced the taste of foods. These were soon looked upon as essential to the diet. Early observation revealed that certain foods gave more energy than others. Thus energy value came to the fore and held undisputable sway for a considerable period of time. This step focused attention of scientists on individual foods and what their value might be to man, including the study and the relation of food to the metabolic process of the body.

Then followed an interest in the part that inorganic chemicals, existing in food, played in nutrition, and finally the development of the vitamin field. Though unidentified nutritional factors undoubtedly exist, and there is an enormous field to be explored, the science of nutrition has progressed to the point where, with the information available, it is now possible to plan a food supply which will insure good nutrition for everyone.

First Official Study

While the laboratory workers and medical men were compiling the basic scientific data, nutrition was moving also into the sphere of community interest and social action. In 1894, Congress, for the first time appropriated $10,000 to the U. S. Department of Agriculture for the study of human nutrition. President Grover Cleveland commented in his annual message, "When we consider that fully one-half of all the money earned by the wage earners of the civilized world is expended by them for food, the importance and utility of such an investigation is apparent." Under the auspices of the Office of Experiment Stations, research was instituted and sur-

veys were conducted as to the diets of groups throughout the country, including the farmer and the city dweller, the Appalachian mountaineer and the Chinese laborer, the Maine lumberman and the Southern Negro.

Reports of the Department of Agriculture included comparisons of the amounts of calories and various nutrients people were getting with what it was believed they should have. Recommendations as to diet were included in these reports. Workers in local communities endeavored, through educational practices, to put these recommendations into effect. Private agencies were very active in this respect. County agricultural and home demonstration extension agents were also giving attention to the food problem. Results piled up following 1914 when Congress passed the Smith-Lever Act and laid the foundation for cooperative agricultural and home extension work to be carried on cooperatively by the Department of Agriculture and the Land Grant Colleges. During the year following passage of this act the number of counties with county agents increased from 829 to 1,136. Instruction in the Southern States which began with teaching the cultivation and utilization of a single plant—the tomato—by 1916 included "instruction in every fruit and vegetable grown in the South."

During these years, health workers were also turning their attention to problems of nutrition. The work of the Public Health Service on pellagra followed the lines developed earlier to fight typhoid fever and hookworm. With regard to the former, for example, studies of epidemiology had been conducted by the Public Health Service in Washington during the years 1906–1910. The prevalence of pellagra was not fully recognized in this country before 1907; however, a report on it was compiled in the Public Health Service in 1908. From this early beginning came the later developments which have reduced the scourge of pellagra to its present low level in the United States.

Now we have reached the place where the relations between health and nutrition are sufficiently well recognized to permit development of a nutrition program for the prevention of deficiency disease which should rank in importance with the program for the prevention of infectious diseases. This concept opens up an entirely new field of preventive medicine with vast possibilities. Today, we accept, without even thinking about it, purification of our water supplies, safety in our sewage disposal, cleanliness in our milk, and sanitary eating establishments. Is the day not dawning when we will see the same acceptance of nutritional adequacy of our food supply? Admittedly, this may be somewhat in the future, but so were all these other health measures.

Home Economists Pioneer

As these scientific achievements were being realized, efforts directed toward the application of these findings in home practices were also beginning to be put forth.

The home economists, as a professional group, have pioneered this field and no group has made a greater contribution to extension of knowledge of good nutritional practice. Through home economics education, public knowledge of food patterns, food standards, proper care of food, and the many other practices related to food and nutrition has been far advanced. The work of the home economists has led the way to the wider community interest that now exists.

The development of local interest and community activity in nutrition was stimulated, in the period of World War I, by the work of many agencies in cooperation with local private and public groups. In the early nineteen-twenties extension home demonstration agents, public health workers, and other groups cooperated in community health and nutrition programs. These people, in the cities particularly, came together in nutrition councils and committees. This tendency toward cooperative and coordinated action began to be most noticeable in the early thirties.

Before the end of that decade attempts were made to institute a greater degree of the cooperative and coordinated effort which had been developing in communities and localities. A major step toward this end at the Federal level was taken through the establishment of a Technical Committee on Nutrition by the Interdepartmental Committee to Coordinate Health and Welfare Activities created by President Roosevelt in 1935. The Federal agency representatives on this Committee gave sustained attention to problems of research and educational activities on a broad scale.

Then in 1940 the National Defense Advisory Commission was set up. Under this Commission an over-all Nutrition Policy and Planning Committee was created, which was requested to consider the formation of a nutrition program in relation to national defense activities. Plans for this program were soon under way and in a preliminary report emphasis was placed on two considerations: First, the mobilization and use of existing science as a scientific policy foundation for any action programs that might be developed; and, second, the utilization of existing agencies through coordination of their efforts rather than the setting up of new agencies.

A plan for mobilizing science for defense and the war effort was already in existence in the National Research Council. Therefore, when it became apparent that the coordinated program would need scientific advice on diet and food habits, the Council was asked to set up two committees of equal standing, one dealing with the biochemical and physiological side of nutrition—now the Food and Nutrition Board—the other dealing with the psychological and cultural pattern—a Committee on Food Habits.

Nutrition Conference

In 1941, under plans developed by the Nutrition Policy and Planning Committee and a National Nutrition Advisory Committee associated with it, a National Nutrition Conference met in Washing-

ton at the call of President Roosevelt. It was attended by almost a thousand people. The Conference was the culmination of a great deal of study and preparation over a period of years. It was first-hand evidence that Federal agencies, physicians, scientists and others were now fully recognizing the need for translating nutrition knowledge into applied science and for establishing better food habits among all the people.

One of the most important announcements of the Conference dealt with the findings of the Food and Nutrition Board and its recommended daily allowances. These have been called the nutrition "yardstick." They represent the best available evidence on the amounts of the various nutrients necessary to include in adequate diets. The development of the "yardstick" is really a milestone in nutrition history and its importance cannot be over-estimated. It established the first standard of minimum daily requirements on which there has been general scientific agreement.

The Conference itself served as a transition point in moving out of the laboratory and into the wide-scale job of directing the nutritional facts into popular understanding and use. In fact, the recommendations as a whole laid the foundation for the first nation-wide cooperative educational drive in which all of the groups represented at the Conference could participate. Shortly after the Conference a Nutrition Division was set up in the Office of Defense Health and Welfare Services. This office was charged with the responsibility for coordinating the food and nutrition programs of some 20 Government and quasi-governmental agencies and for stimulating the educational activities of the State and local nutrition committees.

It will not be necessary here to follow the continuation of this sequence of events into the national wartime nutrition program. These developments have been presented in detail in former reports of the New York State Joint Legislative Committee on Nutrition. It is sufficient here to note that a great surge of understanding about the importance of nutrition has swept the Nation during the past five years and that this trend will continue into the future.

Education, of course, in itself is not enough. It can help in individual improvement of nutritional status and it can also help set the stage for the more tangible action that will have to be taken to eventually make adequate nutrition throughout the world a practical reality. For as individuals become more and more "food value conscious" through their increased knowledge of the principles of good nutrition, the demands will increase for an economy that will make it possible to realize these objectives under normal standards of living. The future problems and the goals ahead will then lie in the readjustments of our various economies to keep pace with these social pressures for higher nutritional levels. This, essentially, is the great task which the Food and Agriculture Organization of the United Nations is just beginning.

Changing Food Habits in the Post-War Period

By Dr. Margaret Mead
Associate Curator, American Museum of Natural History
Formerly Executive Secretary, Committee on Food Habits, National Research Council

DURING the last decade governments, federal and state, have taken increasing responsibility for the nutrition of their peoples. This responsibility has taken three main forms: (1) responsibility for providing sufficient means to purchase food, or other methods by which food could be obtained, to those who are unable to obtain it, (2) responsibility for the equitable distribution of foods which are in short supply and for the facilitation of the distribution and use of foods which are in long supply, and (3) responsibility for the education of the population in the use of foods so as to attain the fullest measure of health and well-being.

Roughly speaking, this first function of government is most prominent during periods of economic depression, the second during periods of war and dislocation attendant upon war, while the third is a continuing function which can come most fully to the foreground in periods when neither extreme economic depression or wartime scarcity occupy the center of the stage.

Findings of nutritional surveys over the last decade have demonstrated that the people of the United States fail to utilize the foods available to them so as to obtain all of the nutrients which our knowledge of the science of nutrition indicates would benefit them.

The customary patterns of food consumption therefore may be said to lag behind our scientific knowledge. In people's expectation of what they will have for a given meal, in the choices which the housewife makes at the grocers, the wage earner makes in the cafeteria and the school child makes in the lunch room there is not yet a full expression of nutritionally guided choices.

Meanwhile, owing to migration from one part of the U.S. to another, to the large number of those of foreign extraction in our midst and to the continuing shift of our population from rural to urban living, an increasing number of our people are eating in ways which not only lack the guidance of modern science but also the safeguarding hand of tradition.

When people move from place to place, substitute one food for another, replace natural foods by highly processed foods, change the proportions of different foods in their diets in response to greater availability of scarce articles, etc., their dietary patterns become seriously disturbed.

As a result, we may say that not only are the American people less well fed than they should be, if available scientific knowledge were embodied in their food practices, but that also they are often less well fed than they or their ancestors were under more limited but more traditional food habits.

The disruption of traditional ways of life which guaranteed at least a survival pattern of balance in the diet, makes it especially urgent that science should be actively applied to improving the pattern of our eating habits.

Ideally, all three functions of government, providing food for those who are unable to obtain it, distributing food fairly among those who draw on an inadequate or unbalanced supply, and educating people to make more effective use of the food available should go hand in hand. The stamp plan in use during the depression can be seen as a means of providing food for the needy, as a means of ensuring a more equitable distribution of certain commodities, and as an educational experience for the recipients of many foods with which they had had no previous knowledge.

In practice, however, one of these functions was likely to be emphasized at the expense of the others, and critics and defenders of governmental policy have decried one function in order to play up another.

Programs which could certainly be described as designed to feed people have been majorly advocated and defended because they gave relief to agricultural producers, as for instance the Stamp Plan and the use of surplus commodities in school lunches, or during the war, the defense of industrial feeding as a device to attain greater war production.

Conflict of Objectives

If governmental measures become identified with ends which are either temporary or designed to serve the interests of certain portions of the population, the introduction of wider humanitarian considerations into the discussion is likely to be viewed with suspicion.

Compare for example the different overtones of a proposal initiated to serve hungry school children warm lunches and a proposal initiated to use the Federal surplus commodity program in school lunches.

A similar conflict of objectives developed in the controversy as to whether rationing of foods could be used for educational purposes. Those who were interested in conserving our increasing knowledge of nutrients objected that the rationing of meat and fats together obscured a fundamental nutritional distinction while their opponents argued that the act under which the Office of Price Administration was established forbade the use of OPA regulations for purposes of reform.

In any discussion of governmental responsibility in the nutritional field, it therefore seems essential to establish the improvement of nutrition as a legitimate long time educational end, appropriate for any responsible government, and relevant to any other governmental activity.

Just as no government would seriously consider a wartime measure which violated the Food and Drug Act, similarly the need to submit all programs—wherever located and wherever directed—to the criteria of whether they do or do not improve the nutrition of the people should be firmly established.

If this is done, what becomes the most appropriate area of governmental preoccupation with nutrition in a period such as the one which we are now entering in which the difficulties of distribution are becoming increasingly less, and there is only a moderate amount of need for direct relief? Such a period as that which we are now entering may well become a period of deterioration in public interest and public responsibility in regard to nutrition.

Newspaper editors, with an eye on their advertisers, and on a public weary of war measures, will be likely to direct their food editors towards more palatable emphasis, cakes instead of vitamins, party foods rather than protective foods. The general sense of plenty which is inevitable after wartime restrictions will reinstate the idea that every one who has plenty of what he likes is inevitably well nourished.

The illusion of plenty for all because there is plenty for many, may obscure the very serious undernourishment which exists, and

which will increase as prices rise, among the lower income groups in the population.

Education in Nutrition

Alternatively, with proper stimulation and leadership, long-time educational measures may be so built into our public life as to make an appreciable difference in the health and well-being of our population.

The objective might well be phrased that just as a democratic society wants a literate population and will take such measures as are necessary to ensure that all children born within it are made literate, so a democratic society needs a nutritionally-literate population, a population whose efficiency will be high and whose drain on publicly supported institutions will be lower because of the adequacy of their dietary habits.

If this be granted as a legitimate public objective, the problem arises of means. Should each individual child be painstakingly indoctrinated with a knowledge of vitamins and minerals, proteins and calories, and reared to exercise conscious choice whenever he or she is faced with an array of food? Or is there a more effective method of education?

During the last three years, the deliberations, recommendations and publications of the Committee on Food Habits of the National Research Council and of the various investigators and research workers who have been concentrating on the problem, all point to the advantage of training people to follow desirable food patterns as a matter of course, rather than as a series of single acts of will power and conscious effort.[1]

Stated briefly, the question is whether it is not safer to have a population which (a) eats oranges for breakfast and (b) believes that nutrition is important so that if oranges are lacking, nutritionists advice will be asked, than to have a population which approaches each breakfast with the statement "I ought to get my vitamin C."

Studies of small children and of adolescents both suggest that the safest base for desirable eating habits is a genuine liking for food and that this can best be attained if there is an absence of moralizing, calculating and considerations of reward and punishment. But if this is so, then it follows that the way to teach the population how to eat a desirable dietary, is to give them an opportunity to eat and enjoy eating such a dietary, and limit formal teaching to a generalized recognition and respect for nutrition.

In practice this means that school lunch and industrial feeding programs become the most important leverage for changed food habits and improved nutrition which are available to us. It means that it may be seen as a public responsibility to ensure that all publicly regulated situations within which children and adults meet foods arranged in combinations and patterns, should be educational.

[1] See Bulletins 108 and 111 of the National Research Council.

It means that the measure of public responsibility is not completed when provision is made for a school lunch, or for feeding in a factory, but is only attained when facilities are provided to make those eating situations habit-forming in the best use of the available foods.

If this is done, then our school children, and our industrial and office workers will come to learn, in the deepest sense of the word, a way of eating which will ensure their bodies of what they need, without introducing motives and inducements which interfere with their enjoyment of their food, on which all adequate nourishment must be based.

Because only a certain portion of the eating situations which are also learning situations come under public regulation or control, it seems also desirable and necessary that the State should support in every way possible such agencies as are directed towards improving the pattern of the housewife's choice, the independent restaurant's menu, and the foods offered in casual eating places.

Nutrition Committees, food information centers, Extension services activities, etc., all play an essential role in the establishment of living habits which are congruent with our 20th Century knowledge of nutrition.

The Research Program of the Nutrition Foundation Inc.

By Dr. Charles Glen King

Scientific Director, Nutrition Foundation, Inc.

IN THE 1945 report of the New York State Joint Legislative Committee on Nutrition, Mr. Ole Salthe, the Executive Secretary of the Nutrition Foundation, reported on the purposes and operation of the Foundation. Now, I would like to describe some of the advances in the science of nutrition that have been made by grantees supported by the Foundation.

The Nutrition Foundation has made 111 grants, totaling $1,047,755, to 46 universities and medical centers in the United States and Canada.

In establishing the Nutrition Foundation, the food industry has given emphasis to two essentially new and fortunate trends in American life: first, a greater recognition of nutrition as a basic factor in public health; and, second, a clearer concept of the importance to society of independent scientific research and advanced education.

In the development of the Foundation's program, we are endeavoring to find what quantity of each of the 40 or more essential nutrients is required for good nutrition; how each functions inside the body; how each can be used to protect human and animal health; and how each can be measured accurately, either as it functions in the body or as it comes to being on a farm and later takes its course through the channels of commerce to the ultimate consumer.

The Foundation has been privileged to support a number of studies which have contributed important information to the science of nutrition.

Proteins and Amino Acids

The human adult requirements for eight of the 23 amino acids common to protein foods, at least insofar as they are required for the maintenance of nitrogen balance, have been established by Dr. W. C. Rose at the University of Illinois. Dr. Rose has extended the qualitative findings to include quantitative data, and within the next two years, reasonably good measurements probably will be available. In addition to providing a sound foundation for normal protein feeding, the data will also guide medical practice in regard to intravenous feeding and the use of hydrolysates.

Improvements in measuring the amino acids and their derivatives, and comparative studies of natural and synthetic amino acids, have been developed by Dr. L. E. Holt, Jr., and his associates at New York University.

Methods which are simple, less costly, and more rapid, for the microbiological assay of amino acids, have been developed by Dr. M. S. Dunn at the University of California and Dr. G. W. Beadle and associates at Stanford Uni-

versity. (The armed forces had occasion to use the results of these studies repeatedly.)

Human feeding tests of the protein quality of soybean, yeast, corn germ, eggs and other foodstuffs have been conducted by Dr. J. R. Murlin, Dr. Arthur Smith, and Dr. H. E. Carter, at the University of Rochester, Wayne University, and the University of Illinois, respectively.

Vitamins

The approximate levels of vitamin C intake recommended by the National Research Council have been supported by the findings of Dr. L. E. Sevringhaus at the University of Wisconsin.

At the same university, new light has been thrown on the variations of symptoms that arise from vitamin C deficiency. Using monkeys, in which the tissue changes closely resemble those in the human body, it was found that very low intakes of vitamin C cause a rapid onset of the typical signs of scurvy, without characteristic redness and swelling of the gums, and that a long period of moderately low intake results in gum conditions like those frequently observed in most areas of the United States and Canada. These findings strengthen the opinion of many physicians and nutritionists that our population would be benefited in health by an increased consumption of foods rich in vitamin C.

Possible lower requirements of vitamins B_1 and B_2 than have been recommended heretofore for men during periods of hard work, are strongly indicated by the work of Dr. Ancel Keys and his associates at the University of Minnesota.

The origins of high concentrations of vitamins in common plant foods have been explored at Yale University, Ontario Agricultural College, and Purdue University. The prospect that field crops can be developed with greatly heightened nutritive value, without sacrificing other desirable qualities, is very bright.

New micro-organisms for vitamin measurement have been introduced by Dr. Vernon Cheldelin of Oregon State College.

There are probably no less than three, and perhaps more, vitamins yet to be isolated and identified as members of the B complex. Grants have been made to aid the work of Dr. D. W. Woolley at the Rockefeller Institute, Dr. Paul L. Day at the University of Arkansas, and Dr. L. C. Norris of Cornell University in identifying such factors.

During the late summer, you may recall that a new member of the vitamin B-complex, called folic acid, was identified. Dr. T. D. Spies, assisted by a grant from the Foundation, has just completed tests showing that the new vitamin is useful in combatting certain types of anemia found among his patients in Birmingham. The new vitamin is not very stable. Hence the recent work will tend to emphasize the importance of consuming fresh or at least carefully prepared food.

In the background of Dr. Spies' finding that folic acid can aid in curing some of the baffling types of anemia, few people will realize that there were 20 years of patient work on the problem in American and European laboratories. Chicks,

monkeys, rats, guinea pigs, butterflies and bacteria have all served as guides in reaching the stage where the substance can be used in human tests.

A better knowledge of the functional role of choline, a constituent of complex fats, has been supplied by the studies of Dr. R. S. Riley and Dr. H. C. Hodge at the University of Rochester.

Minerals

The current interest in vitamins and amino acids has caused many persons to lose sight of the fact that serious problems are also at hand with regard to minerals. Blood donor service has accentuated the problem of protection against simple anemias that arise in part from iron deficiency.

The pathway by which iron from foodstuffs can be built into red blood cells is being charted by means of radioactive iron in the laboratory of Dr. P. F. Hahn of Vanderbilt University.

Maternal and Infant Nutrition

It appears that the prospect of an infant being in robust health is four times greater when the mother's diet has been good or excellent, compared to the result when maternal diets have been poor or very poor, and the risk that an infant will be classed as poor or very poor in health is only one-twentieth as great when the diet is good or excellent, according to the studies of Dr. H. C. Stuart, Mrs. Bertha Burke and their associates at Harvard University. Support has been provided by the Foundation for extending these studies.

New basic information regarding the nutritive requirements of infants and mothers has been obtained, also, as a result of a joint project between the Children's Fund of Michigan, Cornell University, and the University of Pittsburgh. Reports on these findings will soon appear in the American Journal of Children's Diseases.

The importance of a new member of the vitamin B-complex, "folic acid," for maintenance of lactation in experimental animals has been shown by Dr. L. R. Cerecedo at Fordham University.

The importance of good nutrition during early pregnancy, as a means of lessening the incidence of physical deformities in the offspring, has been demonstrated in experimental animals by Dr. Josef Warkany at the University of Cincinnati.

Diabetes and Sugar-to-Fat Conversion

Valuable leads concerning the role of sugar fragments in the synthesis of fats and "animal starch," including new information regarding the role of insulin and its relation to diabetes, have been developed by Dr. Hans T. Clarke and his associates at Columbia University, Dr. DeWitt Stetten, Jr., and Dr. Konrad Bloch.

Dr. C. F. Cori at Washington University has now discovered a new path by which sugar can react when it is started on the way to being either burned or converted to fat, instead of being stored as starch. The most exciting part of his work is the demonstration, for the first time in history, of a direct chemical basis for the functioning of three glandular hormones, all

related to the use of sugar in the animal body. The work goes a long way in giving a clearer picture of the nature of the common disease, diabetes. Medical authorities estimate that at least one person in every 200 in the United States has a measurable disturbance of this nature.

Hormones have been recognized for a long time as controlling agents in the body, but this is the first time that anyone has been able to demonstrate so accurately their method of functioning. Here in Dr. Cori's work we have the reactions of blood sugar regulated by an interplay of three separate hormones and one vitamin, all of which act on the newly discovered catalyst which is a crystalline protein.

At the present stage, Dr. Cori's work does not provide a cure for anything; it simply opens a new horizon of understanding. We can be confident, nevertheless, that physicians and biological scientists will soon find ways of bettering the lot of their fellow men as a result of the new insight.

Tooth Decay

The studies of food consumption in relation to tooth decay in experimental animals by Dr. C. A. Elvehjem and Dr. Paul Phillips at the University of Wisconsin have led to the introduction of a new type of experimental animal, the cotton rat. New information was gained also relative to the importance of different types and proportions of carbohydrates in the diet.

Pellagra

At the University of Wisconsin, Dr. Conrad Elvehjem has opened up a new area of wide theoretical and practical interest. The main point of his work is related to pellagra. Nutrition people have been puzzled by the apparent value of milk and other protein-rich foods in preventing pellagra, because some of these foods contain only small amounts of the anti-pellagra vitamin. The new findings show that protein quality of itself is an important factor in preventing the disease. When the supply of one of the amino acids from protein is low, more of the vitamin is required; and conversely, when the intake of a certain vitamin is low, there is greater need for high quality protein. The importance of such inter-relationships between the 40 or more essential nutrients is coming more and more to the foreground. These findings only become possible, of course, when each nutrient can be identified and studied with quantitative accuracy.

Length of Life

One of the most baffling problems in nutrition is to evaluate the over-all gains in health that might be achieved by intakes of specific nutrients which are two, three, or perhaps four times greater than the quantities that will protect the body against definite signs of deficiency.

With different levels of vitamin A intake, gains in health at levels well above those required for normal growth and freedom from specific signs of deficiency have been demonstrated by Dr. H. C. Sherman at Columbia University. Findings of a similar nature had

been reported earlier with respect to calcium and vitamin B.

Nutrition is still a young science, and we have a long, hard row ahead of us if we are to have a true scientific knowledge about nutrition. The food industry has made possible a completely unrestricted program of fundamental studies in nutrition. The prospect that basic research and education in the science of nutrition might make a major contribution to human betterment has never been brighter than it is today.

Let's Keep the Industrial Feeding Program

By Dr. Robert S. Goodhart

Scientific Director, The National Vitamin Foundation, Inc.
Formerly Chief, Industrial Feeding Division,
Production and Marketing Administration

WHETHER wars in their total sense are of any practical benefit to humanity is a moot question, and its decision—if it must be decided—can best be left to the philosophers and historians.

Most of us will agree, however, that the all-out effort put into World War II brought forth many discoveries and advancements that will prove of inestimable value to the human race in the peacetime years ahead.

Everyone is familiar with the more spectacular wartime achievements in medicine and surgery. Penicillin, streptomycin, and atabrine are now familiar to most of us. Blood plasma with its life-saving qualities is no stranger to us. Our mental cupboards and our vocabularies have also been enriched by the extraordinary advances in the field of physical science during the war years. In casual conversations we now discuss such things as atomic energy, jet propulsion, radar and the proximity fuse. The war-born advances in industrial production are also well known to us. We've seen ocean-going ships mass produced and we witnessed the creation of the gigantic synthetic rubber industry. These are but a few of the things to come out of works inspired by or accelerated by the war, and which now provide us with subjects for much pleasant speculation.

But there were other by-products of the war effort, which, though less publicized, are in many respects no less of importance to society than the better known achievements in medicine, science and industry. One of these is the industrial nutrition program. This program was an ambitious project spearheaded by what is now known as the Industrial Feeding Division of the United States Department of Agriculture, and administered in co-operation with State and community organizations.

Objective

The general objective of this program was to keep the Nation's industrial man and woman power at the peak of working efficiency insofar as this was possible through adequate and nutritionally balanced meals. It sought to do this by promoting the establishment, and providing guidance for the operation of on-the-job feeding facilities for the millions of workers employed in essential war and war-supporting industries.

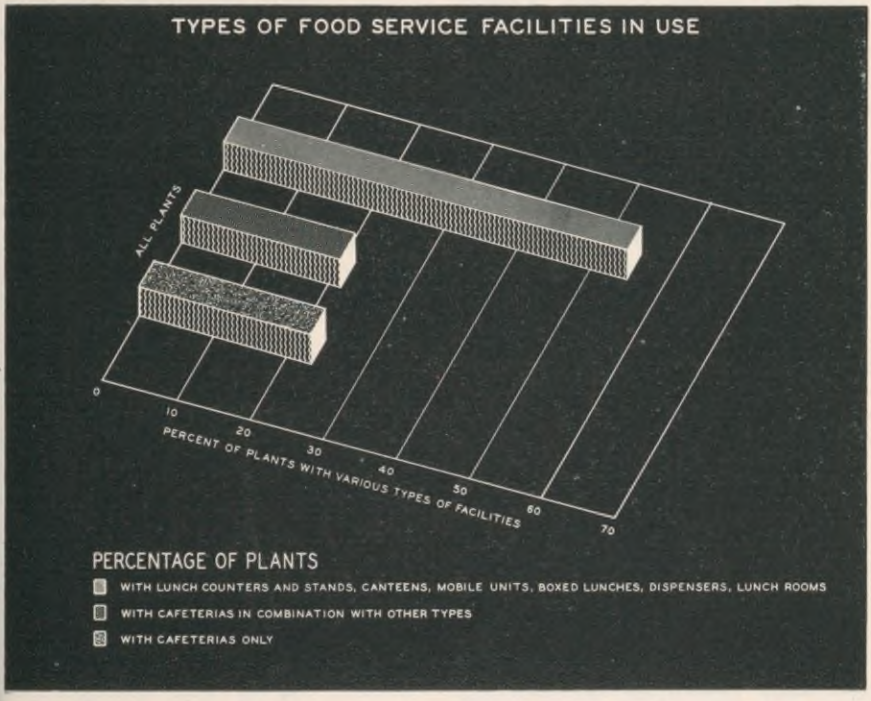
During the war the installation of new, or the improvement of existing on-the-job food services was subject to many complications. Priorities had to be obtained for

many materials and much of the equipment, labor had to be recruited, quotas for rationed foods had to be established, and prices had to be set in accordance with OPA regulations. To minimize these headaches, the IFD established an effective liaison with all pertinent war agencies, and with other departments and agencies. The IFD also provided technical and advisory services to interested plants, and furnished the necessary educational material and guidance needed to carry out the educational phases of the program.

A number of states and localities organized staffs and carried on their own nutrition programs for industrial workers in co-operation with the IFD. Outstanding among these were New York; Massachusetts; Connecticut; Union County, New Jersey; Louisville, Kentucky; Los Angeles, California, and the Bay Area Committee, San Francisco, California. Some of these programs were carried on by Nutrition Committees and others by State health or labor departments. In addition, a number of commercial organizations, primarily manufacturers of electric and gas operated kitchen appliances, developed excellent educational materials and programs which were distributed widely to industry.

Accomplishments

The program made few headlines, but its accomplishments can be measured in substantial figures. Official estimates place the number of industrial and white collar workers being fed midday and midshift meals on the job in 1945



at 9,000,000, as compared with a pre-war peak of about 2,000,000 workers. This is a considerable achievement. The operation of these in-plant feeding systems paid dividends in terms of good for the country. Not only were the poor eating habits of millions of Americans changed for the better, but the health and morale of industrial workers was improved, absenteeism and labor turnover were reduced, the accident rate was clipped, labor management relations were improved, and most important of all—productive efficiency was substantially increased.

The results may appear a little abstract to the reader, but there are statistics and testimonials to back them up. Philco, Boeing, Firestone, Dupont, Lockheed, Goodrich, Eastman - Kodak, Colgate - Palmolive-Peet, and Sharpe and Dohme are but a few of the more prominent industrial concerns to attest to the benefits of industrial feeding. Furthermore, a recent poll indicated that a majority of the firms that installed in-plant feeding systems for the first time during the war are maintaining them in their peacetime endeavors. The program has also been given the warm endorsement of labor groups, and of health, medical and nutrition authorities.

Danger of Discontinuance

With so much to its credit, it would appear that the future of the industrial nutrition program should be assured. With the compelling influences of war gone, however, its future is quite uncertain. Unlike wartime developments in medicine, science and industry, the industrial nutrition program has no substantial group in private channels effectively organized to carry out its objectives. During the war the program operated on public funds at the national and in some cases the State level, and with the voluntary, patriotic services of interested parties at local, community levels. It still operates on appropriations at the national level, though on a greatly reduced scale. There was a congressional move to eliminate it altogether following the end of the war, but complaints from industry and labor, and other groups were so great that it was temporarily extended to permit further study. The program will need considerable public interest if it is to be continued.

From the point of view of the writer, and others who have actively worked with the program, it would be a most unfortunate occurrence if the program were permitted to die, for while its wartime accomplishments were considerable and benefited a great number of persons, the program also served to point up the magnitude of the work that needs to be done in this field.

Workers' Diets

The extent of the average American's understanding of the principles of proper nutrition is appalling. This was illustrated beyond a question of doubt through a number of tests taken before and during the program's operation. A study of diets of families of employed wage earners, made by the U. S. Department of Agriculture in 43 cities in 1934–36, indicated that the proportion of white families with

diets that could be classified "good" ranged from 11 to 21 per cent in various geographic regions; those classified as poor ranged from 40 to 60 per cent. In studies conducted in 140 villages and 20 small cities, it was found that only about one-seventh of the non-farm families in 1936 had diets meeting the National Research Council's Recommended Dietary Allowances.

Another survey conducted by the U. S. Department of Agriculture in the spring of 1942 revealed that increased incomes and widespread nutrition education had produced some improvement in American food consumption patterns. However, there was need for considerably more improvement.

A subsequent survey made by the Illinois State Health Department of 1,102 luncheon trays in the cafeterias of four Chicago war plants revealed that only 8 per cent of the workers chose adequate foods, 21 per cent chose foods that were borderline in respect to adequacy and 71 per cent purchased totally inadequate meals. Another survey of the food selected by 1,020 workers in a 24-hour period was made by a nutritionist for a large industrial research foundation. It was found that 28 per cent of the workers had no milk with any meals, 22 per cent had no fruit, 44 per cent no eggs, 77 per cent no cereals, and 22 per cent no green vegetables. That a number of war workers (10 per cent) in the San Francisco area often arrived at their work without breakfast has been reported. Sixty-four per cent of the breakfasts chosen were rated as poor, and only 14 per cent as good.

Perhaps the most accurate data on workers' diets were furnished by a study of about 1,100 aircraft workers in Southern California. The weekly consumption records of selected foods indicated that over 55 per cent of the diets were poor as regards green or yellow vegetables; nearly 50 per cent were deficient in citrus fruits or tomatoes; 33 per cent were poor in milk; and about 20 per cent low in eggs. Practically all the workers consumed sufficient lean meat. Only 2 per cent had diets which met or approximated the Recommended Dietary Allowances of the Food and Nutrition Board, National Research Council, 11 per cent of the men obtained marginal diets, while 87 per cent had diets which were decidedly unsatisfactory in one or more of the food groups! Young men had somewhat better diets than older men. Men under 25 years of age drank more milk and ate more citrus fruits than those 25 years or older, but they all consumed about the same inadequate amounts of green and yellow vegetables and eggs.

These workers were also subjected to medical and laboratory examinations in order to more accurately determine their nutritional status. Their weights according to heights and age, were for the most part normal, but nearly every subject displayed signs suggestive of vitamin or mineral deficiencies. Eye changes suggesting vitamin A deficiency were noted in nearly every subject, while 17 per cent showed one or more abnormal neurological signs of the type found in thiamine deficiency.

Signs associated with riboflavin deficiency were also found. Nine per cent showed cracks or fissures at the sides of the mouth and scaly, greasy desquamation at the angles of nose and eyes. Twenty-three to 43 per cent showed ocular symptoms, such as lachrymation caused by light; eye fatigue or eye-strain, burning, itchy, or gritty feeling in the eyes; sensitivity to bright light.

Thirty-two per cent of the men had subnormal plasma ascorbic acid concentrations indicating the low vitamin C content in their tissues. Eleven per cent had hemoglobin values below normal.

From these and similar findings, it is obvious that the Nation, from the nutritional point of view, is definitely below par—this despite the fact that most people are eating more and spending more money for food than they ever did before. The cause is one of ignorance more than anything else, and as such it is not too difficult to cure. But such a venture takes time and organization, and in order to reach all the people, will require spirited public interest. Few will argue against the desirability of eliminating this drag on the health of the Nation. The dividends would far outweigh the costs in both time and money.

The success of the wartime industrial nutrition has already been noted, and it is significant. But it cannot be emphasized too much that what remains to be done far exceeds what has been accomplished. And for this reason, it is most important that sufficient support be obtained to permit the program's continued operation on both the National and State level. There are some points of encouragement, of course, that shouldn't go unnoticed. The program's endorsement by management, labor, farm, medical, health and nutrition groups has already been mentioned. Many State health officials and State legislative heads have also applauded the program and have urged its continuation. But a program of this scope will need even greater support, particularly from the general public, if it is to remain effective. This calls for all the active effort and publicity that can be mustered by the professional, trade and government groups who appreciate most the importance of the relationship between proper nutrition and the physical and economic health of the Nation's people. Only such energetic and enthusiastic support can furnish the direction and organization that the program needs and assure its continuation.

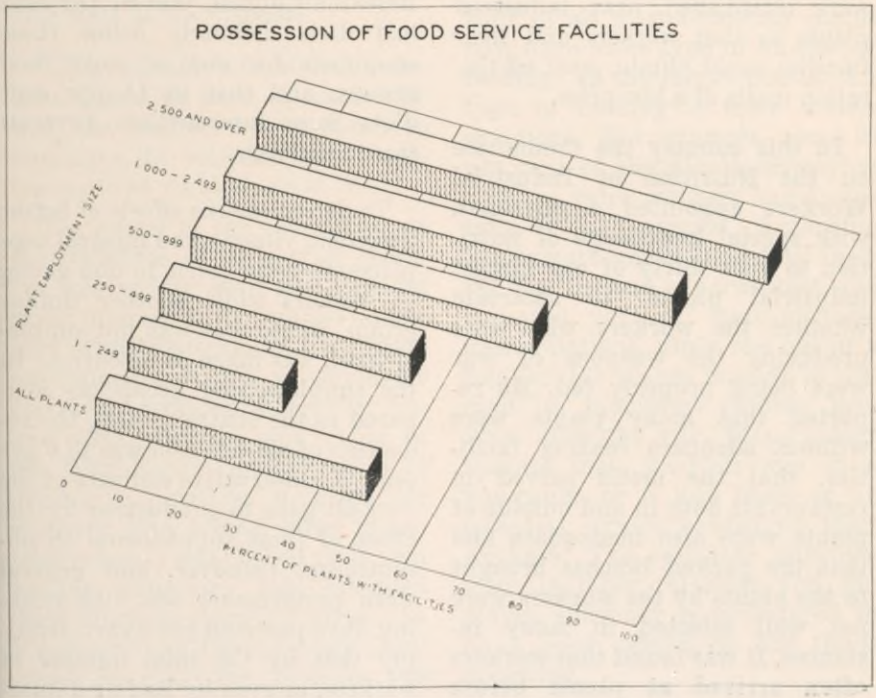
Nutrition in Post-War Industry

By Dr. Frank G. Boudreau

Chairman, Food and Nutrition Board, National Research Council

EARLY in the war both the United Kingdom and the United States appreciated that victory depended not only upon the armed forces but also upon the health and morale of those who produced the weapons of war.

In 1941 the Committee on the Nutrition of Industrial Workers of the National Research Council drew attention to the need for ensuring the proper nutrition of industrial workers, based upon the following considerations: A joint study of nutrition in New York City carried out by the United States Public Health Service, Cornell University, the WPA, and the Milbank Memorial Fund showed that a large proportion of WPA workers were malnourished. The great increase in industrial activity in this country was coming at a time when the fittest of our men would be drawn into the armed forces, hence industries would have to rely upon older men and women many who had been unemployed for long periods, and younger men who had been rejected by the armed forces. Many new plants were being built in sparsely settled areas where the worker could not find proper eating places, and thousands of work-



ers and workers' families were living in makeshift homes such as trailers, where it was not only difficult to obtain food but also difficult to prepare it. Moreover, if food rationing had to be resorted to, it would be a most complicated task to allocate to the different types of workers the extra food they needed.

The United Kingdom was in a desperate situation and was ready to take extreme measures to ensure that workers would stand up under long hours of work and often a seven-day week. Hence, in Great Britain the Government required every factory with 250 employes or more to provide canteens where workers could get a good meal; extra food, such as cheese and tomatoes, was provided for workers in certain heavy industries like mining, and British Public Restaurants were established near industrial plants so that workers and their families could obtain good off-the-ration meals at a low price.

In this country the Committee on the Nutrition of Industrial Workers appointed a physician with special knowledge of nutrition to visit thirty of our largest industrial plants, to ascertain whether the workers who were producing the weapons of war were being properly fed. He reported that many plants were without adequate feeding facilities, that the meals served in restaurants both in and outside of plants were also inadequate and that the packed lunches brought to the plants by the workers were not well selected in many instances. It was found that workers often arrived at plants before having breakfasted, after driving many miles, and on arrival they were served breakfasts of coffee and doughnuts. Contrast this with the Armed Forces which selected the fittest young men and gave them better diets than soldiers have ever had before. It was evident that physical efficiency in the production of weapons would not equal the efficiency of the Armed Forces who used those weapons.

A committee in California carried out a study of the nutrition of large numbers of airplane workers in a well known West Coast plant, under the auspices of the Committee on the Nutrition of Industrial Workers. It was found that the diets of only 2 per cent of these workers came up to the standard recommended by the Food and Nutrition Board of the National Research Council, that 87 per cent had diets definitely below these standards for one or more food groups, and that in 11 per cent diets were intermediate between these two levels.

To determine the effects of better nutrition, vitamin and mineral supplements were given to one group of workers while another similar group, whose diet was not supplemented, was taken as a control. In the supplemented group, as compared to the control group, the reduction of absenteeism was 18.6 per cent. A conservative estimate of the over-all gain to production by the effect of these supplements on absenteeism, turnover, and general work performance was 10.5 working days per man per year. Multiply that by the total number of workers, or even by half or a quar-

ter of the workers in this country and you will appreciate how great a gain there would be in production if workers were better nourished.

Committee Report

Accordingly the Committee on the Nutrition of Industrial Workers recommended to the Government:

"That special attention be paid to the diets and nutrition of all workers in industry and particularly of those most concerned with the national defense effort. That nutritious meals of natural foods at prices the workers are accustomed to and can afford to pay should be made available in all plants engaged in production for war or defense purposes, except in small plants where the worker may obtain such meals elsewhere in the free time at his disposal.

"That suitable educational measures should be used in connection with the food service in plants to stimulate the selection and acceptance of the right kinds of food."

The report of the Committee on the Nutrition of Industrial Workers was widely read and aroused great interest in the subject on the part of the Federal and some State governments, as well as employers and labor representatives. In August 1942 a section was set up in the War Food Administration to develop a nutrition program for industry, and several large industries not only established their own feeding programs but extended their efforts to other industries. In Washington an Inter-Agency Committee on Food for Workers was set up, including representatives of the War Food Administration, the War Production Board, the War Man Power Commission, the War Department, the Navy Department, the Maritime Commission, the United States Public Health Service, the Federal Works Agency, the Office of Price Administration, and the Public Housing Authority. Various state health and labor departments cooperated actively in the program. Eighteen representatives of the section of industrial feeding of the War Food Administration worked out of five regional offices, cooperating with and advising states, local communities and plant management.

These details of government organization for promoting the nutrition of industrial workers may not be as interesting as an account of the results obtained. Half of all manufacturing plants now have some type of on-the-job feeding. In the larger plants, this type of feeding is more widely practiced. For example, some 95 per cent of the plants employing 1,000 or more workers have some type of food service. According to a private survey industrial feeding has become a permanent and accepted part of labor-management relations. Only one out of a total of 101 plants intends to discard its industrial feeding program after the war. Many plants operate their food services on a non-profit or a loss basis as an essential service needed by their workers. The resultant improvement in labor relations and employee efficiency is considered to be a good return on the funds expended.

The acceptance of the program by workers is indicated by their increased use of plant feeding services.

There is some doubt about the number of workers to whom inplant feeding services were available when this program was started, but there is reason to believe that the program has been responsible for bringing the advantages of inplant feeding to about seven million workers.

Let me quote from an article by Dr. Robert S. Goodhart and Dr. L. B. Pett of Canada on "The Wartime Nutrition Programs for Workers in the United States and Canada."

These writers state the provision of food services for the worker, at his place of employment, has certain tangible advantages to a nation at war.

These advantages are:

"1. It is a medium for obtaining the best possible use of available foods and it is a medium for providing workers with the food they need in addition to their ration allowances.

"2. It is a means of applying nutrition principles and scientific techniques in the feeding of a large and important segment of the population, thus improving the health of the Nation. No other method has proved as effective as group feeding, with its possibilities for the application of educational procedures and principles of mass psychology, in influencing the food habits and food consumption of normal individuals other than infants and small children.

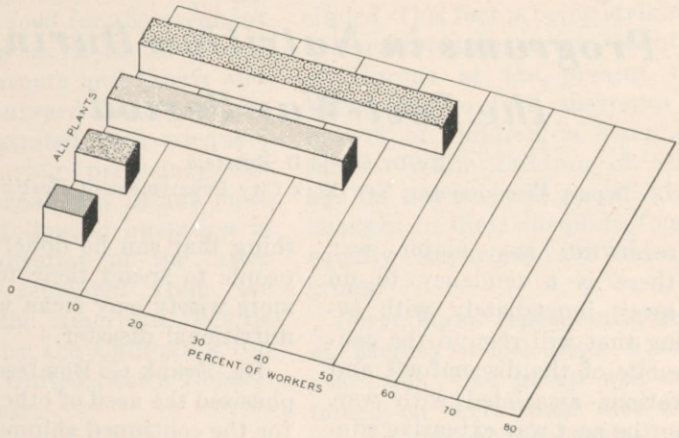
"3. It serves to protect and improve the worker's health and morale, thus improving employee-management relations and increasing the production of war materials."

It is very clear to me that most of these reasons apply just as forcibly in peace as in wartime.

From the point of view of better health and nutrition, the effort that has been made during the war to get workers properly fed represents a very great advance. If there is to be anything like 60 million jobs in this country, the program of better feeding in industry will make a notable contribution to national health and welfare. But it was a wartime activity and we are likely to give it up and to lose some of the ground we have gained. The effort of the Federal Government in this field has diminished and will probably be still further reduced.

New York State has an opportunity, now that the Federal effort is diminishing, to lead the way in fostering the better nutrition of workers in her many industries. I am sure that the efficient State Health and Labor Departments can work out a joint program which will set a high mark for the country as a whole. And I can think of no other similar activity so likely to contribute substantially to the health of this large and important segment of our population, and indeed to virtually all of our people.

SOURCES OF MID-SHIFT MEALS
FOR WORKERS ON ALL SHIFTS



PERCENTAGE OF WORKERS

- BRINGING PACKED LUNCHES
- OBTAINING FOOD IN THE PLANT
- USING NEARBY COMMERCIAL FACILITIES
- GOING HOME FOR LUNCH

Need for Continuing Educational Programs in Nutrition During the Post-War Period

By Dr. David D. Rutstein
Deputy Commissioner, New York City Department of Health

FOLLOWING any major war there is a tendency to do away immediately with everything that will remind the general public of the discomforts and deprivations associated with war. During the past war extensive educational programs in nutrition were developed and they recall an unpleasant connotation of food shortages. In spite of this emotional reaction it is necessary to evaluate the need for the possible continuation or revision of such programs.

During the present period of reconversion there has been a slight increase in the availability of certain categories of food. However, many essential foods are still short in supply and the rising price level has made it more and more difficult for people living on small incomes to purchase an adequate diet. Recent figures released by the Federal Government indicate a 33 per cent rise in living costs, which is lower than the average increase in the cost of food. There is, therefore, a need at the present time for continued education in the need for a well-balanced diet. Careful analysis of food supplies followed by proper publicity is also necessary so that those in the low income group may find it possible to obtain adequate diets. With the danger of inflation constantly before us anything that can be done to educate people to spend their food money more wisely may mean warding off nutritional disaster.

Dr. Frank G. Boudreau has emphasized the need of other countries for the continued shipment of food in order to prevent starvation. This means that our available food supplies must be shared with other countries for some time to come which is another reason for the wise use of food supplies in this country. During the past five years the United States has been blessed with phenomenal crop yields. If this level of production is not continued, we may be faced with serious food shortages. Every housewife has been faced with the problem of selecting substitutes for unavailable or rationed foods during the war period. With no control of consumption—such as rationing—widespread educational programs will be necessary if shortages occur.

Three Groups

There are three groups of individuals for whom an adequate diet is particularly important: pregnant women; infants and small children, and those suffering or convalescing from disease.

Physicians have long been aware of the importance of proper feeding

for infants but research which has been done during the past few years has emphasized the necessity for adequate food for the pregnant woman. The work of Ebbs and Tisdall in Toronto and Stuart and Burke at Harvard among others have demonstrated that adequate nutrition during pregnancy decreases maternal and infant mortality. The following quotation is from a publication of the latter authors as reprinted from the Journal of the American Dietetic Association by the Children's Bureau of the United States Department of Labor:

". . . despite still large gaps in our knowledge as to the exact requirements and functions of many of the specific nutrients during pregnancy, there can be little doubt that nutrition of the pregnant woman is sufficiently important to normal growth and development of the fetus and the health of the mother to warrant an important place in all prenatal care programs. That proper nutrition during pregnancy is an important factor in reducing the incidence of stillbirths and early neonatal deaths has not been widely appreciated. If a good diet is a safety factor to the mother and preventive of certain forms of toxemia, that alone is extremely important since toxemia is still one of the major causes of maternal mortality during pregnancy and an important cause of fetal mortality, premature births, and neonatal deaths. The benefits which may be derived from effective and intelligent nutrition teaching during pregnancy are overwhelmingly in favor of making this information a part of all prenatal care."

It has long been apparent that proper food is essential for growth of young animals, children included. This fact is being strikingly demonstrated in certain countries of Europe at the present time where due to food shortages the growth of children is being curtailed. While children of school age do not respond as quickly to changes in diet, adequate food is equally important for this age group.

Corry Mann reports on a group of English school boys, 6 to 11 years old. One group was maintained on their usual diet which was well planned and judged to be good while other groups received various supplementary foods. The most striking difference observed over a three-year period occurred between the control group and those receiving an extra pint of milk a day. During the first year the former group gained an average of 3.85 lbs. and 1.84 inches while those receiving the extra milk gained an average of 6.98 lbs. and 2.63 inches. Similar gains in growth and development in general health records have been reported both in this country and England as a result of supplementary feeding through school lunches.

Convalescence from illness or operation is shortened if the diet meets the individual's requirements from the onset of illness or injury. Malnutrition either mild or severe almost always sets in whenever disease or injury occurs. Illness causes specific nutritional demands and many patients are prevented by their illness from consuming an adequate diet. This is particularly true when an inade-

quate or poor diet has been eaten for some time preceding the acute stage of the illness. Convalescent diets should meet all the normal nutritional requirements of the individual as well as the special demands of the illness and convalescence.

Educational Needs

There is evidence which indicates the importance of an educational program for improving the selection of proper food. The most recent and among the best known are those of the Milbank Memorial Fund in the Mulberry and Harlem areas in which controlled experiments were carried on. In both of these investigations food habits of the children and adults showed significant improvement in all families in which special educational work was done. The habits of the children and adults in the control families showed relatively little change. This experience is not unique.

It is well to remember that there is great need for educational programs in nutrition to offset the unscientific education carried on by advertisers of vitamin concentrates. Most sales of vitamin concentrates are over the counter. In 1939 the manufacturers' output of these products was estimated at 32.1 cents per capita, which indicates a per capita consumer expenditure of 65 cents. There is every indication that this has increased in the past six years. It is probable that at least part of this money represents a useless expenditure. There is no substitute in the form of pills for an adequately balanced diet. There is reliable evidence that except in cases of deficiency there is no advantage in an increased intake of vitamins. Ruffin and Cayer reported in the Journal of the American Medical Association that no essential difference could be observed in their experimental groups in regard to appetite, energy, "pep", general health and weight when vitamin supplements were added to an apparently normal diet in one of the groups as compared to a control group in which such supplements were not used. Other workers have reached similar conclusions.

Along with education on the improvement of food habits there must be educational campaigns for improved handling of food products, food preparation and storage. These should reach all groups in the population concerned with transportation, sale, storage, and preparation of food.

It is apparent from the evidence of this brief presentation that there is a need for continuing nutrition education programs during the post-war period, and that a program of this type requires the cooperation of all agencies concerned with this problem.

Fortifying Our Soil

By Dr. L. A. Maynard

Dean, School of Nutrition,
Cornell University

SINCE most of our nutrition troubles are caused by the lack of the right kind of food rather than by a lack of enough food, as measured by calories, our nutrition education programs have stressed the larger use of what we have referred to as protective foods. More recently we have come to recognize that much more can be done to improve the nutritional quality of individual foods as actually consumed. Thus we have given a lot of attention to the conservation of nutrients, in processing, storing and cooking. Another general method which has received much less attention, and which has large possibilities, is the improvement of the nutritional quality of the basic food supply as produced.

We know, from the analytical data reported in the literature, that large variations occur in the nutrient content of the same foods, whether seeds, fruits, vegetables or animal products. For example, we know that tomatoes can vary in vitamin C content from 5–45 mg. per 100 g., apples from 2–20 mg. on the same basis. Butter may range from 5,000 to 25,000 I.U. of vitamin A per pound.

These wide variations do not mean that little reliance can be placed on the nutritive value of our food supply, because the bulk of the produce marketed exhibited much narrower ranges than are illustrated above, and we never get

Farmers play a key role in nutrition.

all of our supply of a given food from the same source or batch. The important significance of these wide ranges lies in the possibility of getting more of the kind of higher nutritive value and thus in raising the average for the general supply. This involves an understanding of the factors responsible for the variations and learning how to control them.

There are three principal causes of variations in the nutritive value of food crops, classified as genetic factors, soil factors, and climatic factors. Obviously the starting point of good crops is good seed. This has long been recognized in terms of yield, and plant breeders have been engaged accordingly in developing higher yielding strains, as well as strains which are disease resistant and suitable to storage climates. These strains, however, can vary in nutrient content also,

and little or no attention has been given to this aspect until the last few years. This fact has become evident from variety comparisons with several different crops grown under the same conditions as to soil and climate. Studies at the U. S. Vegetable Breeding Laboratory at Charleston, S. C., for example, have shown that the vitamin C content of 28 commercial varieties of tomatoes grown side by side in the same soil in the same season ranged from 11–22 mg. of vitamin C per 100.

But of much greater significance is the probability that new varieties can be developed with values markedly above the top limit of the range. Table I from Reynard and Kanapaux (Proc. Am. Soc. Hort. Sci. *41*, 298, 1942) gives the mean ascorbic acid content of commercial varieties in comparison with the small-fruited varieties, *L. peruvianum* and *L. pimpinellifolium*.

It is noted that our commercial varieties contain only one-third as much of the vitamin as the small-fruited ones representing the stocks from which the present varieties were derived. It is entirely possible that this original high vitamin content might have been preserved if the existence of the vitamin and its importance had been known at the time the breeding and selection work was carried out. Today the investigators at the Breeding Laboratory are crossing one of the commercial varieties back to a small-fruited variety to try to recover some of this lost vitamin content.

These investigators have already demonstrated, in the case of cabbage, that it is possible to improve vitamin C content as well as yield and market quality, through breeding. Table II (Pool and Grimball, Southern Seedman, January 1944):

TABLE I

Varieties	Number of lines	Mean vitamin C mg/100 gm.	Mean fruit volume cc.
L. peruvianum	21	62.7	2.5
L. pimpinellifolium	50	46.5	1.3
Commercial varieties	30	15.2	96.7

TABLE II

Varieties	Yield per acre (tons)	Vitamin C content mg/100 gm.
New		
Hugenot	19.6	64
Madison	17.3	72
Standard		
Charleston Wakefield	14.5	57
Marion Market	18.6	49
Golden Acre	13.1	50
Copenhagen Market	16.5	51

It is noted that the new varieties, obtained by selection, are higher in vitamin C content than the standard varieties, and also higher in yield with the exception that Madison was out-yielded by one standard variety.

A further example can be taken from the recent work at the New York State Experiment Station at Geneva. While the average vitamin C content of apples is considered to be 5 mg. per 100 g., the food chemists at Geneva have discovered that the White Calville variety has an average of 37 mg. per 100 g. This means that a 5 oz. apple of this variety would supply about three-fourths of the daily allowance of the vitamin prescribed by the National Research Council for the adult.

According to this test, this apple is of the same order of richness as of grapefruit and as of many oranges. There is only one tree producing this White Calville in New York State. Perhaps there isn't another one in the country. The apple is inferior in appearance and in eating and cooking quality. Thus the value of this discovery lies in the possibility of using this variety in breeding experiments to produce an apple which will have a higher vitamin C content than those now commercially marketed and still maintain the desired other qualities.

The studies with snap beans, carrots, peas, corn and other foods have shown that there are large varietal differences in their content of various vitamins and have demonstrated the promise of improving these nutritive values through breeding.

Soil and Nutrition

The influence of soil on the nutritive value of food crops first became apparent from observations with range animals. This is not surprising because here the animal gets its entire food supply from a given area. A classic example is cobalt deficiency. For decades prior to the discovery of cobalt as the essential factor, tens of thousands of grazing animals wasted away and died each year in certain areas of the world, while other animals remained healthy in other areas close by. Now it is known that 0.1 of a milligram of cobalt a day is all that is needed to keep in health sheep that otherwise would die. The losses have been prevented by an application of as little as 28 ounces of a cobalt salt per acre in areas of deficiency. This has increased the cobalt content of the pasturage to an adequate level, and has restored sick animals to health. There are many other examples of nutritional deficiencies in animals resulting from soil deficiencies.

One would not expect similar troubles in man to be of comparable importance because few people get their entire food supply from any restricted area. Yet goitre troubles and the fluorine problem occur in specific areas where soil and water composition is the controlling factor. In certain rural areas in Florida nutritional anemia seems to be correlated with iron deficiencies in the soil.

It is recognized that the calcium and phosphorus content of foods can be markedly influenced by soil factors. The trace elements, to which we pay little or no attention in human nutrition because we

assume they are always present in adequate amounts, are the ones which are the most variable in our food supply. Recent discoveries have shown that crop production in many areas suffers from trace element deficiencies. The obvious and severe troubles in animals resulting from their deficiencies in certain areas have raised the question as to whether unrecognized subacute troubles may not be affecting animal nutrition and health much more widely. The human aspects may deserve study also. Unfortunately, minerals have less glamour than vitamins at present, and thus their study tends to receive less attention.

The most important question regarding soil-nutrition relations is as to whether soil factors affect the nutritive value of food crops in other respects besides mineral content. It has been reported that on low-sulfur soils its addition increases the protein content of alfalfa. Mineral nutrition effects on the protein content of wheat have been noted. In a recent study in Texas, phosphorus fertilization of the soil resulted in a greater response in growth, reproduction and health in grazing animals than adding the needed phosphorus direct to their feed. There have been other reports of an improvement in the over-all nutritive value of forage by fertilization. But all of these observations must be followed up by more closely controlled studies to determine their real significance.

In studies at the U. S. Plant, Soil and Nutrition Laboratory at Ithaca, N. Y., under carefully controlled conditions, neither deficiencies nor excesses, in terms of plant growth, of either the major or the trace mineral elements have had any influence of practical significance on the vitamin A or ascorbic acid content of tomatoes or on the carotene, ascorbic acid, thiamine or riboflavin content of turnip greens. On the basis of studies thus far made, it appears that soil conditions are not an important factor influencing the vitamin content of food crops.

Climate and Vitamin Content

We do know, however, that vitamin content is markedly influenced by climatic factors. Studies at the U. S. Nutrition Laboratory have shown that the light intensity prior to harvest has a marked influence on the vitamin C content of tomatoes and leafy vegetables. In the case of tomatoes it has been shown that those coming on the market in the winter have only about half as much of the vitamin as those marketed during the summer. In experiments carried out during the summer, it was shown that decreasing the illumination by putting a cheesecloth shade over the plants resulted in a 40 per cent drop in the vitamin content. Field studies have indicated that the intensity of the sunlight prior to harvest can make a 30 per cent difference in the vitamin C content in tomatoes of the same variety grown in similar soil. The work with leafy vegetables has not yet progressed to the field stage but similar results are to be expected.

Of large possible significance is the work now being carried on with potatoes. While potatoes are

not classed as rich in any nutrient, they are consumed in such large amounts that they make important contributions of vitamin C and several other nutrients, particularly in the diets of the low-income groups. Stepping up the nutritive value of this cheap, widely consumed and generally liked food would have a large significance in improving the health of our people.

Now of course we can't control climatic conditions, or specifically light intensity prior to harvest, in growing crops which are important sources of vitamins. But this doesn't mean that the possibilities of practical application are nil. If light intensity is of as large importance as work today indicates, it may be possible, by harvesting crops after a period of bright, sunny weather, to obtain maximum yields of ascorbic acid. It is possible that in locating canning operations, areas might be selected in which high light intensity usually prevails during the harvest season.

Thus, we have genetic, soil, and climatic factors all affecting the nutritive value of foods of plant origin. They are interrelated and some of the problems involved are complex. But the results achieved to date make it clear that by learning more about the factors concerned we can control them in such a way as to improve markedly the nutritive value of our food crops. It will take many years to learn all the possibilities, but with the support which such a program deserves, in view of its high promise, each year should bring results of practical value.

Feed and Nutrition

With respect to products of animal origin, the principal factor causing nutritive variations is the feed of the animal. The vitamin value of butter is the outstanding example here. The mean annual potency of the butter produced in this country is around 15,000 I.U. per pound. While the summer butter is much richer than this general average, most of the winter butter ranges around 9,000 units. It would be entirely possible to raise the value of this winter butter, and, more important, of the fluid milk supply, by 50 per cent through appropriate feeding practices. These practices should not increase the cost of milk production because the feeds which will step up the vitamin A value of milk are those which will make the ration better in terms of total production as well. But there must be a real public interest to strengthen the hands of those who are trying to educate dairymen in these better feeding practices.

Similarly the vitamin A and vitamin D content of eggs are markedly affected by the nature of the ration. And here again the rations which promote the highest production improve the nutritional quality of the eggs as well. The eggs we eat today have a higher nutritive value than those of a decade ago because egg production per hen has been stepped up by rations of higher nutritive value and this higher value is in turn reflected in the eggs produced. Further progress in the poultry industry will mean further improvement in the egg supply.

The present discussion has indicated that nutritive values can be improved in production. There is knowledge which can be utilized in practice now. Leads are available for further research with high promise of results of practical value. While it may take years to learn all the possibilities, results can come rapidly if there is public interest and support for such a program. A better food supply can be obtained without increased cost. The program is applicable to all basic foods. It thus holds particular promise for improving the diets of those who, because of low income, find it especially difficult to obtain adequate nutrition from foods within their reach.

Soil and Nutrition

By Dr. Charles E. Kellogg

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MANY facts suggest a direct relationship between soil conditions and the nutritional quality of food. First of all, plants grow from soils and draw much of their nourishment from them. For centuries people have recognized differences in the taste and quality of plants grown under unlike conditions. With the recent emphasis upon vitamins and minerals—critical to health but found only in small amounts in plants—speculation about these relationships has greatly heightened. I say speculation because, unfortunately, not much is known about the direct relationships between specific soil conditions on the one hand and food quality on the other—little more than enough to establish the conviction that such relationships exist.

The problem may be thought of from several aspects:

1. Beginning with the broad, regional kinds of landscapes in the world, one may speculate about the unique ecological associations of soils, plants, and animals that have adapted themselves to each. In fact, each such kind of landscape or region has a unique kind of soil that has resulted from the combined influence of the climate and vegetation acting upon the physical land forms. Soils do not occur promiscuously over the face of the earth, but in an orderly relationship to these factors.

So many close analogies exist between these great soil regions and people, including even their art and social customs, that some important causal factors seem obviously to be operating. It hardly seems that it has been by chance alone that each of the great cultural systems of mankind has developed on its own kind of soil.

Soils of the great grassland areas are relatively high in calcium and phosphorus. Those of the humid forested regions are generally acid and relatively low in mineral plant nutrients. In the humid tropics the soils are thoroughly leached and especially deficient in phosphorus.

2. Beyond the natural differences in soils—both the broad regional ones related to climate and vegetation and the local ones associated with physical land form—are those caused by man himself. Certainly by fertilization, for example, the farmer can correct the deficiency in calcium, phosphorus, and in other minerals. He can. But this does not mean that he has changed the soil much. Pliny said centuries ago that the important differences in crop quality were more closely related to the natural differences in the soil than to the ordinary differences in husbandry. Somewhat to our surprise, our most recent reliable researches seem to confirm this general principle, although there are important exceptions. Chemical analyses show great variations among samples of the same

kinds of food plants in the important food factors, especially minerals. But careful analyses of all existing dependable data—data obtained under conditions satisfying the ordinary requirements of scientific accuracy—lead to the conclusion that these differences are more closely related to the natural soil types than to differences in husbandry. Sometimes additions of phosphate fertilizer to soils deficient in phosphorus lead to significantly increased amounts in the plants. But often this does not happen.

Mr. K. C. Beeson, of the U. S. Regional Soil, Plant and Nutrition Laboratory, has studied the available data regarding the specific effects of various fertilizers on plant composition over a period of several years. His latest conclusions on this point may be summarized as follows:

A. The concentration of phosphorus in most species utilized for forage can be increased slightly by use of phosphate fertilizers particularly where the original phosphorus concentration in the plant is unusually low. There seems to be evidence, however, that the phosphorus concentration in any species may be relatively resistant to change. There is considerable evidence to indicate that the response of phosphorus concentration in the plant to application of phosphates to the soil is dependent to a large degree on the nature of the soil.

B. The effects of nitrogen applied to the soil on the concentration of phosphorus in the plant are inconclusive whether the nitrogen is applied alone or with other fertilizer elements.

C. Any effects of potassium alone or with other elements on the concentration of phosphorus in plants seem to be variable and of little practical significance.

D. Liming the soil seems to depress the concentration of phosphorus in plants under some conditions, while no effect is evident under others. This is probably a soil factor. Liming accompanied by application of phosphates or complete fertilizer mixtures has been found effective under some conditions in increasing the phosphorus concentration in plants.

E. Of several other elements studied, only applications of magnesium to the soil seems to be associated with an increase in the concentration of phosphorus in the plant.

F. In general, liming the soil has resulted in a higher concentration of calcium in the plant although it is evident that plant species and soil conditions will act to modify this factor measurably.

G. The effect of nitrogen in reducing the percentage of calcium in plants has been confirmed under a number of widely variable soil conditions and in many plant species.

H. The application of calcium as superphosphate has not ordinarily been associated with any change in the calcium concentration in the plant.

I. A reduction in the concentration of calcium in plants has generally followed potash fertilization. No positive correlations of calcium in plants with potassium supply have been reported.

J. There is general agreement that applications of magnesium to the soil result in a lower concentration of calcium in plants although the differences are seldom of practical importance except where the calcium level is already low.

K. The number of soil experiments in which the micronutrients have been studied are too few to permit any generalizations as to their influence on the general composition of the plant. The data available suggest some important interactions, and these are supported by the work in solution cultures. It is generally true that applications of boron, cobalt, copper, and manganese result in greatly increased absorption of these elements by the plant.

L. There is some evidence that liming practices and intensive fertilization under conditions of a limited supply of

micronutrients such as boron, manganese, iron, and cobalt may further reduce the amount of these elements in the plant.

Soils are not easily changed.

3. Through soil management practices to widen the choice of crops enormous improvements in nutrition can be made. This is of vast importance even though we do not know how to develop significant practicable increases in the mineral and vitamin content of plants through fertilization except in a few instances.

Summary

1. Careful research to establish the direct relationships between soils and the nutritional quality of food plants is urgently needed. Only a start has been made. These studies need to be related, on the soil side, to specific soil types and, on the human side to accurate clinical examinations. Early attention should be given to areas of known deficiency — where food plants are known to be deficient or where livestock or humans subsisting on local foods are known to suffer from nutritional deficiency diseases.

In the meantime the public should be very wary of the many dogmatic predictions flooding us today—both panic-making prophecies of doom and easy panaceas for perfection—on the influence of fertilizers, special composts, and other soil treatments. Many of the theories and claims probably contain some truth; most of them are certainly exaggerated.

2. Through wider application of what is known now, soils can be made to produce much more nutritious food for both animals and people in two ways:

(1) Through selection of nutritious plants according to their adaptability to the local soil type.

(2) Through the wider use of lime, phosphate, and other soil amendments to widen the choice of crops to be grown. On millions of family farms in the humid parts of the United States the critical need for secure production and income and for improved nutrition is for increased lime and mineral fertilizers. Then good crop rotations with the deep-rooted legumes can be grown. Nutritious pastures may be had. Erosion can be controlled and the soil kept in good physical condition. Naturally, such soils are, on the whole, well adapted to trees and not to nutritious crop plants. They can be made so. But the need for minerals cannot be side-stepped.

Maternal and Infant Nutrition

By Dr. H. C. Stuart and Mrs. B. S. Burke

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EVIDENCE presented during the past five years from intensive research studies made in Canada, England, and the United States dealing with the nutrition of women during pregnancy indicates that relationships exist between the adequacy of the maternal diet and the incidence of complications of pregnancy, labor and delivery. These studies have aroused widespread interest in the possibilities of reducing the hazards of pregnancy and childbirth through nutrition services to women of child bearing age.

Furthermore, the relationships revealed by these studies between the diet of the mother and the condition of her infant at birth indicate that attention to the dietary habits of women previous to and during pregnancy should also result in a reduction in fetal and neonatal deaths and an improvement in the physical development of infants at birth.

Although our child health programs begin with the birth of the baby, the growth of the child begins with conception, not with birth. In fact, the prenatal period is one of the periods of most rapid growth and development. The evidence which is summarized in this paper seems to justify the conclusion that great gains to national health would result from improved maternal nutrition.

The following summary of recent research in this field is based primarily on studies conducted by the writers and their associates in the Department of Maternal and Child

Health of the Harvard School of Public Health and carried out at the Boston Lying-in Hospital in co-operation with the hospital staff and the Department of Obstetrics of the Harvard Medical School. In this study detailed nutrition histories were obtained at regular intervals during pregnancy and the diets were evaluated and used as a basis for the selection of different dietary groups for comparison with results to the mothers during the course of pregnancy, labor, delivery and the postpartum period and with the condition of their infants at birth. Ratings were given both for specific nutrients and for the general adequacy of the diet.

The following relationships of statistical significance were found:

(1) **A relationship exists between the diet during pregnancy and the course of pregnancy.** Sixty-eight per cent of the women having good or excellent diets suffered no complications while only 42 per cent of the women with poor diets had a normal course of pregnancy. The English and Canadian studies are in general agreement with this finding.

(2) **A highly significant relationship was found to exist between the mother's general dietary rating and the incidence of toxemia during pregnancy.** While toxemia did not occur among the women whose diets were good or excellent, it developed in 8 per cent of the women whose diets were fair and in 44 per cent of those whose diets were poor to very poor. The People's League of Health of England obtained a 30 per cent lower incidence of toxemia among a group of women given supplementary feedings than among a control group.

(3) **Although there was no difference in the average length of labors terminating first pregnancies between the best and the poorest diet groups, there were many more difficult types of delivery in the poor diet group.** This difference was found in spite of the fact that the infants in the poor maternal diet group averaged three pounds less at birth and were considerably shorter than those born to women on good or excellent diets. Ebbs and Tisdall found that women who took good diets or who were given supplemental foods when the diet was less adequate were better obstetrical risks and had shorter labors and fewer difficulties during delivery than did women in a group taking poor diets.

(4) **A highly significant relationship was found to exist between the diet of the mother during pregnancy and the condition of her infant at birth.** Every stillborn infant, all of the neonatal deaths except one, the majority of the infants

with marked congenital defects, all premature infants (i.e. weighing less than 5 pounds at birth) and all "functionally immature" infants (i.e. underdeveloped in some way other than length and weight alone) were born to mothers whose diets were very inadequate. In Balfour's study of almost 20,000 women in England, part of whom received supplements during pregnancy while part did not, the lower incidence of stillbirths and of deaths during the newborn period in the supplemented groups was significant beyond any reasonable doubt. Ebbs and Tisdall also reported a lessened incidence of stillborn and premature infants as well as a much lower incidence of illnesses and deaths up to six months of age in the group of infants whose mothers were on good or supplemented diets. In our own study, in which the majority of infants with congenital defects were found to have been born to mothers whose diets were very inadequate, the number of cases was too small to be certain that this was not due to chance, but similar findings by Warkany in studies on animals make it imperative that this relationship be investigated further. If there is any influence of the nutritional state of the mother upon the incidence of congenital defects in the infant, it undoubtedly occurs during the early weeks of pregnancy. To avoid such effects it would be necessary to improve the nutritional state of women previous to and during the early weeks of pregnancy.

(5) **A marked relationship was found between the protein content of the diet during pregnancy and the birth weight and birth length of the infant.** When less than 75 grams of protein was taken daily during the latter part of pregnancy, the infants tended to be short, light in weight, and to receive a low pediatric rating in other respects.

(6) **A marked relationship was found to exist between the development of the bones and teeth of the infants at birth and the general ratings of their mothers' diets.** This was especially true in respect to the amount of protein in these diets. When the women took diets rich in protein, 57 per cent of their infants were advanced and 14 per cent were retarded in bone development, whereas, when the maternal diet was very inadequate in protein, none of the infants were advanced and 71 per cent were retarded. When the ratings of bone and tooth development were compared with the amount of calcium in the prenatal diets, a striking but somewhat less marked relationship was found.

This evidence collectively supports the contention that a good diet during pregnancy reduces the likelihood of certain complications during pregnancy and contributes to a shorter and safer labor and delivery. It also suggests that many women are now taking diets which are not sufficiently "good" to afford this protection. This would seem to be ample reason for intensive efforts to improve the diets of pregnant women for their own sakes. With the added evidence that women taking excellent or good diets during pregnancy are much more likely to have infants who are well developed at birth and much less likely to have stillborn or prematurely born infants or infants who die during the early weeks after birth, the incentive for such efforts is doubly justified. Other studies have indicated that women on good diets are better able to nurse their infants and to provide a better quality of milk. Further research is required to clarify many points concerning the factors involved in these relationships.

Maternal Nutrition Objectives

Thus the objectives of any program for improved maternal nutrition should include the following:

(1) To improve the dietary habits of all women of childbearing age. This is essential if women are to enter pregnancy in good nutritional state.

(2) To provide to all women as early in pregnancy as possible effective and practical education concerning the importance of nutrition during pregnancy and the foods needed to meet their specific requirements. Other nutritional services should be available when necessary and every effort made to correct all existing inadequacies as early as possible.

(3) To provide continued nutrition education throughout the lactation period in order that the nursing mother will take the additional foods required.

(4) To provide corrective nutrition teaching when needed as a part of postpartum care.

Maternal Nutrition Program

These objectives for improved maternal nutrition call for the following changes in or additions to most educational and public health programs:

(1) **Health education should be offered to girls in high school and to young women in college and industry and should include not only normal nutrition but the special nutritional requirements imposed by pregnancy and lactation and their relationship to the well-being of infants as well as of mothers.** This instruction would be most effective if offered to young women contemplating marriage or recently married and should be arranged for such groups.

(2) **Special nutrition services should be instituted in connection with prenatal clin-**

ics or other organized maternal care services. In prenatal clinics the simplest and best means of educating the pregnant woman in the importance of nutrition both to herself and to her unborn infant and of offering practical advice on diet during pregnancy is to include one or more suitably trained nutritionists among the personnel required to staff all prenatal clinics. These nutritionists would co-operate with the clinic obstetricians to enable the pregnant woman to include the foods necessary to meet her requirements. The practical dietary advice and education offered by the nutritionist should be co-ordinated with the prenatal medical supervision so that the suggestions offered are adjusted to meet each woman's individual problems. Since it seems very probable that the results of nutritional difficulties or dietary defects early in pregnancy will depend in large measure upon the nutritional state of the woman when she enters pregnancy, a nutrition history as early in pregnancy as possible should be a part of routine prenatal care. If there is evidence that the woman is underweight or otherwise malnourished or that her tissue stores are depleted, special measures should be employed by the obstetrician to correct all deficiencies as quickly as possible in addition to the establishment of a well-balanced diet suited to her needs.

(3) **In private practice the obstetrician or general practitioner is responsible for the proper management of the dietary problems of the pregnant women under his care.** The physician can render this service as part of routine prenatal visits provided his medical education included sufficient theoretical and practical edution in nutrition. When special dietary problems arise which are time-consuming, the physician should be able to call upon the services of a suitably trained nutritionist on a consultation basis.

(4) **The nutritional advice offered as a part of routine prenatal care should include instruction in the dietary needs of the nursing mother.** Further instruction should be given by the obstetrician and others concerned with the care of the mother and infant during the postpartum period. This service should extend throughout the period of lactation and should be continued as a part of pediatric care.

(5) **Nutritional advice should also be available during the interpregnancy period in all cases where corrective nutrition is needed.** This should be a routine part of postpartum care. In gen-

eral, women who have experienced difficulties during their first pregnancies are keenly interested in preparing for more satisfactory subsequent pregnancies.

(6) **In order to make the services outlined above possible and effective, the amount of nutrition education both theoretical and practical should be increased for medical and nursing students.** There must also be more adequate training for nutritionists interested in this field. The more general educational part of this program necessitates additional nutrition training for school teachers and health educators.

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Developing New York State's Most Important Human Resource

By Dr. Edwin R. Van Kleeck

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THE STATE EDUCATION DEPARTMENT regards the school lunch program as a means to an end. That end is better nutrition. Better nutrition, in turn, we regard also as merely a means to an end. That end is better health.

Our reasoning is syllogistic: where children are fed better, their nutritional status improves. Where their nutritional status improves, their general health improves.

As Governor Dewey has reiterated in recent months in a variety of public pronouncements, the wealth of a state or of a nation, is, at base, determined not so much by natural resources as by developed human resources. Important — perhaps pre-eminent — among those human resources is health. Of major influence in determining health is the nutrition of the young. A "too little and too late" policy in promoting better health is a self-defeating, self-destroying policy. Nowhere is this better exemplified than in feeding, where

a child's 1,095 meals per year—three daily for 365 days—determine not merely the development of his skeletal structure and the degree of efficiency of his physical being but also, as psychosomatic studies are showing us, bear importantly on his ability to learn and indeed on his whole emotional outlook on life."

True it is that a noon lunch daily for 190 days of school per year totals less than one-fifth of these 1,095 meals. But it is the purpose of the school lunch not merely to help meet the daily nutrative requirements of growing children but also to teach parents in an indirect fashion to provide nutritious food. That this is being accomplished by hundreds of our school lunch programs is amply evidenced by our field reports, and by the testimony of school teachers, principals and school and public health nurses and physicians.

"We Are What We Eat"

We are told on the best of authority that if during his formative, plastic years a child's mental development can be sufficiently directed, the result in terms of his attitudes and thinking can be pretty well pre-determined. If this is true in the more abstract, less tangible areas of the mind, the character and the emotions, how much truer it is of a child's physical being. "We Are What We Eat" was the title of a book which was much read a few years ago. That there is more than a grain of truth in this aphorism, nutritional research has proved. General Hershey's testimony at the Congressional hearings on the present Federal school lunch subsidy abundantly reinforced this concept. Drawing on selective service data from all over the Nation, the General showed a direct connection between adequacy of income, of educational preparation and of health status on the one hand and fitness for military service on the other. There was nothing new in this, except that, just as in the first World War, the American people again had dramatized for them this relation between feeding and physical fitness.

Not only then is the school lunch an important part of the general nutrition program for children and youth and not only is it becoming a major force in improving the food selection and dietary habits and the food preparation techniques of countless thousands of mothers, but in many instances, especially among families of limited economic ability, the school lunch is often the only well-balanced meal that the child gets each day.

Though it is rather self-evident that money spent on school lunches is, if I may paraphrase what the Governor said about money spent on schools in general, more in the nature of an investment than of an expense. With this group, including as it does agricultural economists and nutrition authorities, I need not stress a secondary but nonetheless important consideration. This is that, as I attempted to set forth in more detail at the Joint Legislative Committee's hearing a year ago, New York is also vitally interested from a dollars-and-cents standpoint in farm prosperity.

Every consideration therefore—humanitarian, physical fitness, the goal of a happy, healthy and well-adjusted citizenry, as well as economic value—points to New York State's over-shadowing stake in the school lunch program. It is not a panacea. School lunches will not take care of the problems created by the atomic bomb. Noon feeding will not tell us what to do with or about Russia. But school lunches will return, multiplied manifold, in benefits to our boys and girls and to their families and to the economic prosperity of our State, every penny spent on them, whether the funds come from individuals, or the State or Federal Government.

What then is the present status of the school lunch in New York State and what needs to be done in order to help more children?

First, where are we? Well, we have made some progress in the past year. Specifically, so far as the federally-aided part of the program is concerned, we have increased by nearly 40 per cent the number of children who are getting either the half pint of milk or the "A" or "B" lunch. Omitting New York City, which is handled directly with the city schools by the U. S. Agriculture Department, 212,000 children in public schools in the rest of the State are today benefiting. The exact number, according to our most recent tabulation, is 211,564. Of the public school children in New York State outside New York City, nearly one-fourth are getting the benefit, for perhaps 160 of the 365 days of the year, of either half a pint of milk or a good lunch. I say a good lunch, for of the 211,564 children, only 16,789 are getting the less complete "B" lunch and 98,830 are getting the so-called complete or "A" lunch. It is the "A" lunch that brings the Federal reimbursement of nine cents. Ninety-five thousand nine hundred forty-five get the milk only. Two hundred twelve thousand children in the upstate federally-aided program is a "lot" of children. The figure sounds quite impressive until one thinks of the other 730,000. Of these, slightly less than half go home for lunch at noon, according to our spot-check last spring of 3,770 schools enrolling 576,333 pupils. Of the remaining number (approximately 400,000) who remain at school, a large proportion are in schools which operate noon lunch programs without the Federal reimbursement. How many of these are getting a complete lunch or a lunch which, when added to what they bring with them from home, amounts to a complete lunch, it is difficult to estimate.

We do know that, despite marked progress in parent education, many of the lunches brought from home are still inadequate. When added to an inadequate breakfast and to an inadequate evening meal, they supply a daily food intake which is insufficient. We also know that many of these lunches brought from home are supplemented by purchases of items that no nutritionist would regard as optimum choices.

Why, then, you may well ask, do not more of the schools take the Federal money for as long as Con-

gress sees fit to continue the $50,000,000 annual appropriation for the school lunch subsidy? The answer is two-fold and it will also cover my second question, namely what needs to be done to improve the school lunch for all schools.

First, the schools, especially those where in general the children most need the lunch, are so hard-pressed for funds that they are tending to reduce rather than to increase services and expenditures. This is true not merely of lunches but also of home economics, agriculture, industrial arts, music, fine arts, and physical education teachers, as well as of dental hygienists, school nurse service and other services.

The Federal appropriation, 'though huge in the aggregate, is not huge when divided among 48 states. Moreover, New York gets less than the proportionate share of one-tenth, or five million dollars, which on a population basis the State would receive. Indeed, if all the two million public school children of the State were to share on this basis in such a Federal program, New York's money would last only twenty-eight school days. But New York State gets from the Federal fifty million dollars only three and one-half million rather than five million dollars.

Our figures show that a bit less than half the children do not stay at school at noon. But you realize, of course, that in central rural schools, especially, and in the high school departments of many city schools, it is impractical for children to go home at noon for lunch. Even when distances and time permit, elementary children, both of whose parents are working, might better remain at school at noon. Thus they get not merely supervision but also a better balanced lunch. For the thousands of children who can not go home at noon, the schools have assumed an obligation to provide a good lunch.

Financial Difficulties

But many of our schools find it difficult to finance the cost of equipping their buildings for the lunch program and of operating the programs. Three years ago, with the help of this Joint Legislative Committee on Nutrition, the Legislature was persuaded to pass a law permitting school boards legally to pay from tax monies any cafeteria deficits. Very little use has been made of this authorization, partly because of the war but chiefly because of the reason mentioned above, namely, the financial problems of the schools. Nearly all their funds come either from State aid or from local real estate taxes. The schools where our lunch program has met with most success include 90 per cent of the 321 central schools, none of which received any additional State aid under the 1945 legislation. These and other rural schools also, in the main, have the smallest per capita local real estate tax base, and the really rural schools have the largest proportion of children who cannot go home at noon. Even the city, village, union free and one-teacher schools, most of which did get additional State aid under the 1945 law, have, in the main, found that their general expenses have increased substantially more than has their State aid. This is understandable when one considers the effect on prices

of the war, when one remembers the hundreds of New York State teachers in one-room schools who until three years ago were paid $760 a year or who received other pittances ranging up toward the minimum suggested for women workers by the State Labor and Social Welfare Departments.

The second need in extending the school lunch program to more of the 6,000 plus public school buildings in actual use in this State was for increased personnel. At the 1946 session of the Legislature, Senator Desmond's bill for the supervision of school lunches was passed. The sum of $35,000 allows for the addition of two supervisors making a total of six school lunch supervisors with the necessary expenses for stenographic help and travel of supervisors. The supervisors work with school boards, school administrators, teachers of one-room schools, P.T.A.'s and similar groups with lunch programs on the use of the Federal money in order thus to feed more children and to improve the menus. They attempt to get more schools to serve at least milk if they cannot manage the complete lunches. Even where children go home at noon, the mid-morning milk is needed. The supervisors make as many school visits as possible. Some of these schools are without home economic teachers, and, in the case of the three thousand operating one and two-teacher schools, they are often without dishes, equipment, stoves, electricity and help. The supervisors try to show these and other schools how to overcome these handicaps, how to purchase food wisely, how to plan menus and prepare food to retain maximum nutritional values, and how to serve it in such a way that values other than just those of food intake are gained. They try to aid teachers in making the lunch a real part of the whole school health program and an integral part of the pupils' educational experience. To this end, our school lunch supervisors prepare and issue menus and food preparation helps, not merely for the federally-aided programs but for all schools. They are glad also to send these materials to non-public schools. They aid with records and accounting. Last year and this year we have been trying to have more of the programs operating for the full year, and substantial progress has been made. A sizable number of schools have shifted from the supplementary type lunch to the complete lunch. More schools are serving the complete plate lunch at a given price for the entire meal.

During the summer, the supervisors meet groups of teachers at summer schools. Last fall, we conducted in every corner of the State, 30 school lunch conferences, both for promotional purposes and to give the types of technical help listed above. Thirteen hundred persons attended. We offered last year 15 one-day training schools attended by 700 cooks. There is a great need for much more training for cooks and this summer we are offering four one-week institutes for cooks. We have formed a State school lunch advisory council, in order to enlist further help from various interested agencies and organizations. We try to stimulate and utilize interest in the school

lunch on the part of the teachers' colleges, the university schools of education, and among the home economics groups and women's clubs of the State.

Especially in the more rural regions of the State—in the areas where are found the vast majority of our four thousand operating school districts—high school departments of agriculture and of home economics are in a position to develop gardening and canning and food-preservation projects. Thus they are able to produce and preserve large quantities of food that can be used to provide school lunches for the boys and girls who remain at school at noon. The entire community can participate in these projects. By planning a year in advance, by purchasing products that are locally abundant, which can often be done at reasonable prices, a substantial portion of many of the most-used foods can also be obtained. These projects we try to promote also. Last summer our supervisors visited over 60 food preservation projects and eight community canning centers. Not merely the paid workers, but also the teachers, pupils and volunteer adults need training.

We are especially anxious to help schools to spend wisely Federal or State or local funds as well as the money which the children are required to pay where able. Most parents in most communities want to sacrifice and pay for their children's lunches when they are able to do so. Such parents want no subsidy. But not all can afford this. Naturally, it is often the children from those families where the financial shoe pinches most tightly who most need the school lunch. Many of these parents likewise would prefer not to accept a subsidy from Government for milk and food for their children. This independence is to be applauded. But in instances where a parent with several children in school is unable to pay each day for each child the 12 to 15 cents, or the 18 to 21 cents charged in some cities, the schools arrange so that, without embarrassment, these boys and girls do not go hungry.

We live in a state with abundant agricultural resources. We live in a state which in normal times often produces food surpluses. In a state with such rich natural resources, there is no reason for not providing adequate and well-balanced lunches for children, regardless of the source or sources from which the cost may be forthcoming. The eight state-wide organizations on the New York State Conference Board of Farm Organizations—including, as you know, the Grange, the Dairymen's League and the GLF—have evidenced their keen grasp of this principle. They included in their 1946 legislative program an endorsement of an *adequate* school lunch plan. Remember! of the 3,770 schools that reported to us, 58 per cent had neither the lunch nor the milk program last year. And a hungry child is a poor learner.

In summary, I have attempted to set before you the problem we face in improving through better nutrition the physical status of our school children and, at the same time in aiding the farmers of the State. I have indicated that, in

order to develop an efficient and economical school lunch program, it is necessary that the State Education Department be enabled to furnish enough expert supervision to provide needed advisory services to the schools on food production and preservation, food purchase and preparation and serving, and on lunchroom management and nutrition. The challenge that I give to you in closing is to discover the ways and means by which the school lunch program can be extended, so that all children who need its benefits may receive them.

Feeding the Aged

By Dr. Edward L. Tuohy

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IT IS commonplace to compare men and machines. The human body is not only self-propelling but self-sustaining provided it has available the pabulum for growth and cellular renewal. There are presently many cars on the road that are super-obsolescent: they were never intended to survive so long. The war has compelled their prolonged use; some are still in fine serviceable condition; and it will be found that such had good and reasonable care and servicing when they were at their best. The lesson for the twenty-two million people over 65 (estimated for 1980) now living and establishing the foundation upon which to build old age fitness should be obvious.

Well adapted people living in peaceful and productive areas may have the widest choice of food, dependent upon their taste and activity. There is much in the current literature relating to food and nutrition. The Journal of the American Medical Association published the "Handbook of Nutrition"[1] in 1942 under the auspices of the Council on Food and Nutrition. I[2] wrote Chapter XIX, under the title "Feeding the Aged." Those interested in the growing subject of geriatrics will find in that article a recital of some of the foundation principles. Our medical job sums

Feeding the aged is a special problem.

up to the care and direction of an ever-increasing population percentage over 60 years.

Food Production and Population Curves

It is strange that up to the turn of the century any one not especially hungry was supposed to be well fed. In fact, many illnesses were supposed to be caused by certain foods; and often contaminents made them so. Books dealing with diets have been heavily weighted by the attempt to fit a choice of food to a disease rather than to maintain nutritional balance. Since age has always brought its afflictions, the older people have suffered most from ill-advised dietary regimen. Pioneers lived close to the soil. It was a soil rich in growth essentials. Some of our foods today

NOTE: This article is abridged with permission of the publishers, J. B. Lippincott Co., Phila., from a paper published in CLINICS in March, 1946.

are not so well endowed natively. Some such factors are still outside the consideration of the medical profession. Agronomists chafe at this and wonder why. In its broader aspects the availability of food determines the number of all living creatures, including man. The lugubrious prediction of Malthus that populations of the earth could increase geometrically, whereas food supplies follow simple arithmetical progression, may still be indefinitely postponed, provided enough of the forces being mobilized for peace arise through agreement among the powerful nations of the world.

It is so essential that vast amounts of food should be produced and safely processed that doctors more than any others should be more familiar with factors of feeding, so much a part of current animal husbandry. Jolliffe[3] and others are debunking the crass commercialization of vitamins; but doctors have no especial defense for prescribing vitamins about as nonchalantly as our forebears wrote for bitter tonics and whiskey. Certain humans, singly or in massed population groups, cannot subsist on vitamins, food adjuvants and selected minerals, however valuable all of these may be to temporarily complement a substandard diet. Many carry the idea that foods (tomatoes, eggs, pork or hay) wherever produced are standard products. They decidedly are not.

Inherent Food Content and Regional Deficiencies

We may well divide food deficiencies into those of certain geographical areas and those visited upon individuals afflicted, as we may say, endemically. With the hope of stimulating interest in worldwide problems of food and a follow-up of certain of my references, I submit five general headings:

1. Prentice's[4] book on the intriguing subject, "Hunger and History" (1939), presents some masterly research concerning how people lived in the Middle Ages and implied the struggles of Stone Age man in order to survive. Prentice records that in England, between 1201 and 1600, there was an average of seven famines per century; that the faulty farm machinery and forked tree-trunk plow had to be replaced by implements drawn by properly harnessed horses before the average person knew what it was not to be hungry. The same condition obtains in India today that then held in England and France. Certain groups in India are living on diets upon which "rats fed comparably would not survive twenty-four days." Indeed, it can be said, "People are funny"—and very tough. We may say that the much abused "industrial age" has been the chief mechanism for banishing universal hunger; yet, it is ever under the severest criticism, because whereas hunger is more or less universal, ambition and skill are decidedly "spotty."

2. Professor Albrecht,[5] of the University of Missouri, begins a remarkable article thus: "Our health depends on the soil. Bodies are really built from the ground up." He states that salubrious climates do not produce good soils;

glacial deposits, with adequate but not excessive rainfalls, in temperate climates do. Excess rainfall and sun may leach out the soil and bake out the industrious bacterial flora that nitrogenates and fosters the subtle chemical transfers exactly comparable to the physiological changes in living animal tissues. Accordingly, he points out, we have many people trying to live on marginal or submarginal land. Farms are good places for virile old people whatever their age; but a farm ruined by bad agriculture, lack of contour plowing on a natively poor soil, single cropping and lack of refertilization, yields us one of our greatest economic headaches in many parts of our own country. It likewise turns the sociologist's criticism toward medicine, with the assertion that poor health causes poor farming. Hence the cry to put more doctors and more hospitals out where the people may come and pick up their vitamins! The soil cannot give up what is not in it; and that's that.

3. Auchter,[6] from our United States Department of Agriculture, discourses nostalgically upon the ever-increasing trek of people from the farms to the industrial centers. He recognizes that "good soils and good husbandmen produce high grade food products." Wilson, writing on this same subject, states that "in twenty-five years we may see three-fourths of all American farm incomes taken from animals and fowls." This trend is tied up with the all-important factor of maintaining the soil fertility and combating erosion through the planting of grasses and legumes and such "to sow the soil into place." The threat of atomic bombing may indeed disperse industry; split it up into smaller units and bring them closer to good native soil. In this way Henry Ford's suggestion of two decades ago may bring the families of automobile workers back to part-time or subsistence farms. These would well offer profitable hours of work within the capacity of many too old or incapacitated for factory employment.

4. Our best farms are now small independent factories. Through the barnyard array of fowls and domestic animals most of our farm crops come to the consumer via the poultry route, the milk products firms, the canners and the packers. These domestic animals are food concentrators; by their by-products and their forage good soils are maintained and depleted soils restored. Furthermore, animal husbandry under skilful direction can make many submarginal areas habitable. When it comes to the matter of a "living wage," hours of work, not to mention ultimate pension systems, it is well to recall the cynical Oscar Wilde, who said, "Everyone knows the price but few the value of things."

5. New biochemical discoveries may change and greatly enhance the continuous and recurring productivity of the soil; soy bean, for example. This thriving and sturdy crop has astounding versatility and nutritional value. The public's appreciation of its high protein content may, with proper culinary research, make it a cheap, satisfactory replacement for animal source of protein. It has long been

a basic source of protein for people in the Orient.

Endemic Nutritional Problems Among the Aging

Let us now study nutritional disorders as we see them in our region in so-called "peace times." Age, by itself, is no excuse for dietary fussiness. If obesity is our "most common form of malnutrition," then doctors will generally agree that older people lose their fat grudgingly. It can be said that fat hoarding has been *too much and too early*. Some thin, spare people seem able to eat enormously and remain thin. Of women Dorothy Dix wrote, "They seem in age either to become hatracks or feather pillows"—unkind but descriptive! Much abnormal eating (and drinking) is a mental reaction and stems from psychogenic unrest. Food settles nerves; as the saying goes, "Hungry animals are quarrelsome." The present consensus is that alcohol in liver cirrhosis displaces or supplants balanced diets. If elderly people desire the stimulation of alcohol (and many do) they must be zealous to eat well and wisely at the same time. Those dying after acute alcoholic debauches show the liver enlarged and fatty. The study of diabetes in elderly patients is centering more and more upon the function of the liver rather than the efficiency of the pancreatic islets.

In the rehabilitation of the elderly no research in recent years has been of value comparable to the effort directed to promote protein balance and economy in the body. This is in contrast to former teaching: no matter what ailed the average patient the direction usually went forth, "Leave out all meat, especially red meat; take a little white meat of chicken."

The issues involved in bodily protein rehabilitation are daily becoming better established and proven; the techniques are not involved, and any practitioner of medicine can profit by their use. Those in good or reasonable health need to know how to keep fit; those pitted against the debilitations of disease (diabetes, cancer, hyperthyroidism, chronic diarrheas); people in recovery after infections (all types) or debilitated by senility; psychoneurotic faddism in diets or subjective maladjustment as seen in anorexia nervosa and cardiospasm; chronic fistulous losses or extensive skin ulcerations, including meleney ulcer and chronic ulcerative colitis, all stand more chance of rehabilitation by high protein feeding than any other route available, not excluding the current fervor and furor over the miracle groups—sulfo and mold extracts.

This broadside statement calls for support. I propose to offer both personal experience and digests from current medical reports. The remainder of this discussion will cover a review of some of the enlightening source materials.

(1) **Starvation in the Netherlands:** A recent survey[7] summarizes what the inundations of war and pillage, with their resultant "bodily and spiritual exhaustion," have imposed upon the Netherlands. The average individual got about 1100 calories a day, although

it was agreed that the younger children would always be deferred to by others, *and most of all by those in advanced age.* Dizziness, and a tendency to collapse on standing from weakness, with chilliness and numbness, were often noted. Edema occurred in 20 per cent, and yet there was an associated dry, desiccated skin. Objective findings were present sufficient to justify the diagnosis of certain avitaminoses, including scurvy, beriberi, pellagra, purpura, cheilosis, follicular hyperkeratosis, etc. There was the commonly recognized overlapping of deficiencies, all based less upon any isolated vitamin or mineral deficiency than upon lack of adequate food, properly balanced.

Anemia of an average of 11 grams of hemoglobin and osteoporosis were more or less universal. Nevertheless, only 5 per cent of the population was in a very bad state, *mostly in the industrial centers.* (Those living near the soil always fare the best everywhere.) Relief agencies realizing the great lack of needful protein, sent relatively large amounts of "enzymic protein hydrolysates" to Holland. Such parenteral feeding did not prove very satisfactory where long continued deficiencies had been accumulating. The lower concentrates (5 per cent protein hydrolysates) seemed to produce less benefit than did stronger solutions accompanied by 10 per cent glucose; with many the giving of this protein parenterally seemed to depress the appetite. Some patients lost their edema but *did not gain weight.* The best results followed 300 grams natural protein on a *3200 calory daily diet,* and when fat was gradually added a sense of satisfaction and weight increase followed. The anemias were not helped by vitamins, iron, hydrochloric acid or liver injections. Not until the basic diet prevailed did the blood slowly improve. Specific vitamins, plus nicotinic acid for sore tongue, and vitamin D for bone dystrophies, did give prompt symptomatic results.

In our essentially well-fed and fertile Middle West we see such debilitation, chiefly in advanced cancer and tuberculosis, or in the wastage of diabetes or ulcerative colitis. On the other hand, we have many psychoneurotics — followers of faddish diets, or a few psychotics with active resistance to feeding. Our profession needs more neuropsychiatrists, or those trained in the field of nursing, to direct these otherwise good and useful people into more normal channels of living. The very timely Hershey report is at hand for those interested.*

(2) **The Fatty Liver:** Substances known to aid in liver defatting are designated as "lipotropic." The transfer of fat is expedited by availability of phosfo-lipids, chiefly lecithin. From the dietary point of view surfeiting of the liver with

* Medicine and the Neuroses; Report of the Hershey Conference on Psychiatric Rehabilitation. Reprints may be secured by writing to the National Committee for Mental Hygiene, Inc., 1790 Broadway 19, N. Y. C. This committee was made up chiefly of internists and neuropsychiatrists. An earnest plea is made for a comingling of the medical training for both specialties.

fat follows starvation much more often than from excess ingestion of fat. This is not as paradoxical as it sounds; in starvation the fat comes from the body's depots of fat. This reconversion of stored fats involves very complicated physiological processes. They have been well profiled in a brochure by Peters under the title, "A New Frame for Metabolism." In the course of starvation it is obvious that fatty stores are used as sources of energy. The release of this energy is done at the accumulating expense of the liver in all its intricate metabolic functions. When feeding starts the liver demands first of all its own readjustment before it proceeds with its other normal functions all so essential to life. The situation is somewhat comparable to civil readjustment after the economic wastage of reserves in war.

(3) **Practical Application:** Owen Wangensteen, professor of surgery at the University of Minnesota, has given us a very resourceful application of these principles, particularly in the pre- and postoperative care and follow-up of surgical patients. He has designated his purpose as "defatting the liver" in starved patients. His associates, Varco and Kalouch,[8] have formulated diets embodying daily intakes that are as high as 300 grams of protein. A very great technical and caloric adjuvant in accomplishing this high intake of protein is through what we in Minnesota have come to call "Varco Gastric Feeding No. 2."

The current consensus is that while carbohydrates (including the much used intravenous glucose drip) safeguard the normal liver by sparing protein, when tissue protein, including the liver itself, is auto-cannibalized, there is no restoration without getting into the individual the right assemblage of the 10 essential amino-acids out of the known 23. Herein lies the very great advantage of the casein of milk with its rich content of choline and methionine (strongly lipotropic substances).

Varco and Kolouch further offered this useful guide as to the length of time patients required for rehabilitation, dependent upon their degree of weight loss:

FORMULA FOR VARCO GASTRIC FEEDING No. 2

Carbohydrates	408.8
Protein	114
Calories	2422

	CHO	P	F
Whole egg — 6	.....	36.0	36.0
Eggwhites — 2	.....	8.0	....
Skimmed milk Powder — 4 oz	58.8	40.4	1.2
†Lactose — 300 gms	300	.....	....
Skim milk — 1000 gms	50.0	30.0	....
	408.8	114.4	37.2

5 g. salt

† Dextrose has usually been substituted. The milk powder may be used freely in other mixtures or independently as a regular food supplement.

5 to 10%.....5 to 7 days
20% .....10 to 12 days
25%–30% .....3 weeks
35 %.....1 month

(4) **Teeth and the Aging Process:** We age by organs rather than symmetrically. Tooth caries and pyorrhea illustrate this: the former in early life, the latter chiefly after the fourth decade. What is the relationship to basic nutrition and the protein factor which I am stressing? With the mouth, "the barometer of health," it is certain that the teeth are its most prominent fixture. The consensus of dental opinion has not followed the contention of Price[9] that primitive peoples, wherever he studied them, had sound teeth until they got access to the over-refined sugars and starches of civilization. Some believe strongly that trace elements, and especially fluorine, can become specifics, and be added for tooth protection, as iodine is used in water supplies as an anti-goitrogenic agent. After much reading I find myself more convinced by the anthropologists than by the current dental researchers. Explorer-scientist and well-informed nutritionist Stefansson[10] presents first-hand observations that are very impressive. He does not scoff at the advice, "See your dentist twice a year," but he implies that primitive peoples, subsisting upon high protein and low carbohydrate intakes, do not need to. Anthropologist Hooten, of Harvard, wrote, "Tooth pastes and brushes protect the teeth about as effectively as shoe polish and brushing protect the shoes." Stefansson adds, "Pending further study, however, I had better be a little cautious here and say that, while we do know that diets, the calories of which are 98 per cent or more from animal fats and animal proteins, will guarantee you against caries, we do not know for sure that a 75 per cent meat diet, with 25 per cent of carbohydrates, is much better for the teeth than one that is 50 per cent meat and 50 per cent carbohydrates." There isn't enough animal protein in America sufficient to allow even 10 to 20 per cent of protein in our daily diets.

The intimation that many great people have lived and accomplished greatly as near vegetarians is no contrarywise argument at all. The Geographic Magazine (November, 1945) relates that when Chinese laborers were pressed into using American power drills to blast out the Stillwell Road they were unequal to the task. Resourceful foremen fed them for a few weeks on the same kind of fare given our college squads training for football, and the road crossed the hump. The advertising slogan, "You cannot eat like a bird and work like a horse," graphs this idea.

I have given considerable space to show the relationship of this development to the production of food. The United States and Canada have demonstrated in this war this unsurpassed ability. There is considerable progress in learning how to use this food, not to mention to perfect ways and means to accomplish an equitable distribution of jobs, incomes and effort, in an industrial economy where the utmost in expansion finds expression in taxes. We are within the cylonic swirl of attempts at legislative regimentation, at the same time that we pledge ourselves to the worship of

the various freedoms. Lacking the enthusiasm of youth and the optimism of middle age, our elderly population is jittery. Any security stemming from the plans and provisions of politicians and venturesome economists shares the uncertainty inherent in the minds of the heirs of a wealthy relative who spends much time watching the board in his brokerage office.

A Few Direct Dietary Suggestions for the Elderly

1. Few are unaware presently of the efficiency lift which an adequate balanced nutritional state provides. It is obvious that this is as needful in age as at any period of life.

2. Food sufficient and in type only for energy release induces gradual starvation. Many elderly people enter that state. Carbohydrate is the ready source for immediate use, and its protein conservation faculty must be made full use of. But the "tea and toast diet for grandma" is a buildup for her ultimate demise as, for example, following a hip fracture from a casual slip on the bedroom rug.

3. I have stressed the prominence presently given to protein in health. Purposely the expensive features of its production and distribution are outlined; and the agronomic, economic, industrial and political problems confronting our country are posed to show the manifold trends that separate our people from the soil and breed artificiality.

4. When we can demonstrate what forced protein feeding can do, as for example, in those starved by gastrointestinal cancer, in preparation for surgery, with greatly reduced mortality, then it should need no detailed argument to show that ample degrees of protein intake promote salubrious maintenance.

5. No stimulant for the aged is comparable to zestful food. Few will care to deny them other less worthy stimulants, including condiments, coffee and alcohol, in moderation. Tobacco depresses appetite and should not be encouraged before the 60th year of life! For years I have advised the great advantage of a good breakfast. A total lack of appetite in the morning is often a bad habit, especially among nervous women. For alcohol addicts and heavy smokers the loss of breakfast hunger is a signal to reform. Paradoxically, a good breakfast, with lean meat, promotes and helps weight reduction: the slow release of the carbohydrate fraction of the protein offsets the mid-forenoon tendency to hypoglycemia and the frequent intake of "cokes" or their equivalent.

6. All habits of eating, good or bad, are acquired early in life. An ideal economy would make every elderly person totally independent. Sad to relate, we are far from it. Our "short stay" hospitals, not to mention the "long stay" infirmaries and insane hospitals, carry a 15 to 20 per cent census of old folks for whom no one in the home is able or willing to assume the care. Chronic cardiovascular disease and inoperable cancer make up most of this category. So-called "retirement" in age is not the Utopia that popular repute acclaims. Courage and ability to *do some useful service* in age is the real purposeful goal. To accomplish this the elderly doctor may well practice upon the old formula, "Physician heal thyself."

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Nutritional Problems In Group Food Service

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THE SCIENCE of nutrition has developed with amazing rapidity during the last half century. We have learned something of the essential nutrients, much of their chemical composition and of the physiological processes in which they are involved. All knowledge in this vast field is important but for most of this period we have known enough about the nutritional needs of people and ways of meeting them to have changed the lives of millions and perhaps to have altered the history of the world. For many reasons such as ignorance, indifference, economic maladjustment and shortsighted selfishness we have failed to make wide use of this knowledge—with results which are obvious. During these years, however, we have learned that we must use many methods of approach and a variety of techniques if we are to apply effectively our knowledge of nutrition.

Among the best of these are the various opportunities presented by group food services. The changing pattern of our society has made it necessary for a large percentage of our population to eat in groups every day or at many times during their lives. A million and a half patients and staffs totaling an additional million eat in hospitals every day, exclusive of the large veteran services now developing. Seven million children eat a school lunch. More than sixty-two million meals are served daily in the 525,000 public eating places which constitute one of the Nation's largest industries. Other millions eat in industrial restaurants, in children's institutions, homes for the aged, college and school cafeterias and dormitories. Through this vast network of organizations feeding groups of people it is possible to make a marked contribution to the improvement of the nutritional level of our population.

In some of these services the guest has little or no choice as to the food he selects. This is the case in most hospitals, institutions for children, and the aged, some school lunch rooms and many school and college dormitories. These services offer the greatest opportunity to provide an adequate diet, planned to meet the nutritional requirements of the guests. If the meals are so palatable and attractive that they are fully consumed, they serve their nutritional purpose and at the same time educate the guest in food selection. Unfortunately, many of these services do not have supervision or management by persons with good training in nutrition and with knowledge of food preparation which will translate the written menu into a good meal

inside the guest. Food is frequently deplorably poor and this important means of improving the nutrition of many millions is not utilized. Probably not more than one-fourth of the hospitals and a much smaller proportion of the other institutions employ trained dietitians. It is all the more important, therefore, that those in charge of food service obtain all possible assistance from simple texts, from government publications, and from state departments having advisory dietitians or food service supervisors.

School Lunches

There is also great need to extend the service of highly nutritious meals especially in schools. We can make a significant contribution to national health by insuring every child a good noon meal through the eight to twelve years he spends at school. Yet only seven of twenty-four million school children have any lunch service at school. In several thousand schools in almost every state, children depend entirely on lunches brought from home. The distressing results of studies of the nutritional status of school children, both urban and rural, indicate that we have just begun to apply our knowledge of nutrition to the most important group in our population. Entirely apart from the economic advantages attaching to the wide extension of the school lunch program, this expansion is demanded for the health of children and their improved scholastic progress when well nourished.

The delivery of food to a school kitchen, even a well-equipped one, does not insure a good lunch. Such meals must be skillfully planned, attractively served. Here, as in other institutions, we need trained supervision and skilled workers if we are to make the best use of this unique opportunity. The setting of the pattern of a Type A lunch, as a basis for Federal subsidy, as a minimum standard, is an impetus toward serving a full meal. The system which permits of unguided choice is still to be observed in some schools. In these, poor selection is the rule.

The feeding of industrial workers offers an opportunity for improved nutrition of large groups of people. But here, as in schools, this is accomplished only if well-planned and palatable meals are offered and selected. Observation of the type of lunch chosen by many workers is discouraging indeed. Pastries, soft drinks, sandwiches with small amounts of filling—these may serve as between meal snacks but they could never be considered a substitute for a real meal required by normal active men and women.

Experience in school feeding and recently in industrial feeding has demonstrated beyond question that the offering of good food does not alone insure good food selection. It is essential that an educational program go along with the service of food. Many schools have recognized this and are now integrating the school lunch with the rest of the educational program. Many industries have conducted extensive educational programs among the employees and their families. Hospitals have for many years maintained a teaching program for

patients in the hospital and in clinics, for medical students and for nurses and dietitians.

Restaurants

Some type of educational device is also used in many public eating places in which the food selected by the customer is largely his own choice. If his food habits are good his selection will be better than that of persons having no knowledge or interest in obtaining maximum nutritive value for the money they spend. Realizing this, the National Restaurant Association, through many of its members, has made an effort to educate its patrons in a wise choice of food and to arouse their interest in it. The good restaurant operator also provides with his menus the means with which the customer can automatically secure a good meal as far as combinations are concerned. Choices offered are between items of comparable nutritive value. He uses the device of price adjustment to "push" the fruits and vegetables which are highly desirable and which might not otherwise be the most popular thing on the menu. He increases the consumption of vegetables by giving a choice of these with whatever entree is selected, and the customer is likely to take something he is paying for anyway. To a certain extent these and similar practices are successful in insuring a nutritious meal, but the average restaurant operator will confirm the difficulty of getting his guests to try vegetables outside the range of the three or four with which they are familiar, to use as many salads and raw vegetables as are desirable and to purchase milk as well as hot beverages if they desire the latter.

Operators of commercial eating places are becoming aware of the particular contribution of their industry to improved nutrition. They realize that health and well-being of the millions of people who eat in restaurants every day is affected by the food served them. Nor is this responsibility likely to decrease. During the war years millions of people, at home and in the armed forces, have come to appreciate the need for an adequate diet. Having learned the importance of proper and nutritious food for good health and vigor, they will not readily return to the poor food habits which formerly characterized too large a percentage of our population.

Thousands have also for the first time come to enjoy the pleasant experience of "eating out" and, incomes permitting, they will in all likelihood continue this custom. All signs point to great increases in travel in the coming years and increased food service will probably be required by the traveling public. These increases will come through greater development of restaurant operations on highways and through increased provisions for feeding airline, railroad and bus line passengers. To an increasing extent, therefore, the food service industry will play a vital role in improving the nutrition of a high percent of our people.

Problems in Group Feeding

There are many problems in group food service from the standpoint of providing optimum nutrition for guests. These begin with

the fundamental problems of marketing and distribution of foods. Days usually elapse between the harvesting of the crop and its final consumption. Optimum handling and storage conditions must be established if the vitamin content is to be retained, if quality is to be kept at the maximum, and if waste, due to spoilage, is to be kept at the minimum. Frozen foods, many of which are now of inferior quality to begin with, are subjected to partial thawing on long hauls in unrefrigerated trucks and there may be no proper storage for such foods after delivery. These foods thus lose much of the fine flavor and probably some of the vitamin content. Facilities for handling and storage of other perishables is woefully inadequate in many food services. Fruits and vegetables stand in hot kitchens for hours before being cooked or served.

Another problem is the selection and layout of equipment suited to the operation. It is impossible to prepare and serve good food without the right type of equipment and enough of it. It is always necessary to plan the menu with the equipment in mind and if equipment and space are limited, it is better to do a few things well than to attempt too much. Much of the food on dining cars, for example, and in many restaurants is entirely unsatisfactory because too much variety is attempted in limited space. Foods are therefore cooked far in advance and held too long. Contrast the serving of one simple meal on airplanes. In most instances this meal is entirely acceptable and far superior to a more elaborate type of service attempted without adequate equipment.

Another problem presents itself in the need for interested and trained personnel. A whole new attitude must be developed among employees doing food preparation and service, if foods are to maintain the maximum nutritional value and best flavor and appearance. For example, the custom of cooking vegetables in quantity, of holding them in a *bain marie* for some time before serving, and for discarding all waters in which they are cooked, are all procedures which result in nutritive losses. Similarly, the holding of food on the hot table or in an electrically heated cart for some time, and the reheating of left overs, are common practices which lower nutritive values.

Such procedures also lower the consumption by the guests. They account for the relatively poor consumption of vegetables in the average institution and public eating place since this type of handling detracts from the palatability and good appearance of many foods. With children and with adults, eye appeal is the most important method of increasing food consumption of desirable items. Fortunately, the foodstuffs which are important from the standpoint of good nutrition are attractive to look at and delicious to taste if properly handled and prepared. Standards which have been dropped during the war or which were never raised, must now be set at a new high of careful preparation and prompt service if food consumption of essential nutrients is to be adequate.

To summarize, the great majority of Americans eat in groups in a wide variety of places such

as schools, hospitals, the places they work, in travel, and for pleasure and amusement. The foods they eat play an important part in establishing and maintaining good nutrition. By the eating of good food they may learn to like it and thus to select it. Along with this they should be taught through many media of education to know the foods which they need for development and maintenance of optimum health. In addition, all persons responsible for group food services should provide satisfactory equipment for storage, handling and preparation and service. They should also provide trained supervisors and service personnel to the end that all food served shall be prepared to conserve maximum nutritional value, palatability and appearance.

Homemakers' Nutritional Problems

By Dr. Sarah Gibson Blanding
President, Vassar College
Former Dean, New York State College of Home Economics

ALMOST inevitably when the term "homemaker" is used, it conjures up a picture of a nice little woman, a mother tending her brood, taking care of her husband; devoting the major portion of her time to her home.

Now, actually the term "homemaker", covers a variety of situations. Webster's Unabridged Dictionary gives this as a definition: "One who makes a home as distinguished from one who keeps the house." There is nothing in this definition to preclude a man being a homemaker. But ordinarily, we think of a homemaker as a woman.

She may be married or she may be unmarried. If she is unmarried, in all probability she has a full-time job and she may live in a house or she may live in an apartment or a room. She may live with other people or by herself.

If the homemaker is married, she may be devoting a part of her time to her home; she may have a part-time job or she may have a full-time job, or she may devote all of the time to her home. I am going to give you an example of one homemaker who could serve as a kind of example for many homemakers.

Homemakers' Headaches

Mr. and Mrs. Van Atta live in New York City on Riverside Drive, in a five-room apartment. There are two small Van Attas, both boys; one 9 and one 11. Mr. Van Atta has what is known as a white collar job. Mrs. Van Atta does not work. She has been brought up to believe that being a good wife and mother, and keeping home, is the most important responsibility that a woman can have. Her husband's salary never quite reaches over all of the expenditures that have to be made. She is an intelligent woman; she understands good nutrition; she understands good nutrition is an important element in keeping her family well and happy.

She has taken advantage of the recent years—the interest in nutrition that has developed over the recent years. She took a course in nutrition developed by the Red Cross; she went to a series of war-time demonstrations put on by the New York State Emergency Food Commission. In both of those places she learned basic facts of nutrition; she learned the importance of milk and eggs in the diet; she learned the importance of fresh fruits and vegetables.

Now the war is over; shopping, thinks Mrs. Van Atta, is going to be a lot easier, it is going to take less time. Every morning after she gets Mr. Van Atta off and she gets the children off to school, she takes her market basket and goes around to Amsterdam Avenue, to do her shopping.

She is a good planner and she goes with her lists already made out. Heavens, things are high! In order to stretch her food dollar, she had to make some purchases she

had not planned on making. For instance, she had to buy a vegetable that Mr. Van Atta does not like very well, but it was cheaper than the one that she had planned to have, and the one that he would like.

She planned on having a tossed salad. But that morning the lettuce looked like it had been rolled in oil, and there was not any endive, and the spinach was coarse and old, and the tomatoes were simply out of the question.

She thinks she will settle for a nice bunch of celery, but, gosh, the celery looks like it was a wet dish rag. She bought some potatoes. She bought a yellow vegetable; she bought a head of lettuce, bad as it was, and then she went to buy her staples. Now, Mrs. Van Atta knew that the larger the quantity she bought, the lower cost per unit, and she would have liked to have saved some pennies that way; but she knew her storage space, or rather, she knew her lack of storage space and so she was forced to buy in small quantities.

Mrs. Van Atta left the store with a good deal less lift or less spirit than when she went in. Her purchases had cost her more than she had planned, and the quality of the vegetables was not quite as good as she might have wished.

When she got home she dropped down in a chair to listen to the radio just for a few minutes before she started to get the house cleaned up. It was between programs, and a man's voice was on the radio extolling the virtues of a certain vitamin that was purported to be a combination of all the vitamins. Her nutrition teacher had told her that vitamins or vitamin pills were expensive, and it was a lot better to get her vitamins through natural foods, through the foods she ate.

But she remembered those vegetables, and she remembered the state that they were in, and she wondered if she ought not to stretch a point and buy a bottle of vitamin pills, and give them to her family.

In the middle of the afternoon the children bounced in and said, "Mommie, what about something to eat"? Well, she gave them a glass of milk and some crackers. While she gave them a glass of milk and some crackers, she quizzed them on what they had for lunch that day in school. Well, they were a little indefinite about it. She had gathered that they had some soup, some crackers and a glass of milk, and a dessert! But what kind of soup and what kind of dessert she could not get any information about.

She often wondered whether the children got a third of their daily minimum requirements at the school luncheon.

She made up her mind that she ought to go up and visit the school. Mr. Van Atta arrived home a little after six. He was tired after a hard day's work and the subway crush. He took off his shoes and settled down in his bedroom slippers, dropped into a chair, and started reading the evening paper. The children were noisy and inclined to be a little cross. Mrs. Van Atta decided that she ought to be particularly gay at dinner that night, to take off the edge from her husband's fatigue and the children's tiredness.

By 6:30 dinner was ready. It was a good dinner, nutritionally sound, and attractively arranged and well prepared. True, the meat was not a thick juicy steak, but nutritionally was just as good as a steak. There were baked potatoes and yellow squash with a little onion added to take off some of the bland. Mrs. Van Atta had opened a can of pineapple and had a nice pineapple salad with a little cottage cheese on it. For dessert there was a baked custard and some soya cookies. There was a glass of milk for each of the children, and coffee for the grown-ups. But the dinner bogged down on the quash.

"My God," said Mr. Van Atta, "Can't we have anything but squash, squash, squash?" At this remark, the children joined in and asked why in the world does mother always feed them the squash.

That night when Mrs. Van Atta got into bed, she thought about the next day. It was all to do over again, and was it worth it? Well, Mr. Van Atta was a nice man and there were no finer children on earth, and so it was worth it.

Six Problems

Now, here were the problems that Mrs. Van Atta faced. The first one was the ever-present problem of having enough food available at a reasonable price for an adequate diet. In this country, there has never been any question, even in the darkest days of the war, of having enough food provided the homemaker knows her nutrition. There is also the problem of reasonable price.

That presents a problem for our marketing and distribution facilities in this country.

The second problem was the degree of freshness of the vegetables. That, too, is a problem for marketing and distribution. It is also a problem for research, because, as two of our speakers have suggested this afternoon, we have done a great deal of research in order to get greater yields. We have only in the last few years begun to do research on the nutritional qualities of fruits and vegetables and other food products.

Nutritional qualities plus shipping qualities. The third problem was the problem of storage. No homemaker to whom I have ever talked has ever had enough storage, and that probably is because the architects never talked to the home economists. Luckily, I think they are beginning to talk more frequently to the home economists, and I hope in the years to come, that houses and apartments will be constructed with adequate storage.

The fourth problem was the problem of advertising. It is not just the vitamin pills but the new foods. How is your homemaker to know what actually is in those new foods from the nutrition standpoint?

The fifth problem, a tremendous problem, is the problem of the dislikes of families, likewise the likes. Frequently the dislikes are more imagined than they are real. It is a psychological problem of trying to convert or tempt the husband to eat the foods that he swears he does not like.

The sixth problem is the problem of what is eaten by members of the family who are not at home for their luncheon. Probably Mrs. Van Atta was an exceptional home-

maker. There are many thousands of homemakers who are not as well educated, as far as nutrition is concerned, as Mrs. Van Atta.

It poses the point, that we must continue our educational program; such programs as the New York State Joint Legislative Committee on Nutrition is carrying on; such programs as the New York State Emergency Food Commission; the State Nutrition Committee; the New York City Nutrition Committee; all of the agencies that have had nutrition as one of their major interests in the last few years.

The job of homemaker is a profession. I bespeak your interest in her and your continued help and guidance of her.

*Fortification of Foods**

By Dr. George R. Cowgill

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DISCOVERIES in the science of nutrition over the past three decades have made it possible to state more exactly than ever before the many specific factors that are essential for satisfactory nutrition.

A brief classification of them would include food energy, the protein factor, essential fatty acids, indispensable mineral nutrients and the vitamins. An attempt to list individually all the substances required gives a total of approximately 40, the exact number depending on whether the claims for the existence of certain factors are to be accepted or not.

In view of this new knowledge it is obvious that foods can now be evaluated in a manner much more precise and specific than was ever possible before. These recent discoveries have also included the isolation and finally synthesis on a commercial scale of several of the vitamins thus making it possible to add these factors to foods. Such possibilities have naturally received the attention of both the food industry and students of nutrition and public health. On the industrial side it has been necessary to solve many technoligical problems. Nutritionists, clinicians and governmental agencies faced with these possibilities have naturally interested themselves in the formulation of principles to be followed in such addition of special factors to foods, amounts to be added and related topics.

Need to Improve Staples

The application of these new discoveries can of course result in the production of new foods that would doubtless be classified for some time at least as novelties or specialties because of their relatively high cost and only slight use by the mass of the population. In contrast to this, and much more important for public health and preventive medicine, is the application that means definite improvement in the quality of cheap staple foods that occupy prominent places in the dietary. To the extent that these staples, already endowed with a high consumer appeal and acceptance, can be nutritionally improved, the chances of incidence of diseases that represent dietary shortcomings can be reduced and the cause of public health thus advanced. This article deals with the latter possibility.

The Grains

Discussions of the foods that figure prominently in various dietaries throughout the world, therefore staple foods,[1] usually deal with them in terms of their contri-

*NOTE: This paper is presented with the kind permission of the American Medical Association which originally published it in "Handbook of Nutrition," Ch. XVI.

[1] Bennett, M. K.: Wheat in National Diets, Wheat Studies of the Food Research Institute, Stanford University 18:37–76 (Oct.) 1941.

bution to the energy needs of the population. The cheapest source of food energy in the diets used throughout the world is the cereal grains. In the United States the two cheapest sources of calories are cereal products and cane sugar. In southern China and certain other parts of the Orient rice is the most economical and readily available food and therefore the most widely used cereal. From the standpoint of world-wide use rice comes first; this cereal is eaten by more people than any other member of the cereal grain group. The dominant cereal used as human food in the United States is wheat.

The greater keeping qualities of milled cereals in contrast to the whole grain, together with the exigencies of modern civilized life such as ease of transportation over long distances, has resulted in some degree of milling of the grain becoming the established custom, a practice which, from the standpoint of nutritive value of the material, means loss in corresponding degree. It is not surprising, therefore, that the addition of essential vitamins and minerals to milled cereal products, wheat flour for example, should have received serious attention as one of the new possibilities for application of modern nutritional knowledge in the interest of preventive medicine.[2]

TABLE 1.—CURRENT STANDARDS FOR ENRICHMENT AND FORTIFICATION OF FOODS

Enriched White Flour[3] (Required):

Thiamine	From 2.0 to 2.5 mg. per pound
Riboflavin	From 1.2 to 1.5 mg. per pound
Nicotinic acid (niacin) or its amide	From 16 to 20 mg. per pound
Iron	From 13 to 16.5 mg. per pound

Enriched White Flour (Optional):

Vitamin D	From 250 to 1,000 U. S. P. units per pound
Calcium	From 500 to 625 mg. per pound
Wheat germ	Not more than 5 per cent

Oleomargarine Fortified with Vitamin A (Federal Register 6:2761 [June 7] 1941):
Not less than 9,000 U. S. P. units of vitamin A per pound

Milk Fortified with Vitamin D:
Council on Foods and Nutrition of A. M. A. approves milk containing from 135 to 400 U. S. P. units per fluid quart or reconstituted quart

Iodized Table Salt:
Council on Foods and Nutrition of A. M. A. accepts salt containing 0.01 per cent of potassium iodide or equivalent of sodium iodide, provided distribution of the iodide in the salt is uniform and this concentration is present after storage under ordinary conditions. Food and Nutrition Board of National Research Council also has approved of this standard

[2] Cowgill, G. R.: The Need for the Addition of Vitamin B^1 to Staple American Foods, J.A.M.A. 113:2146–2151 (Dec. 9) 1939.

[3] Definitions and Standards of Identity for Flour and Related Products, Federal Register 6:2574–2582 (May 27) 1941. Wheat Flour and Related Products: Amendments to Definitions and Standards of Identity, Federal Register 8:9115–9116 (July 3) 1943.

Interest in this possibility of improving the nutritive value of wheat flour finally resulted in the establishment by the Food and Drug Administration of the Federal Government of standards for enriched flour.[3] The standards established in 1941 were modified in July, 1943. The data given in table 1 are based on the 1943 amendments to the original order. Current standards for enrichment or fortification of other foods are also given in this table.

Enforcement of the regulation with respect to enrichment of flour with riboflavin was delayed until October 1, 1943, because of shortage of this vitamin owing to lack of satisfactory methods for production of it on a sufficiently large industrial scale.

Discussion of this "enrichment" or fortification problem has brought out many suggestions of principles and facts to be considered when making additions of vitamins and minerals to foods.[4] It is pertinent to inquire whether a a lack of the dietary essential in question in the ordinary diet of the people is sufficiently widespread to justify the proposed addition of it to appropriate foods. If no real need for such addition can be shown, one may well question the wisdom of it as a socially planned and directed move; its chief justification then becomes a commercial one dependent for its success almost entirely on advertising and other promotional activities of units of the food industry.

If there are reasonable grounds for believing that a serious deficiency of the dietary factor of interest does exist, the question arises as to the most suitable food to be "enriched" or fortified with it. There may be rather general agreement as to the class of food to be enriched, but it does not necessarily follow that all products in this class should be so treated.

As an example of this situation consider macaroni, which is made largely of wheat flour. Macaroni is always boiled when being prepared for the table, and tests have shown that such handling results in loss of a considerable part of added vitamin B_1. Therefore, even if the pure vitamin can be obtained at practically negligible cost, so that relatively large amounts more than sufficient to offset such loss can be added, one may well question the practicality of its addition to macaroni.

As another example one may consider the fortification of lard with vitamin A. Since this animal fat is widely used in cooking and such use results in appreciable loss of the vitamin, a conservative attitude toward the question of the addition of vitamin A to lard is justified.

In the light of these two illustrations it is obvious that a body of facts regarding the need for various dietary essentials and the probable supply in common foods is required, as well as information of the technological sort concerning

[4] The Fortification of Foods with Vitamins and Minerals. A Symposium held at the American Institute of Nutrition, Toronto, Ontario, April 26, 1939. Published in the Milbank Memorial Fund Quarterly 17:221–262 (July) 1939. American Institute of Nutrition, Symposium on Fortified Food, April 1, 1942. Published in Federation Proceedings 1:324–351 (Sept.) 1942.

the feasibility of the proposed addition to any given food product before approval should be given any specific proposal of enrichment or fortification.

Students of nutrition have long agreed with Sherman that there is a real likelihood of a significant deficiency of calcium, and therefore there is justification for promoting wider use of calcium rich foods like milk, milk products and green leafy vegetables. There are also reasons for believing that the American diet is not as rich in thiamine as it should be.[4] The testimony offered in the hearings held by the Food and Drug Administration which resulted in the Federal standards for enriched flour supported the view that the average American dietary does not furnish amounts of some essential vitamins and minerals sufficient to insure the public health. On the basis of the evidence they have summarized concerning the existence of malnutrition in our population, Jolliffe, McLester and Sherman[5] believe that such malnutrition is sufficiently widespread to justify taking measures to obviate it.

Vitamins and Minerals

In 1939 the Council on Foods and Nutrition of the American Medical Association considered this general question of the addition of vitamins and minerals to foods and adopted the following statement as an expression of its policy:[6]

"The Council on Foods desires to encourage the restorative addition of vitamins or minerals or other dietary essentials, in such amounts as will raise the content of vitamin or mineral or other dietary essential of general purpose foods to recognized high natural levels; with the provision that such additions are to be limited to vitamins or minerals or other dietary essentials, *for which a wider distribution is considered by the Council to be in the interest of the public health.*"

The words that I have italicized are particularly pertinent here, because they state an important limitation which not only the Council has adopted, when expressing its approval of such additions, but the Committee on Food and Nutrition (now Food and Nutrition Board) of the National Research Council as well.

In its approach to this problem the Council on Foods and Nutrition of the American Medical Association deemed it advisable to express the limitations of additions of various factors to general purpose foods in terms of milligrams per hundred calories and established such limitations with respect to calcium, iron, thiamine, riboflavin and niacin. The values are presented in table 2.

The Committee on Food and Nutrition of the National Research Council expressed its views on this question in the following resolution:

"WHEREAS, There exist deficiencies of vitamins and minerals in the diets of significant segments

[5] Jolliffe, Norman; McLester, J. S., and Sherman, H. C.: The Prevalence of Malnutrition, J.A.M.A. 118:944–950 (March 21) 1942.

[6] Annual Meeting of the Council on Foods, J.A.M.A. 113:680 (Aug. 19) 1939.

of the population of the United States which cannot promptly be corrected by public education in the proper choices of foods, be it resolved in order to correct and prevent such deficiencies:

"1. That the Committee endorses the addition of specific nutrients to staple foods (as indicated under 6 below) which are effective vehicles for correcting the above deficiencies in the diets of the general population, or of significant advantage of geographic, economic or racial segments thereof;

"2. That the Committee opposes the inclusion of additions of specific nutrients under definitions and standards which may be promulgated under the Food, Drug and Cosmetic Act, except in the case of foods which constitute such effective vehicles of distribution;

"3. That the Committee favors unequivocally the fulfilment of the nutritional needs of the people by the use of natural foods as far as practicable and to that end encourages education in the proper choice of foods and the betterment of processes of food manufacturing and preparation so as to more fully retain the essential nutrients needed thereto;

"4. That, to avoid undue artificiality of food, the Committee favors, whenever practicable, the choice, as vehicles for the corrective distribution of vitamins and minerals, of those foods which have suffered losses in refining processes and recommends that the vitamins and minerals added to such foods should preferably be the kinds and quantities native therein in the unrefined state;

"5. That the addition of other than natural levels of vitamins and minerals to foods which are suitable as vehicles of distribution may be sanctioned when more natural routes are practically unavailable as ways to correct known nutritional deficiencies;

"6. That, at present, the Committee favors appropriate enrichment of flour and bread (and perhaps corn meal), the fortification of milk with vitamin D, the suitable addition of vitamin A to table fats and of iodine to salt for dietary use. There is no information available to the Committee at the present time which indicates that it is desirable for the Committee to recommend the addition of vitamins or minerals to foods other than those named;

"7. That, specifically, the Committee opposes the addition of synthetic vitamins to carbonated beverages and confectionery."

From the statement quoted it is evident that the idea of adding vitamins and minerals, or other dietary essentials, to foods has been accepted sufficiently to secure official sanction in the following cases: the appropriate enrichment of flour and bread (and perhaps other cereal products) with several factors, the fortification of milk with vitamin D, of table fats with vitamin A, and of table salt with iodine. To what extent other additions will finally acquire widespread acceptance and then official approval, only time and the accumulation of new data can determine.

When it has been agreed that certain dietary essentials may well be added to particular foods or classes

of foods, the question arises as to how much should be added. The discussion of this problem has been most interesting to follow. It has been argued that a worthwhile principle to apply is that of restoration of the milled or processed food by appropriate addition of dietary factors to give a product approximating the natural food of the unenriched food, sufficient vitamins and minerals to make a substantial contribution to the nutritional welfare of persons eating the enriched food in customary amounts. In order to promote honesty and fair dealing by fulfilling this implied promise, it is necessary that the kinds and quantities of enriching ingredients be determined

TABLE 2.—IMPORTANT FOOD VALUES OF NATURAL GRAINS AND UPPER LIMITS OF "RESTORATION" FOR GENERAL PURPOSE CEREAL FOODS

(Council on Foods and Nutrition, American Medical Association)

Product	Ca, Mg. per 100 Calories	Fe, Mg. per 100 Calories	Thiamine, Mg. per 100 Calories	Riboflavin, Mg. per 100 Calories	Niacin, Mg. per 100 Calories
"Restored" cereal	75	1.5	0.25	0.10	
Cornmeal	7.2	0.9	0.065	0.05	0.4
Oatmeal	26	1.2	0.24	0.05	0.4
Whole wheat flour	14.8	1.4	0.13	0.07	1.8

source, whole wheat flour for example as contrasted with highly milled white flour. This has been called the principle of restoration. Paragraph 4 of the statement of the National Research Council Committee is based on this idea of "restoration" of the milled product to something comparable to the natural one.

The following statement of the policy of the Federal Government with respect to the addition of nutritive ingredients to foods,[6a] published July 3, 1943, is of interest in this connection:

"The labeling or advertising of a food as enriched with vitamins and minerals is an implied promise to consumers that it contains, in addition to the normal constituents in the light of deficiencies of the various nutritional factors in the diets of the population in general and of significant population groups, the place occupied by the food in such diets, and the suitability and effectiveness of the food as a carrier of the enriching ingredients without undue separation or loss before consumption.

"Honesty and fair dealing will best be promoted if such enriched foods as are made available to consumers serve to correct such deficiencies and furnish a reasonable margin of safety. Enrichment above the levels required to accomplish this end is wasteful and contrary to the interest of most consumers; nutrient factors in concentrated form are available for

[6a] Federal Security Agency, Food and Drug Administration. Statement of Policy with respect to the addition of nutritive ingredients to foods, Federal Register 8:9170 (July 3) 1943.

use in those special cases of deficiencies in the diets of persons who do not constitute significant population groups. Enrichment of foods with nutrients that are supplied in adequate quantities by the diets of all significant population groups is not only wasteful but tends to confuse consumers as to their nutritional needs.

"Knowledge of the roles in human nutrition of various components of food, particularly the vitamins, is incomplete. There is reason to believe that as new information is developed food factors not now recognized as essential may be shown to be necessary to adequate nutrition.

"Most natural foods contain a wide variety of needed factors in significant amounts. It is highly probable that a diet of unenriched foods so chosen as to contain the required quantities of the presently known needed vitamins and other factors would more nearly supply all needed factors, known and unknown, than a diet which is raised by enrichment to adequacy in the vitamins and minerals now known to be needed.

"Even though adequate nutrition could be better assured through the choice of natural foods than through reliance on enrichment, unenriched foods of the kinds and in the quantities necessary for adequate nutrition are not now available to substantial parts of the population and are not likely to be available soon; nor are most consumers sufficiently educated on nutritional questions to enable them to make an intelligent choice of combinations of unenriched foods on the basis of nutritional values.

"Because of the lack of adequate production of a number of foods high in certain nutrients and the lack of consumer knowledge of nutrition, appropriate enrichment of a few foods widely consumed by the population in general or by significant population groups will contribute substantially to the nutritional welfare of consumers and to meeting their expectations of benefit. Enrichment of those foods which are not a substantial part of the dietary of any significant group tends to confuse and mislead consumers through giving rise to conflicting claims of nutritional values and by creating an exaggerated impression of the benefits to be derived from the consumption of such foods.

"If the customary process of manufacturing a staple food refines it so as to remove significant quantities of nutritive factors present in the natural product from which the food is made, and if the refined food is a suitable and efficient carrier of the factors so removed, some nutritionists advocate the restoration of such factors to the levels of the natural product as the most desirable basis of enrichment. To the extent that restoration serves to correct deficiencies of such factors, it is consistent with the promotion of honesty and fair dealing that refined foods be enriched on a restoration basis. However, when the evidence shows that the restoration levels are too low to correct deficiencies, or that deficiencies exist in other factors for which the refined food is an efficient carrier, the promotion of honesty and fair dealing may require the inclusion of corrective quantities of nutritive

factors in the enriched food even though such factors are present in smaller quantities or wholly lacking in the natural product from which the food is made. Similar considerations may require the enrichment of unrefined foods."

When a single dietary factor is being considered, this principle has much to commend it. For example, the processing of a fruit juice may result in appreciable loss of vitamin C, and products of this sort are normally very valuable as sources of this factor. **The addition of ascorbic acid in amount sufficient to "restore" this particular processed juice to approximately the highest concentration characteristic of the natural juice would seem justifiable.** The principle of restoration proves to be unsatisfactory, however, when the addition of more than one factor is being considered. In the case of ordinary wheat flour, for example, the addition of vitamin B_1 in amount sufficient to make the flour approximately equal to whole wheat with highest natural concentration means a significant addition of the restorative sort; a restorative addition of riboflavin (vitamin B_2) to the flour, however, means very little because the cereal grains are not good natural sources of this factor. If, therefore, riboflavin is nevertheless to be added to the flour in significant amounts, the addition means "fortification," because the enriched product will contain even more riboflavin than is found in the natural whole grain. It will be noticed in the statement of governmental policy quoted above, that this point is discussed.

When several dietary factors are being added to a given staple food, some in accordance with the principle of restoration, others in accordance with fortification, one is not limiting oneself to making the staple processed food as nearly as possible like the natural source but frankly modifying it to make an entirely new product to meet a particular nutritive situation. Enriched flour is the prime example of this. In such a case it is evident that the proposed addition of several factors is best made in some relation to the human requirement for them, taking into account the other sources of supply available in the dietary and other pertinent considerations. It may be questioned whether there are very many staple foods that lend themselves as suitable vehicles for the wider distribution and intake of several dietary factors instead of only one or perhaps two. In view of this there may still be a place for operation of the principle of restoration in the improvement of numerous processed foods.

Other Methods of Improving Foods

The foregoing discussion has dealt with the ideas that have been advanced for improving staple foods by what might be called the artificial addition of dietary factors lost as a part of food processing. There are other ways of achieving the same objective that should be mentioned. One may select plant varieties on the basis of genetic constitution and vitamin content. It is known that varieties of wheat and other cereals differ considerably in their respective contents of thiamine. Data bearing on this

topic have been summarized by Taylor[7] and are shown in table 3. In addition to illustrating the variation in thiamine content characteristic of cereal grains the data in table 3 emphasize a point frequently forgotten by those who argue that enrichment of flour is unnecessary, that the use of whole grain flour is the answer to the basic problem being attacked. There is no such thing as a standard whole wheat flour with respect to "high natural level" of thiamine content. The adoption and wide use of a standardized enriched flour in contrast to a nondescript unstandardized whole wheat product has therefore some definite points in its favor.

Some staple foods of plant origin can be nutritively improved by the adoption of special methods of cultivation. At the present time we do not know all that we should like to know about the effects of various environmental factors on the vitamin and mineral content of important plants that we use as food. The subject is being actively investigated.[8] Exposure to sunlight, supply of special materials in the soil, water supply and similar factors require investigation. A food like the potato, which remains in the soil until harvested, is known to reflect in its iodine content the iodine concentration of the soil and water.[9] In an iodine survey of various sections of the state of South Carolina the iodine content of potatoes grown in the respective

TABLE 3.—THIAMINE CONTENT OF CEREAL GRAINS AND TYPES OF WHEAT

Milligrams per Pound*

Kind of Grain	Thiamine	Type of Wheat	Thiamine
Oats	2.20–4.90	Durum	2.10–3.80
Wheat	1.45–3.80	Hard spring	1.45–3.49
Barley	2.58–3.33	Hard winter	1.68–2.71
Corn	1.85–3.04	Pacific	1.76–2.44
Rye	1.88–2.28	Soft red	1.79–2.38

* Original data from Taylor,[7] who comments as follows: "These include analyses of pure varieties and nondescripts (more than random samples), commercial grades and ungraded, from good and poor crops, stored for short and longer periods, with different methods of assay. The significance spreads cannot be as wide as those given."

[7] Taylor, A. E.: Why Enrichment of Flour? Wheat Studies of the Food Research Institute, Stanford University 18:77–108 (Nov.) 1941. See particularly page 92.

[8] Hamner, K. C.; Lyon, C. B.; Ellis, G. H., and Beeson, K. C.: Factors Influencing the Nutritive Value of the Tomato, Proc. Am. Inst. Nutrition, 9th Annual Meeting, Federation Proceedings, Part II, No. 1, March 16, 1942, p. 189. Rose, Mary S., and Phipard, Esther H. F.: Vitamin B and G Values of Peas and Lima Beans Under Various Conditions, J. Nutrition 14:55–67 (July) 1937. Bonner, J., and Greene, J.: Vitamin B^1 and the Growth of Green Plants, Bot. Gaz. 100:226–237, 1938. Lilly, V. G., and Leonian, L. H.: Vitamin B^1 in Soil, Science 89:292 (March 31) 1939. Burkholder, P. R., and McVeigh, Ilda: Studies on Thiamine in Green Plants with the Phycomyces Assay Method, Am. J. Bot. 27:853–861, 1940; Pyridoxine as a Growth Factor for Graphium, Science 95:127–128 (Jan. 30) 1942.

[9] Hayne, James A.: Endemic Goiter and Its Relation to Iodine Content of Food, Am. J. Pub. Health 19:1111–1118 (Oct.) 1929.

areas proved to be as good a criterion of iodine supply as analyses of water and soil. In dealing with a shortage of dietary iodine, obviously, then, one has several possibilities, namely (*a*) wider use of sea food, which is an excellent natural source of this element, (*b*) wide use of a root vegetable like the potato cultivated in an iodine enriched soil or water or (*c*) the fortification with iodine of a product such as table salt. The first two of these possibilities are impracticable for an inland area for obvious reasons yet valuable procedures in coastal regions; the inland area situation is more easily met by the use of iodized table salt.

Milk and Butter

Nutritive improvement of foods of animal origin like milk and its derivatives can be achieved in accordance with much the same principles. Milk is such a valuable food that nutritive improvement of it has not had very extensive consideration. Most of the discussion of this topic has centered around the use of fortified milk as a means of increasing the supply of vitamin D to growing children and thus improving the utilization of its calcium. Vitamin D milk may be obtained by direct addition to the milk of the vitamin, or a concentrate of it, with such products differing merely in the material added; such a milk is obviously a "fortified" one. Vitamin D may also be added to the milk through the metabolism of the cow by feeding a product like irradiated yeast, which contains the vitamin, or even the vitamin itself. This amounts to affecting the environment in which the milk is produced.

The addition of vitamin A to milk or its fat derivative butter has received some attention. The vitamin A content of butter is known to vary with the season, being low in winter and high in summer.[10] The development of a butter more uniform in vitamin A content is a worthy objective of the butter industry that has apparently had less attention than it deserves; such a product would be the logical one with which to meet the competition offered by vitaminized oleomargarine. Vitamin A concentrates could of course be added to winter butter. In view of recent experiments by Deuel and his associates,[11] there is presented the possibility of significantly enriching cow's milk with vitamin A by feeding certain extremely concentrated preparations of the vitamin. Improved feeding of cows during the winter season constitutes another approach to solution of this question.

From this brief discussion it should be evident that by improving the quality of cheap staple foods it is possible to affect the public health in many important ways. The success which attends this method will obviously depend on several factors. One is the extent to which the consumer is made aware of the values of the improved product when it is in the

[10] Dornbush, A. C.; Peterson, W. H., and Olson, F. R.: The Carotene and Vitamin A Content of Market Milks, J.A.M.A. 114:1748 (May 4) 1940.

[11] Deuel, H. J., Jr.; Halliday, Nellie; Hallman, Lois F.; Johnston, Cornelia, and Miller, A. J.: The Production of High Vitamin A Milk by Diet, J. Nutrition 22:303 (Sept.) 1941.

market competing with the older unimproved but accepted food. The solution of this problem lies in consumer education, and in this work the physician can do much because of his influential position in the community. If the improved product can be given a favored status of some sort, its use will of course be increased. South Carolina and Louisiana have passed laws requiring all white flour sold in their respective domains to be of the enriched variety; and considerable attention is being given in many quarters to the enrichment of corn meal particularly with niacin as a means of combatting pellagra. Louisiana has also passed a law requiring that all oleomargarine offered for sale contain vitamin A. It is possible that still other states will follow the lead of South Carolina and Louisiana in these respects. This way of achieving greater consumption of a desired product has certain shortcomings as well as advantages. In the case of enriched flour used in these Southern states the advantages are believed greatly to outweigh the disadvantages, because in enriching its flour the milling industry has tended to enrich only the more expensive brands; it is especially important that the enriched flour be used extensively by the lower income groups of the population who have the least money to pay for the improved product. It is to the credit of the milling industry that it has sought to bring about by voluntary means the enrichment of all its staple flour by every unit of the industry.

The enactment of laws to solve problems always poses of course some additional problems of effective enforcement and the like; whether a law will be readily accepted, no matter how desirable it may be from a strictly scientific point of view, depends on a sufficient number of the people being properly informed and convinced of its value. Thus we are brought around once more to the fact that the fundamental solution of our basic problem lies in effective education of the general public with respect to the principles of nutrition, food values and related topics. Given the proper education in these matters, the general public will naturally prefer more and more the improved staple foods over those that are not improved; the extent to which this occurs will very largely determine the role that this particular application of modern knowledge in nutrition plays in promoting the public health.

Food Processing and Nutrition

By Edward F. Kohman
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THE UNITED STATES is the only major country whose ability to produce a food supply has always outstripped its growth in population. In recent years food production has been accelerated with increased impetus.

In May 1941 the Committee on Food and Nutrition, National Research Council, issued recommended daily allowances for specific nutrients, the nutrients of which we are most likely to receive inadequate amounts in case of an unequal distribution of foods or an unbalanced diet. Those recommended amounts were arrived at by estimating the average requirement, based on available data at the time. This average requirement was then increased by 50 per cent to take care of individuals who are not average, individuals who might have higher requirements. By the same token there should, of course, be those whose requirements are less than average.

Our food production has reached a level that fully provides this 50 per cent safety margin of specific nutrients. But this is not enough to assure that every individual at all times may have access to this abundance of food. There must be equality of distribution and for distribution foods must be processed to spread them over time and space; a process for each food in accord with its peculiar requirement; a process that eliminates time and space as far as foods are involved by making perishable seasonal products available everywhere at all times.

In developing processing methods the United States has been even more outstanding than in its production of foods. It is not only appropriate but necessary to consider each processing method in the light of modern nutritional information, in the development of which the United States has played a greater part also than any other country.

Processing Wheat

Our major food crop is of course wheat. Since the processing of wheat was fully developed before there was any appreciation of the science of nutrition, it is not surprising that some of its fundamental principles were violated. Two factors largely governed the developments of processing wheat suitable for distribution—its stability against spoilage and the taste demands of the consumer. Neither factor ever can be ignored in any processing method. But since a third, equally important factor, or perhaps the most important factor that should be considered, was wholly unknown, there is little wonder that it was violated.

We now know that we remove from the wheat berry, in processing it for distribution, the larger portion of its calcium and iron, most of the B vitamins and reduce

the nutritional quality of its proteins. Those who advocate abolishing the so-called refining aspects of processing wheat, whereby it is converted into a form easy to distribute without spoilage loss, fail to take into account that while wheat may be stored for years, as soon as that wheat is in the form of wheat flour, deterioration in the flavor becomes a matter of weeks, not months or years. What is needed, if all the nutrients are to be retained, is a small machine to convert wheat into whole wheat flour by him who, and in the place where, it is to be used. This does not satisfy the taste demands of many individuals however, and for them a continuation of the wartime instituted plan of enrichment, that is, returning certain nutrients that are removed in milling, must be continued.

In the meantime it is not outside the realm of possibility to correct our milling operations to retain a larger portion of the discarded important nutrients and still satisfy tastes. Canada and England acted on this principle during the war rather than adopting our plan of enrichment. Our present 80 per cent extraction may be an influence in that direction. This as well as a means to produce whole wheat flour on a small scale when and where needed are matters that call for serious and concerted research.

Processing Rice

Outside of the United States the major food crop is rice, the main sustenance of vast multitudes of people. The same fundamental factors have operated in the development of processing methods as in the case of wheat. The advent of the milling of rice in the Orient resulted in hundreds of millions of people dying because of the removal of certain vital nutrients.

But recent developments to improve the stability of rice for better distribution have incidentally greatly reduced the removal of valuable nutrients. Since rice serves people in more tropical climes than wheat, insect infestation has been a predominant factor in the development of methods to prepare it for distribution. To minimize insect activity a unique procedure has been developed. While the rice is still in its paddy, it is steeped in water and heated under pressure. The B vitamins of rice are even nearer the outer surface of the berry than in the wheat berry and milling—polishing as it is termed—has an even more drastic effect in removing them. But in this steeping process, as the berry absorbs water, the B vitamins, being water soluble, are carried by the water to the inner portions of the berry. After this steeping and cooking process the rice is thoroughly dehydrated and the B vitamins that have been absorbed are retained. Its texture however has now taken on an entirely new characteristic. The berry is translucent in appearance and most important, its texture is hard and horn-like, so hard that insects have difficulty to feed upon it even though it is more nutritious. This hardness has a second favorable consequence—the berries are able to withstand the milling or polishing operation much better

without becoming crushed and broken. Milling losses are thus reduced. There is still a third improvement in the rice berry. In subsequent cooking for table use the berry retains a much desired uniform oval shape and has far less tendency to break up and mat together. Rice so treated is known as converted rice.

The nutritional value of this development in the processing of rice is indicated in the following tables which should be evidence to convince one and all that it is by no means a futile idea to discover ways for milling wheat to satisfy the taste of all and also retain much of its nutritive value now discarded.

EFFECT OF CONVERSION IN RETAINING VITAMINS IN RICE

(micrograms per gram)

				Percent Retention	
	Non-Milled	Converted Milled	Unconverted Milled	Converted Milled	Unconverted Milled
Thiamine	3.70	2.57	0.59	69.3	15.9
Riboflavin	0.51	0.36	0.25	71.9	49.7
Niacin	53.8	39.9	18.1	75.1	33.6

EFFECT OF MILLING FIVE UNCONVERTED VARIETIES OF RICE

RICE	Supreme Blue Rose		Early Prolific		Fortuna		Lady Wright		Improved Blue Rose	
	Thiamine	Riboflavin	Thiamine	Riboflavin	Thiamine	Riboflavin	Thiamine	Riboflavin	Thiamine	Riboflavin
Whole Brown	2.58	0.47	3.51	0.57	3.05	0.66	3.00	0.57	3.00	0.48
1st Break Huller	0.88	0.22	0.92	0.38	0.84	0.26	1.04	0.28	0.95	0.28
2nd Break Huller	0.87	0.25	0.96	0.34	0.77	0.24	0.73	0.33	0.95	0.28
Pearling Cone	0.83	0.29	0.94	0.39	....	....	....	....	0.70	0.34
Brush	0.80	0.19	0.79	0.38	0.54	0.24	0.45	0.28	0.66	0.12

EFFECT OF MILLING WHEAT ON B-VITAMIN REMOVAL

	Thiamine	Riboflavin	Niacin
Wheat	4.52	1.24	56.5
Feed Middlings	20.8	3.02	95.0
Shorts	15.15	2.48	140.0
Bran	6.98	2.38	232.0
Germ	21.3	4.53	68.0
1st Patent Flour	0.81	0.67	10.3
1st Baker's Flour	1.21	0.54	17.6
2nd Baker's Flour	2.44	0.76	25.3
Low Grade Flour	8.15	1.05	41.5

The higher vitamin content of the low grade flour is the basis for Canada and Britain having made 85% extraction (as against 70 to 75% extraction formerly) compulsory, in place of the enrichment program in the United States.

Processing Milk

Of equal importance to wheat as a food in the United States is milk. While there is now a cry for wheat to prevent starvation in war-stricken countries, milk, as no other food, has raised the nutritional level of our population and there should be no backsliding from this achievement. In spite of the shortage of labor there has actually been an increase in milk production during the war estimated to be over 20 per cent. Enough milk is produced to give every man, woman and child a full quart per day. Unfortunately, only about half of this is used as liquid milk. The very satisfactory distribution of this liquid milk—most sensitive of all foods to spoilage—is made possible by a processing procedure that embodies fundamental principles far from being fully appreciated and with far-reaching possibilities for the future. Reference is to the simple pasteurizing process, whose very simplicity probably tends to lower appreciation of its full virtue. The primary purpose of pasteurization is of course to kill pathogenic, disease causing bacteria. At the same time, it kills some non-pathogenic bacteria that spoil milk, sour it. But it by no means kills all such bacteria. It however has an effect on those it does not kill, but this effect would be of little value if it were not promptly followed by refrigeration, even though the refrigeration is only temperate. Neither the temperate heat nor the temperate refrigeration to which milk is subjected in modern distribution, each by itself alone, would have significant effect in preventing spoilage. The two processes, intelligently applied to supplement each other, have little short of a miraculous effect. The explanation is that the bacteria, being plants in character, are severely shocked by the temperate heating, and the temperate refrigeration provides an effective obstacle to their recovery from this shock. The use of extremes of heat and of cold will be discussed below. Attention is merely called here to the possibility of appropriate combinations of moderate degrees of heat and of cold in processing foods in the future.

Milk Products

Only half of the milk produced is consumed as liquid milk. The other half is processed to furnish butter, ice cream and cheese. While these are both excellent foods of the highest nutritional order, they leave behind them an enormous quantity of food of equally high nutritional order in the form of skim milk, buttermilk and whey, of which about 90 per cent is discarded as human food and diverted to animal feeding. It is true it thus produces food of animal origin for us in the form of eggs, poultry and other meat. But this human food of animal origin is of no higher nutritional order than the milk products consumed by the animals and the conversion is very inefficient, to say the least.

It is calculated that this part of the milk that is diverted from human consumption would supply the following percentages of the required nutrients listed below.

Protein	**20%**
Calcium	**60%**

Phosphorus	26%
Iron	6%
Ascorbic Acid	10%
Thiamine	7%
Nicotinic Acid	3%
Riboflavin	26%

The high amount of important nutrients indicated above are a challenge to Food Processing of the future. A way must be found to convert skim milk, buttermilk and whey into tasty products that will result in their being consumed by humans. "Tasty" is used advisedly since the mere fact that they are nutritionally desirable will not persuade people to consume them.

Solving that job will entail another, however. Diverting skim milk, buttermilk and whey from calf and chicken feed will leave a void in feeding these animals. To correct this, feed technologists will have to find ways of making other sources of proteins, such as soybean press cake, corn and wheat germ, as suitable for animal feed as non-fat milk solids, the protein of which is the most valuable component for animal feeding.

A tribute is due Food Processing in its achievement with margarine. Nutritionists no longer question the nutritional equality of butter and margarine to which vitamin A has been added equal to that in butter. To achieve this by using oil of plant origin direct without the inefficient passage through the cow to form butter is no mean achievement. The implications that this involves, the reasons for continued legislation adverse to margarine, and the effect on the dairy industry, are outside the borders of this discussion.

Vegetables and Fruit

Not less far-reaching in importance than the achievements enumerated above to elevate the nutritional level in our people is the prodigious increase in vegetable and fruit production in the last few decades. Within the memory of man tomatoes were still regarded as poisonous by some and when children ate them inadvertently, medication to counteract their toxin was in order. In 1918, however, a leading pediatrician and recognized authority on scurvy recommended tomato juice for infants three months of age. Today tomato juice represents the largest volume of a variety of ever-available fruit juices.

The loss of B-vitamins in the milling of wheat seriously lowers their amount in our diets. In the face of this the vitamin contribution of vegetables and fruits is of importance since the increase in their consumption has been accomplished by a decrease in wheat consumption in this country. Perhaps it would be more accurate to state that their increased availability lowered the demand for wheat. The average thiamine and riboflavin content of a large number of vegetables has been estimated at respectively 2.8 and 2.4 milligrams per 1000 calories whereas the amount of these added to flour is only 1.25 and 0.8 milligrams per 1000 calories. Or put in another way, the recommended daily allowances prescribe for a moderately active man only 0.6 milligrams of thiamine per 1000 calories of food and 0.9 of riboflavin. Since the calories in our foods is the controlling factor in determining

the amount we eat, it is most logical to make these estimates on a calorie basis.

This increased consumption of vegetables and fruits has been made possible largely as a result of the development of food processing methods without which the availability of such perishable products would be limited to short seasons and to restricted areas. Three general types of processing methods may be cited: Canning, shipping as fresh produce, and freezing. A discussion of the relative efficiency of each of these in conserving various vitamins and other nutrients would far surpass the scope of this treatise. Each has its advantages as well as its disadvantages but each has proven itself as eminently valuable in the distribution of seasonal, perishable, succulent vegetables and fruits. One form of product will please some, another form will please others. One procedure may conserve this vitamin more efficiently, while another procedure may be more effective for that vitamin. Each of the three types of methods for stabilizing perishable products has proven itself eminently effective.

In conclusion, while vast improvements are still possible toward supplying a fully adequate diet to every individual in this land of abundance, there is little reason even today that anyone should be malnourished.

Food Technology In Improving Nutrition

By Dr. Roy C. Newton
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INDUSTRIAL nutritionists and food technologists fully realize their obligations and responsibilities for helping to provide maximum nutrition to the consuming public. The food industry's efforts have been properly directed in studies designed to retain highest nutritive values in processed foods and to assure eye and taste appeal in these products.

In carrying forward this program, most of the major food industries have established well-staffed nutrition laboratories, have been generous in support of fundamental research in nutrition in the colleges and universities, and have helped to organize and finance the Nutrition Foundation. The food industry also supports educational advertising on the nutritive value of foods and on the basic principles and advantages of better nutritional practices.

The basic program of the nutrition laboratories of the food industry is founded on three primary aims:

1. **An accumulation of data regarding the nutritive content of food products.**
2. **A study of the various processing conditions that these foods may be subjected to and determinations of the changes in nutritive value resulting from each of these processes.**
3. **From this information to devise processing procedures which will conserve a maximum of the nutrients as well as to provide products of superior appearance and palatability.**

For many years nutrition workers have been making studies of the proximate compositions of foods, largely in terms of protein, fat, carbohydrate, moisture and ash. The more recent programs have extended these studies to include vitamins, minerals and the biological values of proteins and fats.

Owing to the development of rapid quantitative methods for the estimation of the vitamins much of the work of the last decade has centered about these important nutrients. A few examples will serve to illustrate the trend of the findings in the great mass of data which is still being accumulated.

Variations of Nutrient Content of Raw Foods

In the field of nutrition it has become apparent that the amounts of nutrients may vary greatly with individual animals or plants of the same species, even under similar growing conditions. Changes in environmental conditions, of course, will produce even greater differences. It has been determined that the thiamine content of pork loins may range from 9.5 to 23.1

micrograms per gram depending upon the diet.[1] Variation between species may be illustrated by the fact that beef loins rarely ever contain more than 2 micrograms of thiamine per gram, as contrasted to the 10 to 20 for pork. Similar variations occur in the plant kingdom in different varieties grown under similar conditions. The range of ascorbic acid (vitamin C) in milligrams per 100 grams of fresh fruit has been found to be from 10 to 35 for raspberries,[2] from 12.1 to 27.5 for blackberries,[3] from 52.6 to 107.1 for strawberries,[6] from 19.8 to 32.5 for green beans,[4] and from 3.8 to 12.9 for peaches.[5] The effects of the nature of the soil, of geographical location, and even of the location on single tree have been shown to give variations of similar magnitude. There are marked variations in the distribution of vitamins and minerals within a single unit, whether this be a grain of wheat, a potato, or an animal. In general the organ meats of animals and outer layers of fruits, vegetables and cereals contain the highest amounts of vitamins and minerals.

The practical significance of observations of this nature are many and only a few can be mentioned. Not only do the data facilitate the planning of dietaries, for special purposes, but they also point out the possibilities of selecting or of breeding for high nutrient content, as well as good yield and palatability. Such findings emphasize the importance of proper feeds, fertilizers, climatic conditions, etc., and they form the basis of studies on the effects of processing operations.

Effect of Storage Upon Raw Foods

Raw foods generally are accumulated before processing or sale and in many instances this involves holding or storage for varying periods of time and temperature. During storage or in the transportation of most foods there is no opportunity for quantitative changes in the protein, fat, carbohydrate or ash contents although there may be some changes within each class of foodstuffs, e.g., starches or cellulose may be converted into sugars, and proteins may undergo denaturation or partial hydrolysis. While loss of moisture may occur, this will not affect the total amounts of nutrients available, but only their concentration.

Most of the vitamins are also stable during the storage of foods under usual conditions. Among the serious losses are those of ascorbic acid from fruits and vegetables, as the following table indicates.

Damage of the food in any way greatly accelerates the rate of loss of all vitamins. If storage is in light rooms or in direct sunlight, losses of riboflavin may occur. Thus losses of 5–22 per cent of this vitamin were observed when crates of spinach and asparagus were exposed to the light of a laboratory room for 24 hours.[7] Milk may lose as much as 75 per cent of its riboflavin if exposed to direct sunlight in bottles for several hours. Even the cereal grains, which have been thought to be relatively stable have been recently shown to lose appreciable quantities of thiamine during storage for several

PRODUCT	Storage condition	Retention of ascorbic acid	Retention of carotene
		%	%
Berries	24–48 hrs. at room temp.	90–100	
Asparagus [7]	24 hrs. at room temp.	60	91
Asparagus	1 week at 0–4° C.	43	86
Spinach [7]	24 hrs. at room temp.	71	92
Spinach	1 week, at 0–4° C.	65	95
Fresh peas	24 hrs. at room temp.	90	
Fresh peas, podded	24 hrs. at room temp.	79	
Turnip greens	24 hrs. at 4° C.	94–97	
Turnip greens	24 hrs. at room temp.	68–78	
Apples	2 mo. at room temp.	53–88	
Parsnips	5 mo. at 2° C.	ca 50	
Onions	3 mo. at room temp.	35–65	
Potatoes	4 mo. at room temp.	43–60	
Sweet potatoes	4 mo. at room temp.	84	

months.[21] Fresh food products which are washed prior to sale or are kept under water sprays before marketing have been found to lose water-soluble nutrients up to 25 per cent.

Meats, which are stored under refrigeration and for only short periods, seldom show more than 10 per cent loss of any vitamins.[17]

Effect of Cooking or Canning Upon the Nutrient Content of Foods

Several types of losses other than those caused by heat must be considered during the cooking of foods, e.g., losses resulting from oxidation, leaching, exposure to light. Many cooking conditions have been investigated and in general it has been found that those favorable to retention of nutrients are:

1. The use of a minimal amount of water, thus avoiding excess leaching of soluble nutrients.
2. Rapid heating to the cooking temperature thus minimizing oxidations especially those catalyzed by enzyme systems.
3. The use of a closed container, thus reducing losses owing to oxidation and exposure to light.
4. Careful timing of the cooking period to avoid overcooking, thus minimizing losses of the heat labile vitamins and flavors.
5. Prompt serving, to minimize heat, light and oxidative losses.

Canning procedures are similar to cooking procedures in that preservation is effected by heat sterilization, hence losses of the heat labile factors would be expected. In canning, however, there is less opportunity for oxidation or exposure to light, so that better retention of ascorbic acid and riboflavin may be expected. As with storage, ordinary cooking or canning does not result in losses of nutrients other than vitamins except insofar as soluble nutrients are discarded with cooking liquors.

This varies greatly with the amount of water used and frequently constitutes a loss of 30–60 per cent of the soluble vitamins and minerals. In this connection it should be noted that in canned food there is approximately uniform distribution of the vitamins in the solid

Preservation of Foods

While canning is by far the most common method of preserving foods, curing, freezing and dehydrating are also used extensively. for the most part, the losses during these processes result from heat losses, oxidation, or leaching. With

THE EFFECTS OF COOKING AND CANNING UPON THE VITAMIN CONTENT OF FOODS

PRODUCT	Treatment	Per Cent Retention of Vitamins				
		Ascorbic acid	Carotene	Thiamine	Riboflavin	Niacin
Potatoes [9][5]	Steamed 1 hr. at 225° F.	.....	.....	80–86	.....	.....
Sweet potatoes [10][11]	Baked	.....	78	75	89	85
Sweet potatoes [10][11]	Boiled	80–100	93	92	103	100
Carrots [12]	Cooked	.....	.....	100	100	75
Spinach [12]	Cooked	70	.....	100	86	64
Broccoli [12]	Cooked	100	.....	.....	55	47
Peas [12]	Cooked	100	.....	93	87	68
Snap Beans [12]	Cooked	75	.....	.....	100	98
Snap Beans [6]	Canned	25	.....	83	90–100	.....
Tomato Juice [6]	Canned	80	.....	.....	.....	.....
Grapefruit Juice [6]	Canned	70–93	.....	.....	.....	.....
Strawberries [6]	Canned	50	.....	91	.....	.....
Meats	Frying	.....	.....	90	100	94
	Broiling	.....	.....	78	93	95
	Roasting	.....	.....	68	92	90
	Braising	.....	.....	63	96	90
	Stewing	.....	.....	51	99	99
Milk [13]	Pasteurized	80	.....	80	.....	.....
Pork [14][15]	Canning — 12 oz. cans	.....	.....	67	.....	.....
	6 lb. cans	.....	.....	43	.....	.....

and liquid portions.[18] Thus, discard of the juice, which frequently amounts to 30–50 per cent of the total, will result in proportionate loss of vitamins.

Of the great mass of data which has been accumulated it is possible to present only a fraction selected to illustrate the losses that occur.

vegetables, losses by oxidation and leaching during the blanching accounts for the greatest amount of loss. With meats, thermal destruction of thiamine is more significant as there is little opportunity for leaching and no tendencies for losses by oxidation.

EFFECTS OF CURING, HEAT HYDRATING, AND FREEZING UPON THE VITAMIN CONTENTS OF FOODS

PRODUCT	Treatment	Per Cent Retention of Vitamins				
		Ascorbic acid	Carotene	Thiamine	Riboflavin	Niacin
CURING:						
Corn [6]	Brine Cure	40–55	70–100	.....	.....	.....
Greens [6]	Brine Cure	.....	50	.....	.....	.....
Peas [6]	Brine Cure	20–60	80–100	.....	.....	.....
Pork Hams	Cured and smoked	.....	.....	80–85	90	88
Bacon [22]	.....	.....	.....	.....	.....	.....
DEHYDRATION:						
Rutabagas [16]	Blanched and dehyd	13	91	84	.....	.....
Potatoes [16]	Blanched and dehyd	0	.....	77	.....	.....
Beets [16]	Blanched and dehyd	71	.....	80	.....	.....
Pork [14]	Cooked and dehyd	.....	.....	68	85	94
Beef [14]	Cooked and dehyd	.....	.....	76	105	92
Eggs [21]	Spray dried	.....	100	100	100	100
FREEZING:						
Asparagus [6]	Blanched and frozen	.....	.....	89	.....	.....
Peas [6]	Blanched and frozen	63–70	.....	80–98	.....	.....
Berries [6]	.....	75–80	.....	.....	.....	.....
Meats	.....	.....	.....	100	100	100

Effect of Storage Upon Processed Foods

Even after processing the worries of the food manufacturer continue as he must consider the possibility of further losses during storage of his product. Fortunately, such losses are ordinarily slight in properly prepared materials. For the most part riboflavin and niacin are completely stable during any storage consistent with an acceptable product. Losses of thiamine, carotene and ascorbic acid may occur, the extent depending upon the food, the type of the preservation, the length and temperature of storage, etc. Of course, exposure of glass packed foods in direct light, especially sunlight, will lead to marked loss of riboflavin as well as fading of colors. The following examples are illustrative:

RETENTION OF VITAMINS DURING STORAGE OF PROCESSED FOODS

PRODUCT	Treatment	Per Cent Retention of Vitamins				
		Ascorbic acid	Carotene	Thiamine	Riboflavin	Niacin
CANNED FOODS: (in tin)						
Strawberries [6]	9 mo. room temp	40%	.....	.....	.....	.....
Snap beans [19]	12 mo. at 3° C	68/71	.....	67	94	.....
Tomato Juice [6]	2 mo. at room temp	93%	.....	.....	.....	.....
Meat [14]	9 mo. at 27° C	.....	.....	52	100	100
DEHYDRATED FOODS:						
Snap beans [19]	12 mo. at 3° C	.....	.....	85	100	.....
Rutabagas [16]	3 mo. at 14° C	86	.....	29	.....	.....
Pork [14]	7 mo. at 24° C	.....	.....	13	100	100
Eggs [22]	6 mo. at 70° C	.....	52	83	98	100
FROZEN FOODS:						
Snap beans [19]	12 mo. at −20° C	80	.....	78	97	.....
Peas [6]	11 mo. at −18° C	100	.....	100	.....	.....
Peaches [6]	6 mo. at −28° C	.....	100	.....	.....	.....
Strawberries [6]	6 mo. at −18° C	30	.....	.....	.....	.....
Meat [21]	6 mo. at −20° C	.....	.....	100	100	.....

Application

As a result of studies made during the collection of data of the type presented above it has become possible to critically evaluate the importance of various manipulations in food processing and in certain cases to minimize nutrient loss with no detrimental effect on organoleptic quality.

In general the studies have emphasized the need for speed from harvesting to the consumers table if a maximum of nutrients is to be conserved. This may be illustrated by the canning of grapefruit juice in which it has been shown that delays of a half hour in pasteurizing the expressed juice will increase the loss of abscorbic acid from 7 per cent to 35 per cent.[20] In many similar studies it has been demonstrated that vacuum packing is essential to the retention of ascorbic acid in fruits and vegetables both during processing and storage.

The blanching of fruits and vegetables to inactivate enzymes and to preserve color has been long practiced in the canning industry. Studies of vitamins loss data have indicated it to enter into the nutritional picture too, since it tends to promote retention of vitamins by prompt inactivation of enzymes. On the other hand, hot water blanching removes considerable portions of the water soluble, vitamins and minerals. Considered from this point alone steam blanching is preferable, but at times other advantages to be gained by water blanching overweight the loss of vitamins. The importance of blanching before freezing vegetables has been demonstrated as essential to retention of the vitamins as well as to prevent color and flavor changes.

Relatively little progress has been made in minimizing losses of the heat labile vitamins, particularly thiamine. In most cases the food industry has already been restricting the use of heat as much as possible in order to avoid overcooking. Since it has been proved that the loss of thiamine is proportional to the intensity and duration of the heating operation[23, 14], and since a certain minimal heat is required to effect sterilization, it is obvious that any improvement in thiamine retention must come through more rapid and uniform heating of the entire product, thus avoiding over-cooking of the outside layer to adequately treat the innermost portion. In this respect electronic heating might be effective if answers for all of the technical difficulties can be worked out. The possible use of edible chemical preservatives, with consequent elimination of the use of sterilization temperatures must not be overlooked. Vacuum concentrations and spray drying techniques are, for the most part, more conservative of nutrients than other methods of concentration or dehydration as well as much more rapid and economical.

Fortunately for the food industry and for the consuming public most of the factors tending to preserve desirable colors, flavors, and textures in foods during processing likewise preserve the nutrients. Thus, in some cases, improvements resulting in better organoleptic qualities also improve retention of nutritive qualities.

Regardless of the nutritive quality of the food available the public must be educated to better food selection if maximum nutrition is to be achieved. Taste preferences and food habits are not reliable guides in the selection of balanced meals. Accordingly, for best use of food each consumer must realize the importance of obtaining a sufficient amount of all of the essential nutrients and must know how to select his diet to that end.

Toward the accomplishment of that goal industry has joined hands with the universities, research institutes and governmental organizations. By educational advertising and publicity these groups have aroused interest in nutrition and have begun to impress upon people the idea that proper nutrition attained through careful selection of a variety of foods is important to full health and happiness. With this awakening of interest in food values it may be expected that there will be more requests for information regarding the qualities of processed foods and that eventually a product will have to compete on a basis of nutritive value as well as upon flavor, appearance and food habit. Many portions of the food industry have contributed much to nutrition education. The citrus fruit industry, the dairy industry, and more recently the meat industry, to mention only a few, have had extensive and successful campaigns in making the average American more aware of the importance of a better food choice.

In this respect the Nutrition Foundation, Inc. has played an important role in co-ordinating industrial support of nutrition research and in reporting new findings in "Nutrition Reviews."

Summary

The first phase of nutrition research bearing on food technology, that of gathering basic information regarding the nutritive content of foods and the effects of heat, light, oxygen and enzymes upon these nutrients has been worked out to such an extent that applications are becoming increasingly apparent.

Industry is making immediate use of this backlog of information in studying possible changes in processing to minimize nutrient losses. In some cases labile nutrients, such as ascorbic acid, are used as traces to indicate the organoleptic quality of product, since as a rule flavor and color are best retained under conditions favorable to vitamin retention.

Education of the consumer is completing the chain, assuring use of combination of nutritious foods for optimal health and vitality.

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Canning and Nutrition

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COMMERCIAL canning operations began on this continent about one decade after discovery of the principles of canning by the Frenchman, Nicholas Appert. From a humble start in the establishment of William Underwood in Boston in 1819, the canning industry has so grown that today it includes hundreds of plants in practically all the states, Canada, Alaska, the Hawaiian Islands, Porto Rico, Mexico and Cuba. From the standpoints of volume of production, diversity of products, and over-all quality, the American canning industry has far outstripped its European counterparts.

Over the years, commercially canned foods have assumed an important role in the peacetime nutrition of the American public. In every armed conflict since the War of the States they have also proven indispensable in feeding the military forces as well as the civilian populace. During the war just past the part played by American produced canned foods in the sustenance of our Allies is now too well known to require description. In Table I are shown recent production figures for certain standard canned food commodities compiled from various sources. Increases or decreases in the volume of production of some of these products during the war years, as shown in the table, are attributable to seasonal variations, restricting provisions of the W.P.B. tin conservation Order M-81, or to greatly increased demands in requirements for certain commodities for the armed services or for lend-lease purposes. In this latter connection, it is of interest to note the increased production during the war years of items such as corn, peas and tomato juice, products for which no limitations were placed by Order M-81.

When to the totals shown in Table I are added the high production figures for products such as evaporated milk, meats and meat products, and army rations produced between 1941 and 1945, the wartime contribution made by commercially canned foods can be more readily appreciated. The nutritional implication of this volume of food production can be further emphasized by considering only the vitamin contributions made by a portion of the 1942 pack. In this connection, the following table adapted from a recent publication[1] is self-explanatory:

[1] Acknowledgment is expressed to Mrs. Mardell D. Tompkins, Miss F. Edwyna Preiss and Miss Betty L. McGarry for their considerable assistance in the preparation of this paper.

TABLE I
CANNED FOOD PRODUCTION

(Actual Cases of All Can Sizes)

PRODUCT	PRODUCTION IN MILLIONS OF CASES						
	1935	1940	1941	1942	1943	1944	1945
VEGETABLES:							
Asparagus	2.52	3.11	3.10	4.00	3.56	3.83	3.92
Green Beans	5.66	7.96	10.86	19.62	18.72	14.82	14.53
Wax Beans	1.09	1.23	1.63	2.06	2.15	1.48	1.29
Lima Beans	1.13	1.93	2.50	2.45	1.86	1.57	1.55
Beets	2.06	3.25	6.43	6.74	6.60	7.77	.....
Carrots	0.85	1.30	1.85	2.17	2.81	2.50	.....
Corn (All styles)	20.69	16.26	27.05	33.15	29 80	25.98	29.54
Peas	23.76	25.46	29.02	34.85	33.83	30.13	.....
Pumpkin	0.83	2.30	2.49	1.53	1.45	2.13	.....
Sauerkraut	.....	6.48	6.20	3.06	3.01	2.54	.....
Spinach	3.48	4.21	4.15	7.69	5.76	8.07	.....
Tomatoes	24.29	25.23	26.66	35.45	25.03	22.58	14.47
Tomato Juice	9.29	12.41	19.05	20.74	19.25	26.49	.....
Tomato Pulp	2.80	2.16	2.76	3.82	5.24	7.10	7.24
FRUITS:							
Apples	2.33	2.25	4.35	4.17	1.88	3.36	.....
Applesauce	1.89	2.64	4.18	4.59	2.23	4.30	.....
Apricots	3.33	2.26	4.35	3.43	1.26	8.03	.....
Blackberries	0.49	0.44	0.81	0.59	0.31	0.40	.....
Blueberries	0.19	0.32	0.59	0.35	0.44	0.11	.....
Gooseberries	0.05	0.07	0.06	0.07	0.03	0.03	.....
Loganberries	0.23	0.08	0.06	0.03	0.05	0.02	.....
Raspberries	0.52	0.39	0.41	0.39	0.21	0.10	.....
Strawberries	0.18	0.18	0.12	0.11	0.08	.....	.....
Cherries, R. P.	2.56	3.42	2.06	3.06	0.56	3.07	1.30
Cherries, Sweet	0.54	0.63	0.93	1.02	0.91	0.93	.....
Cranberry Sauce	0.92	1.99	2.59	2.53	1.67	1.55	.....
Figs	0.22	0.43	0.71	0.75	0.98	0.94	.....
Fruit Cocktail	1.65	4.19	4.99	5.48	5.65	6.30	.....
Fruit Salad	1.34	0.61	0.64	0.59	.....	.....	.....
Grapefruit	2.41	3.15	4.41	0.90	0.99	*	.....
Grapes	0.11	0.13	0.16	.....	.....	.....	.....
Olives	0.55	1.14	1.17	0.75	1.08	0.95	.....
Peaches	11.75	11.46	14.78	16.73	11.45	14.04	.....
Pears	4.77	5.79	6.85	6.34	4.65	4.80	.....
Pineapple	10.38	11.06	11.01	11.10	10.98	10.16	.....
Plums	0.15	0.11	0.36	0.29	0.59	0.30	.....
Prunes	1.76	1.26	2.08	1.15	1.92	1.15	.....
Spiced Peaches	*	0.16	0.19	0.06	0.02	0.04	.....
JUICES:							
Apple	*	0.51	1.73	1.65	1.74	2.85	.....
Grapefruit	2.24	14.07	11.05	20.06	22.64	*	.....
Orange	*	4.01	4.41	2.70	7.37	*	.....
Blended Citrus	0.08	2.29	2.04	3.11	5.56	*	.....
Pineapple	4.09	11.29	8.72	8.78	8.23	7.95	.....

* Data not available.

TABLE II
ESTIMATED VITAMIN CONTENT
OF THE
1942 PACK OF 32 COMMERCIALLY CANNED
FRUIT, VEGETABLE, AND MARINE PRODUCTS

Vitamin	*Pounds*
Ascorbic Acid	835,000
Carotene	32,600
Niacin	78,400
Riboflavin	3,400
Thiamine	3,400

The State of New York has long been an important segment of the American canning industry. As a matter of passing interest, in Table III are shown the volumes of production of certain important canned food items in New York State during recent years.

Commercial Canning Operation

It is an unfortunate circumstance that the principles of canning and the mechanics of commercial canning are not as well understood as might be desirable. Better understanding of the canning procedure should bring better appreciation and usage of the products of the canning industry.

Canning is a method of food preservation in which specially prepared raw food is permanently sealed in a container and the sealed container processed by heat and then cooled. The heat process or sterilization, as it is sometimes called, destroys or inhibits the growth of micro-organisms which are present in raw foods and which may cause the food to spoil. The seal on the container prevents the reinfection of the foods by these food spoilage organisms which abound in nature, thus insuring preservation of the food in wholesome condition.

The sequence of operations required in canning will naturally vary from product to product. However, besides the basic principles of canning described above, all canning procedures have in common the proper selection and preparation of raw material and its conversion into the final product of the desired quality grade. Raw material production and selection is of prime importance in the canning procedure.

TABLE III

SOME NEW YORK STATE CANNED FOOD PRODUCTION STATISTICS

(Actual Cases of All Can Sizes)

PRODUCT	Production in Millions of Cases					
	1935	1940	1941	1942	1943	1944
VEGETABLES:						
Green Beans	0.76	0.65	0.96	1.52	1.43	1.32
Wax Beans	0.30	0.31	0.47	0.79	0.66	0.50
Beets	0.90*	1.33	2.45	2.55	1.65	2.10
Carrots	....	0.56	0.56	0.38	0.22	0.17
Corn *	1.15*	0.65	1.43	1.63	1.67	1.06*
Peas	1.90	2.26	1.96	3.50	8.31	2.43
Pumpkin	0.03	0.03	0.06	0.02	**	**
Spinach	0.13	0.12	0.22	0.18	0.06	0.16
Tomatoes	0.96	0.84	1.48	1.54	0.85	0.54
Tomato Juice	1.36	**	**	**	**	**
FRUITS:						
Apples	0.17	0.31	0.56	0.65	0.43	0.63
Applesauce	1.04	0.97	1.90	1.70	1.08	1.22
Apple Juice	....	0.11	0.14	0.03	0.75	0.94
Raspberries, Black	0.06	0.04	0.07	0.05	0.02	0.003
Raspberries, Red	0.09	0.10	0.09	0.08	0.05	0.03
Cherries, R. P.***	0.62	0.57	0.29	0.56	0.12	0.50
Peaches	0.01	0.03	0.06	0.04	....	0.001
Pears	0.05	0.12	0.09	0.09	0.001	0.06

* Basis cases 24/2,s.

** No data.

*** Includes Pennsylvania.

Raw Materials

In the case of vegetable and fruit products, the raw products are usually grown under contract by farmers, quite frequently from seed supplied by the packer. For many canned products, varieties specifically for canners' use have been developed which are not generally available to the public on the raw food market. To meet quality specifications laid down in Federal and other canned food grades, close control must be exerted, particularly over the maturity of the raw stock received. Where Federal raw stock quality grades exist, these are frequently applied in purchases by the canner, as, for example, in the purchase of tomatoes. Production of raw stock for canning is one of the important phases of American agriculture.

Equal care is exercised in the selection of animal products for canning. This is particularly true of meat products packed under supervision of the U. S. Meat Inspection Division of the War Food Administration. General recognition by the public of the care exercised in raw product or material selection has largely dispelled the old prejudice that canned foods are packed from surplus or low-grade raw stocks.

Specific Canning Operations

In general, the operations involved in commercial canning procedures involve some combination of the following specific operations:

1. Preliminary or Preparatory

These operations are for the most part performed by machines and include podding, snipping, dry cleaning by shakers or air blasts, cutting, trimming, peeling, coring, soaking, washing, size or quality grading, crushing, extraction, sectioning, blanching, evaporating, deaerating, sorting, formulating and inspection.

2. Filling

Most products are machine-filled although hand-filling is mandatory or preferable with certain products. Check-weighing to assure legal fill is also to be included in this operation.

3. Exhausting

These operations are primarily designed to expel air from the container so as to leave a partial vacuum in the sealed can. Exhausting is accomplished by various means such as hot filling, hot brining or syruping of products packed in syrup or brines, heating the filled cans before closing in hot water or steam, by sealing the can in an atmosphere of steam, or by vacuumizing the filled can at the time of sealing through the use of a special vacuum closing machine. With certain products, thermal exhausts also serve to raise the internal temperature of the can contents so that the time required to reach processing temperature is shortened.

4. Sealing

This is accomplished by special machines which apply and seal the end on the container.

5. Thermal Processing and Cooling

Thermal processing is accomplished in various ways, depending upon the nature of the product. Foods which have a pH of 4.5 or lower are generally processed by holding sealed cans in water at 212° F. for a suitable time. For the more acid fruit juices, a "flash" process is used in which the product is rapidly heated while passing through a tubular coil; the cans are then filled, sealed, inverted while hot to sterilize the can end and cooled.

Non-acid foods with pH values over 4.5 (common vegetables, milk, meat and fish) are processed in the sealed can in pressure retorts or cookers under steam pressure. Retort temperatures of 240° F. or 250° F. are most commonly employed.

After processing, the sealed cans are cooled in air, in water, or sometimes in water under air pressure. This latter procedure, known as "pressure cooling", is used for large diameter cans of pressure processed products.

6. Warehousing

After cooling, the cans are inspected, labeled, cased in fibre cartons and stored in stacks in a warehouse prior to shipment.

Nutrition Research on Canned Foods

At the beginning of the 20th Century, workers in the fields of animal physiology and medicine were, as a result of their experiences, beginning to question whether a diet of food materials providing protein, carbohydrate, fat and minerals, plus water, actually met the nutritive demands of animals throughout the life cycle. This doubt was most clearly expressed in 1906 by Hopkins who in his famous pronouncement indicated that other factors—now known to be the vitamins—were necessary to nourish the animal completely. This pronouncement stimulated research in the field of nutrition and is considered by many to mark the start of the modern science of nutrition.

By 1923, research in nutrition was well under way in America and abroad. The existence of several of the vitamins had been established and preliminary evidence had been adduced as to the existence of several other of these essential factors. One major trend in the nutrition research of that day was towards the establishment of the vitamin values of foods and the determination of the stability of these vitamins in foods subjected to various conditions of handling, preparation and processing. Recognizing the need for more complete information on canned foods, the well-known collaborative nutrition program between the National Canners Association and Columbia University, New York, was inaugurated in 1923. This work, devoted almost exclusively to studies on canned foods, continued until 1937. An excellent review of the work done in this program and in related fields has been prepared by Kohman.[2]

Compilations of Knowledge

The work of Kohman, Eddy and their associates in the collaborative

program just described attracted other workers into the field. As a result, the amount of available information on the nutritive values of canned foods gradually increased as did the volume of data on the nutritional contributions of raw and other types of processed foods. To facilitate the practical application of these research findings on foods, compilations on the nutrient composition of foods began periodically to appear which found wide use among dietitians and others concerned with diet planning or evaluation. A list of these compilations issued between 1936 and 1943 is given in the appended Bibliography.[3,4,5,6,7,8]

Critical review of these publications, however, will reveal that there was comparatively little quantitative information contained therein on the nutritive values of commercially canned foods. One of the reasons for this was the fact that much of the work on canned foods, particularly studies on vitamin contents, had been carried out before more refined methods of vitamin estimation and reliable vitamin reference standards were available. Likewise, as pointed out by Feaster and Alexander, some of the reported studies on canned foods could have been more closely controlled and the results thereof were of questionable significance as far as commercial canning operations were concerned.[9]

The Current National Canners Association—Can Manufacturers Nutrition Program

The inception, objectives and administration of this program are more completely described elsewhere.[10] Here it must suffice to state that while the paucity of information on the nutritive values of canned foods previously described was recognized by technical individuals associated with the canning industry, it remained for the National Nutrition Conference called by the President in May, 1941, to call the situation to the attention of the industry as a whole. As a direct result of the national conference, the current NCA-CMI nutrition program on commercially canned foods was inaugurated and is now entering into its fifth year.

The experimental work in this program has rested largely in the hands of research workers in recognized educational institutions which have been active in the field of nutrition. Broadly, the work undertaken by these investigators has been first, to establish the nutritive values of commercially canned foods as now manufactured and second, to determine how improvements might be made in existing practices in order to retain in even greater degree the nutrients present in the raw canning stocks. About 20 publications have already appeared or are in manuscript form as a result of the program and much of the data subsequently presented in this paper have been taken from these publications.

The Nutritive Values of Canned Foods

Five years ago, any writer attempting to discuss the nutritive contributions which might be expected of commercially canned foods had to deal more or less with

projections of existing information or in generalities. Today it is possible to give more concise expression to the nutritive values of the major canned food commodities. Since the vitamin content of foods still holds prime interest of the lay public, the vitamin values of commercially canned foods as thus far disclosed in the NCA-CMI program are presented first.

Vitamin Contents of Canned Foods

As described, one phase of the NCA-CMI nutrition program was devoted to the determination of the vitamin values of commercially canned foods as now produced. In 1942, some 30-odd major canned foods were selected and 823 samples of these products collected for vitamin assay. Variables such as can size, growing locality, and harvesting period within the growing season were included in the samples taken. This work was repeated on a reduced scale in 1943 and the results of the second year's study should soon be available in the literature.

Vitamin assays of the 1942 samples were undertaken by three leading universities using accepted chemical, physical and microbiological techniques.[11-a,b,c,d] In these assays the entire contents of the cans were taken for analysis since, as subsequently discussed, the brines or syrups in which some foods are packed contain valuable amounts of soluble nutrients and should be utilized by the consumer if the fullest possible attainment of essential nutrients is to be realized. In Tables IV and V are presented the average values for six of the essential vitamins found in the canned foods listed, expressed as milligrams of the vitamins per 100 grams of the food.

The data in Tables IV and V serve to illustrate two distinct points which are not universally appreciated. The first of these is that Nature endows some foods more liberally with certain vitamins than others. However, foods which may not be high in content of one particular vitamin may be a valuable source of another essential factor. This fact underlies the recommendations made in the rules of the National Nutrition Program, instituted in 1941, that foods be classed in seven groups according to the major contribution or contributions which they can be expected to make to the daily diet. In illustration, the data in Table IV and V reveal that the citrus juices, tomatoes and tomato juice, peas, asparagus, spinach, and the pineapple products are to be prized for their contributions of ascorbic acid. The seafood products are practically devoid of this factor but in general are important sources of niacin and riboflavin.

A second interesting point of information which may be developed from the data is a quantitative estimation of the extents to which certain of the foods will assist in meeting daily vitamin requirements for the various factors. The Food and Nutrition Board of the National Research Council has issued a set of recommended dietary allowances to serve as guides to optimum nutrition.[12] These allowances set specified daily vitamin intakes which individuals, with due regard to sex, age and activity,

TABLE IV

AVERAGE VITAMIN VALUES OF SOME COMMERCIALLY CANNED FRUITS AND VEGETABLES

Item	PRODUCT	Average Vitamin Content in Milligrams per 100 Grams					
		Ascorbic acid	Carotene	Thiamin hydrochloride	Niacin	Riboflavin	Calcium pantothenate
1	Apricot, Halves	3.9	1.28	.019	.37	.024	.095
2	Asparagus, Green	15.2	.31	.067	.85	.096	.19
3	Asparagus, Bleached	14.9	.03	.050	.75	.058	.12
4	Beans, Baked, New England Style	2.9	.02	.021	.24	.054	.081
5	Beans, Baked with Tomato Sauce	2.7	.05	.053	.91	.024	.10
6	Beans, Green, Cut	3.2	.18	.029	.32	.034	.061
7	Beans, Lima Green	7.0	.07	.032	.55	.042	.11
8	Beets	2.0	.006	.008	.13	.025	.076
9	Carrots	2.0	7.16	.021	.34	.021	.13
10	Corn, W., W. K.	4.4	.02	.021	.88	.043	.18
11	Corn, Y., W. K.	4.2	.09	.026	.77	.044	.21
12	Grapefruit Juice	33.8	.007	.025	.17	.019	.12
13	Grapefruit Segments	24.6	.009	.026	.21	.021	.13
14	Orange Juice	39.4	.08	.072	.25	.022	.12
15	Peaches, Halves, Cling	3.9	.26	.007	.70	.022	.041
16	Peaches, Halves, Free	2.3	.16	.008	.57	.021	.052
17	Pears, Halves	1.5	....	.009	.13	.019	.022
18	Peas, Sweet	8.8	.26	.115	1.06	.054	.15
19	Peas, Alaska	10.0	.25	.099	.80	.049	.13
20	Pineapple Juice	8.5	.03	.052	.18	.018	.10
21	Pineapple, Sliced	5.1	.03	.070	.17	.021	.10
22	Prunes, Italian	1.1	.63	.024	.36	.026	.044
23	Spinach	11.4	3.16	.020	.30	.082	.051
24	Tomatoes	16.5	.58	.049	.69	.028	.23
25	Tomato Juice	12.9	.51	.049	.75	.028	.25

TABLE V

AVERAGE VITAMIN VALUES OF SOME COMMERCIALLY CANNED SEA FOODS

Item	PRODUCT	Average Vitamin Content in Milligrams per 100 Grams				
		Vitamin A	Thiamin hydrochloride	Niacin	Riboflavin	Calcium pantothenate
1	Mackerel	.029	.034	7.82	.20	.29
2	Salmon, Red	.087	.021*	7.81*	.16*	.57*
3	Salmon, Pink	.019	....	....	....	....
4	Sardines, in Oil	.069	.024	5.57	.11	.53
5	Sardines, in Tomato Sauce	....	.010	3.93	.18	.47
6	Shrimp, Dry Pack	.017	.009	2.23	.032	.29
7	Shrimp, Wet Pack	.018	.008	1.36	.031	.21
8	Tuna	.008	.037	10.2	.14	.17

* All species.

should receive. To indicate more clearly the vitamin contributions made by certain of the common canned foods, Table VI has been prepared showing the percentages of the daily recommended vitamin allowances for a moderately active male adult provided by 100-gram portions of the foods listed. From the percentages shown it should be apparent that commercially canned foods consumed in the amounts are substantial sources of the various vitamins. In certain instances, notably carotene, the 100-gram portions of spinach and carrots supply the complete daily requirement for this factor.

TABLE VI

VITAMIN CONTRIBUTIONS OF 15 CANNED FOODS PER CENT OF RECOMMENDED DAILY ALLOWANCE SUPPLIED BY 100 GRAM PORTIONS FOR MALE ADULT OF MODERATE ACTIVITY

PRODUCT	Ascorbic Acid		Thiamine		Carotene		Niacin		Riboflavin	
	Mg./100 g.	Per cent	Mg./100 g.*	Per cent	Mg./100 g.	Per cent	Mg./100 g.	Per cent	Mg./100 g.	Per cent
Asparagus, Green	15.2	20.3	.067	4.5	.31	10.3	.85	5.7	.096	4.8
Beans, Green, Cut	3.2	4.3	.029	1.9	.18	6.0	.32	2.1	.034	1.7
Beets	2.0	2.7	.008	0.5	.006	0.2	.13	0.9	.025	1.3
Carrots	2.0	2.7	.021	1.4	7.16	239.0	.34	2.3	.021	1.1
Corn, Y., W.K	4.2	5.6	.026	1.7	.09	3.0	.77	5.1	.044	2.2
Grapefruit Juice	33.8	45.1	.025	1.7	.007	2.3	.17	1.1	.019	1.0
Orange Juice	39.4	52.5	.072	4.8	.08	2.7	.25	1.7	.022	1.1
Peaches, Cling	3.9	5.2	.007	0.5	.26	8.7	.70	4.7	.022	1.1
Peas, Sweet	8.8	11.7	.115	7.7	.26	8.7	1.06	7.1	.054	2.7
Pineapple Juice	8.5	11.3	.052	3.5	.03	1.0	.18	1.2	.018	.9
Spinach	11.4	15.2	.020	1.3	3.16	105.0	.30	2.0	.082	4.1
Tomatoes	16.5	22.0	.049	3.3	.58	19.3	.69	4.6	.028	1.4
Tomato Juice	12.9	17.2	.049	3.3	.51	17.0	.75	5.0	.028	1.4
Salmon	....	....	.021	1.4	.060**	4.0	7.81	52.1	.16	8.0
Tuna	....	....	.037	2.5	.008**	0.5	10.2	68.0	.14	7.0

* Thiamine Hydrochloride.
** Vitamin A.

Some attention has also been given in the NCA-CMI program to the establishment of the vitamin values of canned foods with respect to certain of the newer factors. In Table VII are given the results of preliminary studies of this type carried out on 10 canned foods to determine the existing ranges of pyridoxine, biotin and folic acid, the latter having been estimated by both the S. Lactis and L. Casei techniques. Further studies of this type are planned to augment existing information on the existence of these factors in common foods.

Protein, Fat, Carbohydrate and Mineral Values of Canned Foods

In the NCA-CMI nutrition program, attention was also given to the establishment of the values of canned foods with respect to their contributions of essential proximate food components, such as protein, fat and carbohydrate, as well as to their values as sources of essential minerals such as calcium, phosphorus and iron. Working with companion samples to those collected for the vitamin assays previously described, Kramer has studied the proximate and mineral compositions of the canned foods collected in the 1942 and 1943 samplings.

From a statistical analysis of the results, Kramer[13] has developed a classification system for canned foods according to their proximate and mineral components which is shown in Tables VIII and IX. This classification system should prove a valuable and convenient tool for those engaged in diet planning and evaluation. To others, it will indicate the extent of contribution these canned foods may reasonably be expected to make to the diet with respect to the proximate and mineral components.

Distribution of Soluble Nutrients Between Solid and Liquid Portions of Canned Vegetables and Fruits

Certain major canned vegetable and fruit products are packed in brines or syrup which extract sol-

TABLE VII

AVERAGE PYRIDOXINE BIOTIN AND FOLIC ACID CONTENTS OF SOME COMMERCIALLY CANNED FOODS

PRODUCT	Pyridoxine	Biotin	Folic Acid	
			S. Lactis Factor	L. Casei Factor
Asparagus, Green	30	1.7	5.8	9.0
Beans, Green	32	1.3	2.9	7.7
Carrots	22	1.5	1.3	4.1
Corn, Yellow	68	2.2	1.7	5.6
Grapefruit Juice	14	0.3	0.5	1.2
Peaches	16	0.2	0.5	1.5
Peas	46	2.1	1.7	4.4
Salmon	130	9.9	2.6	6.9
Spinach	60	2.3	7.4	20.7
Tomatoes	71	1.8	2.7	5.4

uble nutrients from the solid portions of the food during processing and subsequent storage of the sealed container. To provide more definite information as to the distribution of soluble essentials, such as certain of the vitamins and minerals, studies were included in the NCA-CMI program to determine this partition between the solid and liquid phases in the can. The results of these studies[14,15] shown in Tables X and XI indicate that the liquids from the can contain valuable amounts of soluble vitamins and minerals and

TABLE VIII

CLASSIFICATION OF COMMERCIALLY CANNED FOODS ACCORDING TO CONTENT OF PROXIMATE FOOD COMPONENTS

(Kramer)

COMPONENT	Per cent	Products
PROTEIN	27	Shrimp, Dry Pack; Tuna
	21	Salmon; Sardines in Oil; Mackerel
	18	Sardines in Tomato Sauce
	15	Shrimp, Wet Pack
	6	Beans, Baked
	4	Beans, Lima; Peas
	3	Mushrooms
	2.5	Corn, Vacuum Pack; Corn, Cream Style; Spinach
	2.0	Corn, W.K.; Asparagus, Green; Sweet Potatoes; Turnip Greens
	1 or less	Beans, Green; Tomatoes; Tomato Juice; Pimientos; Peppers; Orange Juice; Sauerkraut; Cherries; Beets; Blackberries; Carrots; Apricots; Blueberries; Grapefruit; Grapefruit Juice; Peaches; Prunes; Pears; Pineapple Juice; Pineapple Segments
CARBOHYDRATE	25	Sweet Potatoes; Pineapple Slices; Peaches, Freestone
	22	Apricots; Corn, Y., C.S.; Peaches, Cling; Prunes; Blackberries
	19	Beans, Baked; Corn, W., C.S.; Corn, W.K.; Grapefruit Segments; Pears
	14	Corn, W., W.K.; Pineapple Juice
	12	Beans, Lima; Blueberries; Cherries; Grapefruit Juice; Orange Juice; Peas, Alaska
	9	Beets; Peas, Sweet; Peppers; Carrots
	4	Asparagus, White; Beans, Green; Sauerkraut; Piemientos; Tomatoes; Tomato Juice
	2 or less	Asparagus, Green; Mushrooms; Sardines in Tomato Sauce; Spinach; Turnip Greens; Mackerel; Salmon; Sardines in Oil; Shrimp; Tuna
FAT	20	Sardines; Tuna
	12	Mackerel
	7	Salmon
	2	Beans, Baked; Shrimp, Dry Pack
	1 or less	Shrimp, Wet Pack; Corn, C.S.; Corn, Y., W.K.; Corn, W., W.K.; Peas, Sweet; Peppers; Piemientos; Spinach; Apricots; Asparagus; Beans, Green; Beans, Lima; Blackberries; Blueberries; Carrots; Cherries; Grapefruit Juice; Grapefruit Segments; Sauerkraut; Mushrooms; Orange Juice; Peaches; Peas, Alaska; Pineapple; Pineapple Juice; Prunes; Tomatoes; Tomato Juice; Turnip Greens: Beets; Pears; Sweet Potatoes

hence should be utilized by the consumer in soups, sauces, or other convenient manner, such as the method of preparation for canned foods later described.

Canned Foods in Human Nutrition

Findings such as those presented herein as well as those described elsewhere[16] tend to justify the high position which commercially canned foods have assumed in the nutrition of the American public. However, the mere fact that any class of foods may possess desirable nutritive qualities is not in itself assurance that the consumer will benefit to the fullest possible extent from consumption of those foods. Factors such as proper daily food selection and proper methods of food preparation must also be considered.

Popular education as to proper food selection has long been one of the most vexatious problems facing the dietitian or instructor in nutrition. Since the inception of the National Nutrition Program in 1941, however, the approach to the problem has been somewhat simplified. Under the stress of national emergency, both before and after Pearl Harbor, considerable publicity was given to the National Nutrition Program through official agencies and industries; on all sides the layman has been thrown constantly in touch with the relatively simple rules for nutrition laid down in the program. Of particular influence have been the simple charts listing the seven food classes recommended for inclusion in the diet.

From the practical standpoint, proper utilization of commercially canned foods can be largely guided by the rules of the National Nutrition Program. Canned varieties of food falling into six of the seven food classes recommended for daily inclusion in the diet are available to the consumer. The burden of evidence is that these canned foods may be interchangeably used with other foods in attainment of adequate nutrition under the national plan.

Popular education as to proper methods of food preparation however, still remains an active problem. It is well known that the usual home methods for preparation of raw foods may entail considerable loss of valuable nutrients, particularly if the cooking water containing soluble nutrients extracted from the foods is discarded. Many reports have appeared in the literature stating the magnitude of these losses under specified conditions and describing recommended cooking practices for maximum conservation of nutrients in raw foods.

A similar, although less acute, problem exists in the home preparation of canned foods for serving. Many canned foods of a fluid nature are used as they are taken from the can without further preparation; in addition, in many cases the entire contents of the can are utilized. However, certain of the common vegetables and fruits are packed in a liquid containing salt, sugar or a combination of both. It is in connection with the serving of these products that the problem arises. Canned foods thus packed

have been cooked by the heat process in a smaller volume of liquid than is customarily employed in home cooking practices. However, as is indicated by the data in Tables VIII and IX, the liquid in the can contains valuable nutrients and thus should be conserved and used. One convenient means of utilizing the liquid from the can was studied in the NCA-CMI program and the results may be of interest.

Hinman et al[17a] have studied the effects of two methods of food preparation on vitamins in canned foods. In Method A, the recommended procedure, the liquid from the can was concentrated to from one-half to one-fourth of its original volume, the solid portion added and allowed to heat, and the combined solid and liquid served. This method has been recommended by the Home Economics Department of the National Canners Association. In Method B, which is commonly employed by home-makers, the solids and liquids were heated together and only the solids served. Some of the results of these studies are shown in Table XII. As will be noted, Method A showed a distinct advantage over Method B in retention of ascorbic acid, thiamine and riboflavin in common products such as green beans, lima beans, whole kernel corn and peas.

Hinman has also reported similar studies on the effects of large-scale food preparatory methods for canned foods.[17b] It is hoped that such studies will promote better utilization of canned foods of the type studied.

Future Research on Canned Foods

Future research on canned foods will be devoted to a study of conditions and factors conducive to greater retention of essential vitamins during processing and storage. The effects of blanching and storage on vitamin content are already under study and from the data obtained in these controlled experiments, it is anticipated that improvements can be made in certain procedures with respect to blanching and in methods of storage which should be conducive to even higher vitamin retentions than have thus far been disclosed. Progressive elements in the canning industry have been aware of the necessity of maintaining a high level of nutritive quality in their products, as evidenced by their support of the current nutrition program. It is reasonable to expect that the next few years will bring further improvements in the nutritive value of canned foods which as a class are well-nigh indispensable in the nutrition of the American people.

TABLE IX

CLASSIFICATION OF COMMERCIALLY CANNED FOODS ACCORDING TO CONTENT OF ESSENTIAL MINERALS

(Kramer)

MINERAL	Approximate Milligrams per 100 Grams	Products
CALCIUM.....	350	Sardines
	200	Mackerel; Salmon
	100	Shrimp, Dry Pack; Spinach; Turnip Greens
	50	Beans, Baked; Shrimp, Wet Pack
	40	Beans, Green; Beans, Lima; Carrots; Sauerkraut; Pineapple Slices; Sweet Potatoes
	20	Asparagus; Beets; Blackberries; Grapefruit Segments; Peas; Pineapple Juice
	10	Apricots; Blueberries; Cherries; Grapefruit Juice; Orange Juice; Tomato Juice; Peppers; Prunes; Tuna
	6	Corn, W.K.; Corn, Y., C.S.; Mushrooms; Peaches, Freestone; Pears; Pimientos; Tomatoes
	4 or less	Corn, W., C.S.; Peaches, Cling
PHOSPHORUS.....	400	Sardines in Oil
	300	Salmon; Mackerel
	225	Shrimp, Dry Pack; Tuna
	175	Sardines in Tomato Sauce; Shrimp, Wet Pack
	100	Beans, Baked
	65	Beans, Lima; Corn, C.S.; Corn, V.P.; Corn, Y., W.K.; Mushrooms; Peas; Sweet Potatoes
	45	Corn, W., W.K.; Asparagus, Green
	30	Asparagus, White; Beans, Green; Beets; Carrots; Peppers; Spinach; Tomatoes; Turnip Greens
	20	Apricots; Blackberries; Grapefruit Segments; Sauerkraut; Orange Juice; Pimientos; Tomato Juice
	13	Cherries; Grapefruit Juice; Peaches; Pineapple Juice; Prunes
	10 or less	Blueberries; Pears; Pineapple Slices
IRON.....	6	Blueberries; Sauerkraut; Sardines in Tomato Sauce; Turnip Greens
	3	Asparagus, Green; Beans, Baked; Beans, Lima; Beets; Cherries; Blackberries; Sardines in Oil; Shrimp; Spinach
	1.5	Apricots; Asparagus, White; Beans, Green; Mackerel; Peas; Peppers; Pimientos; Pineapple Slices; Prunes; Tomato Juice; Tuna
	0.7 or less	Carrots; Corn; Grapefruit Juice; Grapefruit Segments; Mushrooms; Orange Juice; Peaches; Pears; Pineapple Juice; Sweet Potatoes; Salmon; Tomatoes

TABLE X

DISTRIBUTION OF WATER SOLUBLE VITAMINS IN CONSUMER SIZE CANS OF COMMON VEGETABLES

VEGETABLE	Can portion	Weight		Ascorbic Acid		Thiamine		Riboflavin	
		Total per can (Gm.)	Distribution per cent	Concentration Mg./100 gm.	Distribution per cent	Concentration Mg./100 gm.	Distribution per cent	Concentration Mg./100 gm.	Distribution per cent
Asparagus, Green	Solid	359	62	17.6	60	.065	62	.124	71
	Liquid	222	38	19.2	40	.065	38	.081	29
Beans, Green, Cut	Solid	375	64	5.41	64	.036	67	.054	76
	Liquid	212	36	5.54	36	.032	33	.030	24
Beans, Lima, Green	Solid	411	70	5.91	56	.028	68	.054	76
	Liquid	178	30	10.3	44	.030	32	.039	24
Carrots	Solid	378	64	2.55	66	.022	66	.021	74
	Liquid	216	36	1.97	34	.020	34	.013	26
Corn, W., W.K	Solid	392	67	3.86	48	.015	67	.031	80
	Liquid	191	33	8.54	52	.015	33	.026	20
Corn, Y, W.K	Solid	405	68	5.19	61	.034	67	.063	78
	Liquid	186	32	7.18	39	.035	33	.036	22
Peas, Sweet	Solid	393	66	9.30	63	.120	66	.065	70
	Liquid	203	34	10.6	37	.121	34	.054	30
Spinach	Solid	495	63	5.93	62	.013	69	.080	76
	Liquid	296	37	6.15	38	.014	31	.042	24

TABLE XI

MINERAL CONSTITUENTS OF SOLID AND LIQUID PORTIONS OF SOME CANNED VEGETABLES

VEGETABLE	Calcium		Phosphorus		Iron		Proportions in Can	
	Solid	Liquid	Solid	Liquid	Solid	Liquid	Solid	Liquid
	Per cent	Per cent	Per cent	Per cent	P.P.M.	P.P.M.	Per cent	Per cent
Asparagus	.021	.017	.042	.019	11	8	66.02	33.98
Beans, Green	.036	.012	.023	.013	17	40	61.34	38.66
Beans, Lima	.029	.023	.077	.066	17	16	67.73	32.27
Beets	.021	.005	.031	.026	7	4	65.30	34.70
Carrots	.026	.012	.026	.018	6	7	69.49	30.51
Corn, W. G	.005	.003	.052	.048	6	4	68.29	31.71
Peas	.032	.012	.077	.048	21	14	63.88	36.12
Spinach	.124	.002	.033	.032	20	7	71.62	28.38

TABLE XII

ASCORBIC ACID, THIAMINE AND RIBOFLAVIN RETENTIONS IN TWO METHODS OF CANNED FOOD PREPARATION

PRODUCT	Method *	Retention of Vitamins in Percentage of Initial Content		
		Ascorbic acid per cent	Thiamine per cent	Riboflavin per cent
Beans, Cut Green	A	75	100	105
	B	49	59	62
Beans, Lima, Green	A	60	94	92
	B	37	65	74
Carrots	A	44	100	104
	B	....	....	....
Corn, Y., W.K	A	49	93	98
	B	33	66	65
Peas, Sweet	A	46	93	103
	B	39	63	67

* Method A — Liquid concentrated.
Method B — Liquid discarded.

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[11] The nutritive value of canned foods

[a] Clifcorn, L. E. I Introduction and sampling procedure. J. Nutr. 28, 101–105 (1944).

[b] Pressly, A., Ridder, C., Smith, M. C., and Caldwell, E. II Ascorbic acid and carotene or vitamin A content. Ibid. 28, 107–116 (1944).

[c] Ives, M., Wagner, J. R., Elvehjem, C. A., and Strong, F. M. III Thiamine and niacin. Ibid J. Nutr. 28,117 (1944).

[d] Thompson, M. L., Cunningham, E. and Scull, E. E. IV Riboflavin and pantothenic acid. Ibid. 28, 123–129 (1944).

[12] Natl. Research Council Reprint and Circular Series No. 122, August 1945.

[13] Kramer, A. In publication.

[14] Kramer, A. The nutritive value of canned foods. VIII Distribution of proximate and mineral nutrients in the drained and liquid portions of canned vegetables. J. Amer. Diet. Assoc. 21, 354–356 (1945).

[15] Brush, M. K., Hinman, W. F. and Holliday, E. G. The nutritive value of canned foods. V Distribution of water soluble vitamins between solid and liquid portions of canned vegetables and fruits. J. Nutri. 28, 131–140 (1944).

[16] Canned Food Reference Manual. American Can Company, New York, 2nd edition, 1943.

[17a] Hinman, W. F., Brush, M. K. and Holliday, E. G. The nutritive value of canned foods: VII Effect of small-scale preparation on the ascorbic acid, thiamin, and riboflavin content of commercially-canned vegetables. J. Amer. Diet. Assoc. 21, 7–10 (1945).

[b] VI Effect of large-scale preparation for serving on the ascorbic acid, thiamin, and riboflavin content of commercially-canned vegetables. Ibid. 20, 752–756 (1944).

Unusual Foods of Nutritive Value

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A CURSORY survey of any bibliography on foods reveals that almost every living thing has graced man's bill of fare at one time or another. It also is apparent that primitive peoples, as a rule, have been fortunate in their food selections.[1] The diets of those nations of the world which are most advanced in technological achievement suffer by comparison. Technology directed at the food supply has not been wisely guided, and the result is not a happy one. The dramatic improvement in the death rate throughout the so-called civilized part of the world can only partly be explained by improved nutrition in some sections of these populations. It is mainly due to the application of medical science, especially the application of public health and hygiene. The increasing incidence of degenerative diseases and high incidence of decay of teeth suggest that average vigor in the more civilized races has declined.

The several hundred delegates who attended the Washington Nutrition Conference in May 1941 approved recommendations relating to requirements for good nutrition submitted by the Food and Nutrition Board of the National Research Council. These recommendations were reached after a careful review of all the evidence available. Submitted as a table of recommended daily allowances for specific nutrients, they call for protein of a type found best in dairy products and in meat or fish, for calcium, for iron and for several vitamins at specific levels for varying age and activity. While cereals occupy an important place in food economy, to meet these higher standards of nutritional economy more liberal allowances of dairy products, meat, fish, fruits and green or yellow vegetables than formerly were considered necessary will be demanded.

Sir John Orr, scientific adviser on nutrition to the war cabinet in Britain, expressed the opinion that the "Washington nutrition yardstick," as he termed the table of recommended daily allowances of specific nutrients, should receive official recognition in England and

NOTE: The American Medical Association graciously granted permission to reprint this paper, published in "Handbook of Nutrition," Ch. XIV.

[1] The reader is urged to see an excellent discussion by Graubard of the influence of taboos on the diets of primitive and modern population groups: "In his quest for food primitive man showed amazing inventiveness and ingenuity. . . . In the absence of vitamin knowledge he usually succeeded quite unconsciously . . . to satisfy all protective requirements. That he is not urged to do so by an inner drive, as are many animals, is quite clear from the number of cases where he goes wrong. But that he succeeds at all, on an exclusive meat, milk or vegetable diet with often fantastic prohibitions and regulations is indeed a wonder." (Graubard, Mark: Food Habits of Primitive Man, Scientific Monthly, October-November, 1942, pp. 342–348, 453–460.)

serve there as well as here as a guide in planning for nutrition. This table, probably will also serve —it ought to serve—to guide what plans are made for feeding people everywhere. In that case the demand for milk, meat, fruits and other rich sources of the nutrients called for by the "yardstick" will tax resources to the limit. This raises questions whether foods now commonly available are used as economically as possible and whether foods not commonly in use but equally, or even more, nutritious could serve as supplements to common foods.

Dairy Products

Milk tops all lists of foods of high nutritious qualities, but wasteful practice enormously restricts its use for human food. Much milk is separated. The cream is used for making butter, and what is left is fed to animals or discarded. Until quite recently, only 12 per cent of the skim milk produced in the United States was used for human food. Objection to skim milk is mainly due to prejudice and is based on the erroneous conception that skimming removes the major value of the milk. A market for dried skim milk is growing among commercial manufacturers of bread and several other processed foods, but a public demand for such a product has not existed. In the United States some sixty billion pounds of skim milk is produced annually,[2] but around fifty billion pounds remains on the farms and is fed to calves, pigs and poultry. This will continue to be the situation until the farmer can obtain sufficient returns for skim milk to induce him to deliver the whole milk to the creamery or to substitute other protein feeds for skim milk in his feeding operations. Skim milk fed to farm livestock and poultry eventually reaches the human stomach in the form of meat and eggs, but it would make a greater contribution to the nutrition of our people if it were consumed as skim milk. The nutrients in skim milk, pound for pound, equal those of muscle meat, and it appears that 10 pounds (4.5 Kg) of the nutrients of skim milk is required to produce 1 pound (0.5 Kg.) of food nutrients in the form of pork.[3]

The quart of liquid milk a day for children and the pint for adults, as recommended in much nutrition teaching, is more than many family budgets will allow; but why insist on liquid milk? Milk can be distributed for much less cost as dried whole milk, and dried skim milk, which is relatively little perishable, can be sold for much less than the cost of liquid whole milk. The fats of milk, except for a content of vitamin A, are not superior to other less expensive fats, and vitamin A can be found in much less costly foods than milk.

Most diets not providing milk afford less calcium and less riboflavin than are called for by the recommendations of the Food and Nutrition Board, yet many persons dislike milk and never drink it. A

[2] Consumer's Guide, U. S. Department of Agriculture, July 1939.

[3] Abbott, J. S.: The Food Value and Economics of Skim Milk. Am. J. Pub. Health 30:237–239 (March) 1940.

great advantage of dry skim milk is that it can be mixed with other foods in cooking, so that the consumer gets it painlessly. Indeed, much more milk solids can be put in bread, cakes and puddings by using dry milk powder than when liquid milk is used. The water in liquid milk limits the amount that can be added. The taste of reconstituted dry milk is less attractive than that of liquid milk, but the taste of custards and other cooked foods made with dry milk differs not at all from, or is superior to, the taste of similar products made with liquid milk. Buttermilk is also highly nutritious, matching skim milk in its content of vitamins and minerals.[4] It also can be dried and thus distributed more economically.

The delicious taste of butter assures its marketing. However, to produce milk, as has been the custom, only for its butterfat has no advantage from the standpoint of nutrition and is grossly unsound economically, even for the producer.

Cheese mostly represents the casein in milk.[5] Superb as a food because of the high biologic value of its protein and because of its content of calcium, cheese could be more largely used with great advantage. Most persons like it, but city dwellers take too little of it. The European peasant makes much more of cheese. It represents a substantial portion of his diet, and large consumption of cheese undoubtedly contributes to the proverbial vigor of the pastoral peoples of Asia and the Balkans.

Left over from the milk when cheese is made is whey. The water of the milk is in the whey, but with it part of the protein—the lactalbumin—some of the mineral matter and most of the vitamins, yet whey is mostly thrown away by manufacturers of cheese. In late years dried powdered whey has found a place in poultry feeds and in candy manufacture. Much more dried whey could be used for human food, and none should be discarded It is reported that in Germany no milk products may be thrown away and none may be used for feed without a special license.

Sugar is not among the recommended foods. Its recent rationing will not provoke a hardship, for sugar supplies nothing in nutrition but calories, and the vitamins provided by other foods are sapped by sugar to liberate these calories. One of the worst of the many bad food habits that Americans have acquired is their use of sweetened carbonated beverages. Many persons take such beverages by the half pint many times a day, with a resulting excessive consumption of sugar. The suggestion has been made[6] that whey after removing its protein be incorporated in these beverages. By such means the minerals and vitamins of whey could make these drinks nutritious.

[4] Hutchison, Robert: Hutchison's Food and the Principles of Dietitics (Revised by V. H. Mottram and George Graham), e. 9, Baltimore, Williams & Wilkins Company, 1940.

[5] McCammon, R. B., and Kramer, M. M.: Nutritive Value of Various Types of Cheese. J. Am. Dietet, A. 9:292-294 (Nov.) 1933.

[6] Wilder, R. M.: Nutrition in the United States: A Program for the Present Emergency and the Future, Ann. Int. Med. 14:2189-2198 (June) 1941.

Meats and Fish

Next to the dairy products on the list of better foods come meat and fish, but in their use economy has been neglected. There is no evidence that the nutritive value of muscle meat differs significantly from one part of the animal to the other, yet small food budgets are regularly taxed by purchases of expensive cuts when thrifty cuts would do as well.[7] Furthermore, the most nutritious parts of every carcass are seldom chosen by the customer and go to making fertilizer or feed. The blood, lungs, stomach, liver, pancreas, kidney, brain and heart are spurned by many persons. In southern China a suitable gift for a prospective mother is a pair of pig's feet. She will hope by the time the baby is born to have accumulated perhaps two dozen pairs to help support her demand for calcium during lactation.[8]

In the first world war the complaint was made by Reese[9] that Americans had acquired "a lot of silly ideas" about what is fit for food and what is not. Thereupon Reese advocated the use of certain reptiles, such as turtles, lizards, snakes and even alligators. A happy habit of more primitive man was to devour whatever could be eaten in the carcass of his kill. He thus obtained the organ meats as well as muscle. The Navajo, for example, who in contrast to many other Indian groups has retained his vigor despite proximity to the white man's civilization, consumes all vestige of the sheep or goat he kills and exhibits a decided preference for the contents of the abdomen.[10] He eats the organs first. The modern American credits the ancient Greeks with a high state of culture, yet Cornwall[11] found references in the Odyssey to many foods men spurn today—foods such as roasted entrails and goat's stomach filled with blood. There is current discussion of deficiency of certain lipoids in the diet of more civilized races. A return to these food habits of the ancient Greeks and modern Navajo would at once correct such dietetic error, for the lipoid content of organ meats such as liver is high. Much could be done to improve the nutritive quality of processed meats by including in them organ meat and blood. Blood sausage (blutwurst) is popular in Germany. The dog food manufactured by American packers, containing much of what they designate as offals, is demonstrably superior in nutritive value to most of the meat they can for human food.

[7] A useful pamphlet is that issued by the American Meat Institute, Chicago, entitled "Buying Guide for the Thriftier Cuts of Meat." The statements in the pamphlet were approved by the Council on Foods and Nutrition of the American Medical Association.

[8] Rose, Mary S.: Racial Food Habits in Relation to Health, Scient. Monthly 44:257–267 (March) 1937.

[9] Reese, A. M.: Reptiles as Food, Scient. Monthly 5:545–550 (Dec.) 1917.

[10] Carpenter, T. M., and Steggerda, Morris: The Food of the Present Day Navajo Indians of New Mexico and Arizona, J. Nutrition 18:297–305 (Sept.) 1939.

[11] Cornwall, E. E.: What the Ancient Greeks Ate, Ann. M. Hist. 9:30–33 (Jan.) 1937.

The nutritive values of fish are as high as those of meat, except perhaps for iron.[12] The livers of many fish besides the cod are rich in vitamins A and D; also the body oils of fish contain these vitamins. The flesh of fish is also rich in vitamins of the B groups to such an extent that Goldberger and Wheeler[13] found salmon to be effective for preventing pellagra. However, many fish equal in nutritive value to fish that are popular in American markets are neglected, notably the carp. Smoked carp is a delicacy in Europe, and carp culture in Germany is an industry of importance. Raising carp is said to be as profitable as raising pigs. American streams and fresh water lakes are full of rough fish which could be utilized for human food.

The huge oyster shell mounds of the Atlantic coast seem to testify that the aboriginal American made more use of oysters than happens now. A nutritional advantage in the oyster, which applies also to the clam, the lobster, the crab and the shrimp, is that it is eaten whole, so that the valuable nutrients of the internal organs are obtained. Pease[14] maintained that the nutritive value of oyster meats is a little higher than that of cow's milk, owing to a high content of calcium, iron and other minerals and all the vitamins.

Fairchild,[15] on a tour of the world, found giant snails as large as a man's fist offered for sale in Ceylon and Africa. They were considered a delicacy. He thought they might be raised in the Everglades of Florida for consumption in America.

For mention also without prejudice is the possibility of finding protein foods among the insects. Wakefield and Dellinger,[16] in the feces of pre-Columbian bluff dwellers of the Ozarks, found residues of insects. A modern primitive, the Bushman, considers appetizing the eggs of termites.[17] Verrill[18] has written that the grasshopper and the cricket were periodically important as foods for the Indians of the western plains, and in the West Indies a large white grub found in the pith of palm trees serves as food. These grubs when toasted are said to taste like roasted chestnuts. Even the ancient Hebrews, strict as they were in their choice of foods, looked with favor in times of famine on the locust.[19] The nutritive value of insects must be high. The taste may not be bad. Insect

[12] Sherman, W. C.; Elvehjem, C. A., and Hart, E. B.: Further Studies on the Availability of Iron in Biological Material, J. Biol. Chem. 107:383–394 (Nov.) 1934.

[13] Goldberger, Joseph, and Wheeler, G. A.: A Study of the Pellagra Preventive Action of Canned Salmon, Pub. Health Rep. 44:2769–2771 (Nov. 15) 1929.

[14] Pease, H. D.: The Oyster—Modern Science Comes to the Support of an Ancient Food, J. Chem. Educ. 9:1675–1712 (Oct.) 1932.

[15] Fairchild, David: Exploring for Plants, New York, Macmillan Company, 1930.

[16] Wakefield, E. G., and Dellinger, S. C.: Diet of the Bluff Dwellers of the Ozark Mountains and Its Skeletal Effects, Ann. Int. Med. 9:1412–1418 (April) 1936.

[17] Altshuler, S. S.: The Historical and Biological Evolution of Human Diet, Am. J. Digest. Dis. 1:215–218 (May) 1934.

[18] Verrill, A. H.: Foods America Gave the World, Boston, L. C. Page & Co., 1937.

[19] Dor: Explication zoologique des prescriptions alimentaires de la Bible et du Halmud, Bull. et mém. Soc. d'anthrop. de Paris, series 8, 8:63–70, 1937.

culture might some day become a part of food economy.

Should the time ever come when the land fails to provide enough good protein to meet all human needs, an unlimited supply can be found in the sea. The catch of fish has limitations, but ubiquitous in the oceans is the zooplankton, which could be harvested and would provide a first class human food. However, the technical difficulties involved are rather overwhelming. The estimate has been made by Clarke[20] that the human requirement for calories for one individual could be met only by all the plankton in a volume of water "equal to a football field filled to a depth of a meter and a half."

More practical than plankton as a source of proteins is the microorganism yeast. A by-product now and mostly thrown away by brewers, yeast could be grown in limitless amounts. Dried yeast is largely protein, 40 to 55 per cent. Most of the nitrogen free remainder is material consisting of a mannose polysaccharide. The amount of fat is small, from 1 to 3.5 per cent, but this is rich in steroids. The content of vitamins of the B complex is very high; some vitamin A is present and much ergosterol, which by ultraviolet irradiation could be changed to vitamin D. This is important because almost no foods other than fish liver oils provide significant amounts of vitamin D. Among the amino acids found in the proteins of yeast are alanine, valine, phenylalanine, glutamic acid, aminoacetic acid, leucine, oxyproline, aspartic acid, cystine, methionine, tyrosine, proline and tryptophan. The percentage of these ranges from 10 down to 0.5 in the order given. The diamino acids present include lysine 10 per cent, arginine 5 per cent and histidine 5 per cent.[21]

Some brewers' yeast is on the market now, sold mainly as a source of vitamins. The armed forces are receiving yeast in peanut butter as an optional spread for bread. The yeast taste is disguised by that of the peanut. Analysis of samples of such yeasted peanut butter (20 per cent) indicates a composition of approximately 32 per cent protein. The samples contain per gram around 30 micrograms of thiamine, 16 micrograms of riboflavine and 250 micrograms of nicotinic acid. Thus an ounce (30 Gm.) of such peanut butter should provide about 10 Gm. of valuable protein, about half the recommended daily allowances of thiamine and nicotinic acid and a fifth of the recommended daily allowances of riboflavin.[21]

Two products, mixtures of vegetables and brewers' yeast, are listed in Accepted Foods.[22] Bakers' yeast also has virtue as a food for persons who can eat it without abdominal distress. It is much less rich in thiamine than brewers' yeast; also some question remains as to the utilization by man of the vitamin B

[20] Clarke, G. L.: Plankton as a Food Source for Man, Science 89:602–603 (June 30) 1939.

[21] Anheuser-Busch, Inc.: Personal communication to the authors.

[22] American Medical Association Council on Foods: Accepted Foods and Their Nutritional Significance, Chicago, American Medical Association, 1939.

complex in fresh yeast.[22a] A high thiamine bakers' yeast has recently been made available to fortify the dough of enriched bread.

The bitter taste of yeast and some aftertaste present complications to the use of yeast as food, but these objectionable qualities can be overcome. Some special yeasts have very little bitterness, and autolyzing yeast provides a product with a taste like meat. The possibilities of yeast as human food deserves more technological attention. Two major defects in many modern diets are relatively small provision of certain vitamins of the B complex and insufficiency of biologically superior protein. Both deficiencies could be limited by using yeast as food.

Fruits

Another basic nutrient deficient in many diets is ascorbic acid, vitamin C. The trouble mainly comes from lack of fruit in diets, especially lack of citrus fruits. The tomato is good as a source of ascorbic acid, but many fruits such as apples and pears, most of the vegetables, milk and meat are far from rich as sources of this vitamin. However, citrus fruits and tomatoes, while grown abundantly in certain sections, are bulky, perishable commodities and hence expensive to distribute. Ascorbic acid can be made synthetically at relatively small expense, and it may prove to be desirable to add the synthetic vitamin to jellies, jams and other fruit preserves in such amounts as to bring the final content of ascorbic acid to that of ripe tomatoes.

Among less common foods which are rich in ascorbic acid is the black currant. Two ounces of black currants, cooked, according to Olliver,[23] will meet an individual's vitamin C requirements. The reference probably applies to minimal requirements. Consumed raw, watercress and strawberries are good sources of ascorbic acid, providing approximately 60 Mg. per hundred grams. The edible hips of the wild rose are becoming famous for their content of this vitamin.[24] Thone[25] has suggested that the hip could be increased in size and developed commercially. Verrill,[18] whose thesis is that North Americans should use more foods from South America, mentioned some of the unusual tropical fruits now on sale at a few exclusive markets in this country. They include the mamey, sapodilla, silkana, ceriman, papaya, anona, soursop, star apple and guava. Papaya has recently been suggested as a substitute for orange in Hawaii, as well as home made guava juice.[25a] Guava has an especially

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[22a] Parsons, Helen, and others: Utilization by Man of the Vitamin B Complex in Fresh Yeast, Federation Proceedings, vol. I, part II, p. 129, March 16, 1942.

[23] Olliver, Mamie: Antiscorbutic Values of Fruits and Vegetables, Lancet 2:190–192 (Aug. 17) 1940.

[24] Loewenfeld, Claire: Vitamin C from Rose Hips, Brit. M. J. 1:988–989 (June 21) 1941.

[25] Thone, Frank: Wealth from Weeds, Science News Letter 40:166–167 (Sept. 13) 1941.

[25a] The Child, Monthly Bull. U. S. Dept. Labor, Children's Bureau, May, 1942, p. 292.

high content of ascorbic acid. Goldberg and Levy[26] found 300 to 400 mg. in each hundred grams of the fresh fruit, and on drying the guava fruit they obtained a powder of pleasant aromatic odor and practically no taste, with the rather phenomenal quantity of 2,500 to 3,000 mg. of ascorbic acid for each hundred grams. A monograph on the guava is now in preparation by Webber of the California Agriculture Experiment Station.[27]

Vegetables

An important reason for the great amount of emphasis that nutritionists have placed on green and yellow vegetables is the content of beta-carotene in spinach, carrots, beet greens and other colored plants and roots. There is widespread misconception to the effect that chlorophyll has a place in animal nutrition. There is no evidence to support such a view.[27a] Carotene alone and not the chlorophyll of plants is converted in the animal organism to vitamin A. Few foods provide vitamin A ready made. Butter and fish liver oils are about the only sources. Butter may be excellent as a source or only fair, depending on the feed supplied the cow. Assays run from less than 2,000 to more than 40,000 international units to the pound. The daily allowance of vitamin A for an adult man, as recommended by the Food and Nutrition Board of the National Research Council, is 5,000 units, and one of the greatest services the dairy industry could perform would be to standardize the vitamin A content of butter at some high level.

Interference with the fisheries of the world by the war has again directed attention to sources of carotene. Plant oils contain no preformed vitamin A and but little carotene.[27b] However, the pulp of certain yellow vegetables is very rich in carotene. An estimate by Barnett[28] suggests that 10,000 acres planted in carrots would yield 20 trillion units annually of vitamin A. This would amount of 4 billion daily human requirements, or enough to last a population of 100 million persons forty days. Another good source of carotene is the sweet potato, a prolific grower.

Many vegetables little known in North America deserve attention by the food economist. Some could be developed with advantage. The taro, for example, has a subterranean stem resembling the potato. The yield per acre is two to four times that of the potato and, measured in calories, may be ten times that of rice.[29] Taro is a common

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[26] Goldberg, Leon, and Levy, Leopold: Vitamin C Content of Fresh, Canned and Dried Guavas, Nature, London 148:286 (Sept. 6) 1941.

[27] Webber, H. J.: Personal communication to the authors.

[27a] Kohler, G. O.; Elvehjem, C. A., and Hart, E. B.: The Relation of Pyrrole-Containing Pigments to Hemoglobin Synthesis, J. Biol. Chem. 128:501–509 (May) 1939.

[27b] The oil of the red palm is said to provide the natives of tropical West Africa with vitamin A. (A. L. Bacharach, personal communication.)

[28] Barnett, H. M.: Plenty of Vitamin A Is Available for the United States, Science News Letter 40:85 (Aug. 9) 1941.

[29] Potgieter, Martha: Taro (Colocasia esculenta) as a Food, J. Am. Dietet. A. 16:536–540 (June-July) 1940.

food in mid-Pacific islands, in parts of southern Asia and in South America. Varieties known as dasheens have been cultivated commercially in parts of the United States.[30] Taro in Hawaii is mostly eaten as a paste called poi. Fermented poi keeps well without refrigeration. Another vegetable of the tropics said to be high in nutrients is the breadfruit.[31] Others are yautias or taniers, which serve importantly as food for the natives of the West Indies, and yuca, the edible root of the cassava plant, the source of tapioca. Widely used for food today in South America, as mentioned by Verrill,[18] and cultivated by the Incas of Peru before the white man came, are the canna, the leren, the arikuna, the papa lisa, the oca and the arracha, as well as the better known peanut, the potato and the sweet potato.

Use of grass for human food again has come up for consideration since the present war began. Nebuchadnezzar was compelled to "eat grass as oxen" to atone for many sins. However, the benefit he derived, if any, was largely spiritual. The value of a food, as emphasized by Graham Lusk[32] before World War I, depends mainly on the ratio of nutritive to non-nutritive components. Due consideration must be paid to a few special requirements, such as that for vitamin C. The citrus fruits and tomatoes, for example, although bulky, are of great importance in nutrition because of their content of ascorbic acid. Lusk once missed this point, as he later acknowledged.[33] He called tomatoes colored water, but by and large his early emphasis was right. The more nutritious foods are those with nutritive components high and non-nutritive components—namely, water and indigestible cellulose — low. Among the vegetables the tubers like potatoes and the legumes like peas and beans possess more of this quality than do the leaves of plants or grasses.

In times of famine, however, people will resort to whatever they can find to eat. In Russia, for example, in the last war not only grass but also the leaves and the bark of trees were eaten. In Germany and Russia enormous amounts of watery root vegetables, such as turnips, were consumed. In a population leaning too heavily on such foods, war edema is likely to develop. The type of protein obtained is poor and excessive water is ingested. Also the bulk of watery foods which needs to be ingested to contribute significantly to caloric requirements places an intolerable strain on the human intestine. The coarsenes and amount of fiber some such foods contain may even interfere with absorption of what nutrients are present. The Germans as

[30] Young, R. A.: The Dasheen: A Southern Root Crop for Home Use and Market, U. S. Department of Agriculture, Farmer's Bull., June 1924, No. 1396.

[31] Vaughan, W. T.: An Introduction to Tropical Foods, J. Am. Dietet. A. 15:110-116 (Feb.) 1940.

[32] Lusk, Graham: The Fundamental Basis of Nutrition, New Haven, Yale University Press, 1914, p. 42.

[33] Lusk, Graham: Problems of Metabolism, in Lectures on Nutrition, Philadelphia, W. B. Saunders Company, 1924–1925, p. 62.

well as the Russians in the last war attempted to eke out dwindling supplies of flour by adding to this flour bran and chaff and even straw. By doing so they made bad matters worse. Nutrients diluted with large amounts of indigestible material are lost; they cannot be absorbed effectively.

Thus grass serves poorly as a human food. Even tender, leafy vegetables, valuable as a source of minerals and carotene, would not alone provide for human nourishment. Their protein would be inadequate and their water content excessive. However, all the leafy vegetables have a place as supplements to other foods, and tender young grass when dehydrated is excellent as a vehicle for several vitamins and salts. Such a product has been accepted by the Council.[34]

The Cereal Grains and the Legumes

Relative ease and low cost of production and high content of energy yielding nutrients explain why cereal grains, rice and also corn have long contributed importantly to the diets of people whose civilizations have been based on agriculture. Wheat has been developed more than other grains. In England a hundred years ago wheat alone contributed nearly half of all the calories of the diet. Its consumption has been halved, and yet today it provides more calories for the English speaking world than any other food.

Oat consumption could be encouraged with considerable advantage. Oats can grow much farther north than wheat, and oats provide a somewhat more nutritious human food. The content of thiamine is higher and the protein is biologically superior. This explains the value of oats as feed for stock. Samuel Johnson's caustic commentary in his Dictionary that "oats in England is generally given to horses and in Scotland supports the people" illustrates how prejudice works hardships in nutrition. In England, then as now, just as in America, men were more concerned about good nutrition for their livestock than for themselves. The answer said to have been given to Samuel Johnson was "and where will you see such horses and such men." The Scots became a hardy race on oats. So did the early Norse. Oatmeal is often mentioned in the Sagas.[35]

Rye and barley are less popular than wheat in England and America. They are much more used in Europe. Rye is not superior to wheat in nutritive qualities, and rye flour, like white wheat flour, is generaly overmilled. Also what there is of rye in most so-called rye bread is usually diluted with white wheat flour.

Decortication of the grains by modern milling methods has been unfortunate from the standpoint of nutrition. The stone mills of the past left in the flour a large proportion of its vitamins. The flour was

[34] Cereal Grasses in Special and Therapeutic Diets, Kansas City, Missouri, Cerophyl Laboratories, Inc., 1940.

[35] Gudjonsson, S. V.: Kost der alten nordischen Völker, Deutsche med. Wchnschr. 61:1507–1510 (Sept. 20) 1935.

coarse and not very white, but in content of thiamine and nicotinic acid it far surpassed the finer flour of the roller mills. The latter came into general use some seventy years ago. The adequacy in certain vitamins, notably thiamine, of the diet of the populations of England and America—the adequacy especially of the diet of that part of the population of these countries which because of smaller purchasing power consumes much bread—was largely affected in consequence of technology applied to milling grains without the benefit of direction by a science of nutrition. There was no such science when these modern milling methods started.

The effect of roller milling on the thiamine content of American diets has not been estimated. Presumably, however, it was much the same as that in England. Drummond's[36] calculation of the nutrients contained in diets past and present is shown in accompanying table. The comparison reveals that the diet of the middle class Englishman in recent years, while supplying more vitamin A and more ascorbic acid, contains little more than a third as much thiamine as did the diets of the past. In other respects the differences are less significant. The greater use of green vegetables and fruits in recent times accounts for the increased supply of the vitamins A and C. The substitution, about 1870, of roller milled white flour for the coarser flour of the past and the increased use of sugar explain the smaller allowances of thiamine in the modern diet. The milling industry of the United States is thoroughly aware at last of the importance of retaining in flour more of the thiamine and nicotinic acid of wheat. This ultimately will

ANALYSIS OF ENGLISH DIETS FOR ADULT MEN

	Calories	Protein, Gm.	Calcium, Gm.	Iron, Mg.	Vitamin A, International Units	Ascorbic Acid, Mg.	Thiamine, Mg.
Middle class diet today	3,310	110	0.6	12.3	5,170	70	1.2
Poverty diet today	3,000	78	0.3	8.4	520	15	0.66*
Middle (artisan) class diet, 1826	2,130	125	0.2	45	1,220	0	1.77
Navy ration, 1811	2,750	110	0.7	18	2,600	0	3.15
St. Bartholomew's Hospital, 1686	2,600	80	1.9	12	5,100	10	1.89
Meat eating classes, fifteenth century	3,650	250	1.3	50	7,000	?	3.30
Peasant diet, fifteenth century	3,300	140	1.2	21	1,700	10–20	4.20
Recommended by Food and Nutrition Board†	3,000	70	0.8	12	5,000	75	1.8

From J. C. Drummond's "The Englishman's Food," London, J. Cape, 1940.

*A diet containing as little thiamine as this (0.22 mg. per thousand calories) provokes symptoms of severe athiaminosis. See Williams, R. D.; Mason, H. L.; Smith, B. F., and Wilder, R. M.: Further Observations on Induced Thiamine (Vitamin B_1) Deficiency and the Thiamine Requirement of Man, Arch. Int. Med. 69: 721–738 (May) 1942.

† For moderate activity.

[36] Drummond, J. C., and Wilbraham, A.: The Englishman's Food: A History of Five Centuries of English Diet, London, J. Cape, 1940.

be accomplished without loss of other qualities which people have come to like and to demand in flour. Until it is accomplished, which may take many years and involve perhaps a revolution in the milling industry, restorative additions of thiamine and nicotinic acid to white flour and bread should be demanded. Restoration to staples such as flour of nutrients removed in processing was recommended in 1939 by the Council on Foods and Nutrition of the American Medical Association.[37] The procedure as applied to flour and bread was later endorsed by the Food and Nutrition Board of the National Research Council. Flour now is standardized and controlled by the Food and Drug Administration. White flour which bears the label "enriched" must contain thiamine and nicotinic acid, as well as iron, in amounts which are believed to approximate those in flour as flour was milled a century ago.[37a]

The nutritional environment of enormous populations of the Orient, which largely depend on rice for food, also suffered badly from food technology applied without the benefit of science. Milling rice is much like milling wheat. The primitive milling methods removed the husks but left brown rice with much of the bran intact. The later milling methods removed the bran coats and with them much of the content of vitamins and salts. The later methods yielded so-called polished rice. An example of how misguided man can be was supplied by Hou,[38] who wrote that in the rice country of China where beriberi is endemic the quite nutritious soybean is used for field fertilization in the cultivation of the less nutritious rice. One can buy brown rice in American markets, but only at a premium. It spoils and hence its distribution costs are high. A better buy is what is called unpolished rice. Unpolished rice is said to retain about a half of the thiamine of brown rice. It keeps well and after cooking is almost as white as polished rice.

Food habits to a great extent depend on the availability of foods. The story of the pottage of lentils for which Esau, son of Isaac, sold his birthright to his brother Jacob suggests that lentils were more used

[37] Annual Meeting of the Council on Foods, J.A.M.A. 113:680 (Aug. 19) 1939.

[37a] The idea that the nutrient quality of flour can be adequately corrected by retention of the wheat germ is fallacious. While the germ is rich in vitamins and other important nutrients, its contribution to the weight of the grain of wheat is so small—less than 2 per cent—that retaining it in milling insignificantly affects the total content of vitamin in the flour. Furthermore, it would not contribute to the flour problem as a whole to take the wheat germ from some wheat to fortify flour from other wheat, assuming that at some later time methods of milling will be developed that permit the manufacture of a white flour containing all the vitamins of the wheat. However, a large amount of corn germ is available from the corn used by the distilleries, and we are informed (personal communication from VioBin Corporation, Monticello, Ill., Oct. 28, 1942) that if a demand were created for corn germ sufficient to "make it pay to take it out they (the distilleries) would be happy to do it." Corn germ, like wheat germ, is rich in protein of high nutrient quality and excellent as a source of factors of the vitamin B complex. Failure to use corn and wheat germ that could be derived from commercial uses of corn and wheat other than making flour is one more example of a valuable food that now is wasted.

[38] Hou, H. C.: Diet and Health in China, Chinese M. J. 52:413–420 (Sept.) 1937.

in ancient times than now. In Germany lentil soup is still in favor, yet in nearby Belgium lentils, which were distributed in World War I, were spurned by people who were starving. There is no disputing the nutritional excellence of lentils. Likewise meritorius as foods are peanuts and soybeans.[39] The proteins of these legumes are biologically complete, superior to those of any of the cereals. The vitamins of the B complex and minerals are abundant. The Japanese eat boiled or roasted soybeans from bags like candy.[40] A popular food in Hawaii is miso, a fermented mixture of soybean and rice. The soybean is a staple in certain parts of China, and the statement frequently is made that in these regions beriberi and pellagra are unknown. In Germany, cultivation of the soybean and its processing for human food has become a major industry. A sausage known as bratling, made with skim milk and soybean, forms a mainstay of the German army ration.[41] In the United States the press cake that remains after expulsion of the oil from soybean, peanut or cottonseed is sold for feed or is discarded. The industries get their profit from this "premium oil," which in part is used for food, in part for other purposes. Yet the press cake contains nutrients which are almost, if not quite, as valuable as the nutrients of meat and can inexpensively be converted into soups and other very tasty foods. The cost of production of protein from soybean plants is little greater than a tenth the cost of production of meat protein, and the present relatively small annual crop of peanuts and soybeans in the United States would provide 70 per cent as much protein as does the meat supply.

Concluding Comment

This very brief review will show that modern man could reconsider many of his food ways with immeasurable advantage. Greater and more economical use of milk and meat and the use of more organ meat and fish would help to raise the quality of diets. Some common foods can be improved and greater use of many uncommon foods would help provide more adequate nutrition. The world is full of food potentialities, and the anticipated demands for foods possessing superior nutritive qualities calls for a reevaluation of world supplies of food. The reevaluation, if based on the science of nutrition, should reveal the means of providing all that is required for the optimal nutrition of all the populations of the globe, which well may be prerequisite for world security and order.

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[39] Horvath, A. A.: The Nutritional Value of Soybeans, Am. J. Digest. Dis. 5:177–183 (May) 1938.

[40] Miller, C. D.: Japanese Foods Commonly Used in Hawaii, Hawaii Agricultural Experimental Station Bull., 1933, vol. 68.

[41] The Soya Bean, editorial, Brit. M. J. 2:269–270 (Aug. 23) 1941.

Dehydration: Past and Future

By Prof. Emeritus Samuel C. Prescott
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THE PROBLEM of feeding the millions of men in the various branches of the armed forces during the recent war was an enormous one. Food was of prime importance—a munition of the first order, for the efficiency and morale of the fighting man is no less dependent on his food supply than on the other munitions of war.

The problem was made the more difficult because of the global distribution of the men themselves, the vast distances to which food had to be transported, and the tremendous range in climatic conditions to which foods would be exposed once they had been brought into the areas supplying the ultimate consumer at the front.

Obviously only relatively small quantities of fresh vegetables or meats could be supplied. Canned foods, dehydrated foods and limited quantities of refrigerated foods constituted the main part of the nutrients for these men, scattered from the Arctic regions of Greenland, Iceland, and the Aleutians to the steaming jungles of the equatorial Pacific, India, and Burma. There were thousands of fighting men to be supplied in China and the Philippines, in the island outposts, and in the countries around the Mediterranean and in western Europe.

The well known types of canned foods and the less known dehydrated foods, that is those from which the water naturally occur-

Dehydrating fresh vegetables.

ring in their composition had been removed by forced evaporation, constituted a very large part of this food supply.

Basic Requirements

Obviously certain requirements must be met. First of all the foods must meet nutritional needs: Carbohydrates and fats to provide quick energy, protein or nitrogenous components for upbuilding and repair of bodily tissues, and the essential mineral salts and vitamins to maintain normal nutrition. These conditions were met by use of canned foods and on a still greater scale by dehydrated products of wide range, so that the armed forces were perhaps the best fed group in the world even if the diet was generally monotonous and often made no gastronomic appeal.

In the second place, foods for the use of the armed forces had to be so protected by scientific preparation and packaging that they were immune from internal spoilage, guarded against not only infection from without, but also from absorption of moisture which would have been detrimental or destructive to dehydrated products. The preparation of dehydrated foods involved not only the improved methods of drying, but the development of materials and methods of packing in sealed cans which would withstand unusual severity in handling, and resistance to atmospheric moisture or actual immersion in sea water.

Dehydration, although one of the oldest methods of food preservation, assumed a new and vast importance in this war, in part because it offered a means of securing the tremendous quantity of food required, in part because of the great saving in shipping because of the reduction in bulk and especially in weight. A third and still larger factor is due to the greatly expanded range and character possible in the rations which could provide the materials necessary for healthful and sufficient diet. This last named factor has been the result of careful and extended research. Thus it has been possible not only to prepare much better dehydrated foods from the standpoint of acceptability, nutritive qualities, and vitamin retention but to greatly enlarge the range. Among the dehydrated army foods were meat-containing products such as stews, corned beef hash or beef and rice, soups, several kinds of vegetables, fruits such as apple nuggets and orange and lemon juices. All these are known to contain in fairly large percentage the vitamins and salts characteristic of the fresh products.

As I have stated, drying was an old method of food preservation. Its history goes back many centuries, but it is only within a hundred years that dried foods have played a significant part in modern warfare, as in the Boer War, when dried mixed vegetables were much used for soups, and in World War I when both antagonists, especially the Germans, used foods of this character quite extensively. Soon after the United States entered the war in 1917, the production of dehydrated vegetables received serious consideration and a number of plants were hastily put into

operation. The methods employed were generally rather crude. There was little or no preliminary blanching to prevent enzymatic action or protect vitamins and the products were not above mediocrity in quality. Moreover, the men assigned to serve as cooks did not understand the best methods of preparation and the troops disliked the unappetizing dishes which were served to them. Nevertheless, we sent approximately nine million pounds of dehydrated vegetables to our forces in France, and of this amount more than two-thirds was dehydrated potato slices, the remainder being made up of comparatively small amounts of onions, carrots, and turnips, and a larger quantity of mixed chopped vegetables for soup making. It is not entirely surprising that the industry languished after the war in view of the unfavorable reports on their use.

For nearly 20 years following that war there was little significant scientific advance in this field of food technology in the United States. Then with the impending certainty of World War II, and the certainty that great quantities of food which could be transported in concentrated form would be needed much research was undertaken in this field. In the Quartermaster's department of the Army, and under the spur of possible Army needs, in the Department of Agriculture and in many institutional laboratories throughout the land, there began the investigation of the fundamental principles involved in blanching, drying, and packaging. Studies on vitamin retention, on enzymatic changes in color and flavor and on the best methods of treatment and storage for different vegetables were intensively and widely studied. Modern canneries installed drying equipment and large new plants were constructed to produce dehydrated foods under sanitary inspection and laboratory control. Many types of problems had to be solved involving procurement, rapid handling, nutritional quality, and the retention of vitamins. The Army schools for bakers and cooks studied and taught the desirable methods of preparing the foods for use in the camps. A large dehydration industry was developed in which production methods were greatly improved, the plants and product inspected by Federal and Army inspectors, and many millions of pounds of products of good quality were manufactured and contracted for by the Army for all branches of the armed services.

QMC Requirements

For the year 1944–45, the U. S. Quartermaster Corps set up the following partial requirements:

	Pounds
Apple Nuggets	9,500,000
Beets	7,000,000
Cabbage	7,000,000
Carrots	5,000,000
Hominy	5,000,000
Onions	10,000,000
White Potatoes	100,000,000
Sweet Potatoes	22,000,000
Rutabagas	1,000,000
	166,000,000

dry product or the equivalent of 1,660,000,000 lbs. of fresh material. In addition the requirement for other dried products as fruits, cran-

berry sauce, tomato juice, soups, meats, eggs, milk, etc. was about 265,000,000 lbs. for exclusively military use.

It is thus seen that about 431 million pounds of dehydrated foods of all kinds were contracted for by the Army for military uses in all the services. This figure would be greatly augmented if the quantity requirements for lend lease and for civilian use were added.

It has been my main purpose to show that the contribution based on the process of dehydration was of extraordinary use in supplying foods of varied types and of great nutritional value in the feeding of the armed forces in all parts of the world. This is not the whole story. When the range and quality of food supplied to the forces as a result of the use of these components of the dietary are compared with the old basic Army ration which was in use previous to World War I, it will be seen that from the nutritional standpoint there has been an extraordinary improvement. It is not an idle boast that the American Army is the best fed army in the world. And it is my belief that, broadly speaking, the armed forces more nearly approached an adequate, if not an optimal diet, than any sizable class of civilians.

Advances Thru Dehydration

Among the distinct advances which have come from the development of dehydration several are worthy of especial mention. Among these are the invention of precooked potato meals or granules from which in less than five minutes superior mashed potato and other potato dishes can be prepared. Several types of excellent meat combinations commonly described as hash, with potato or rice were produced, and a considerable number of varieties of dried soups. Apple nuggets, cranberries, and other fruits dried to extremely low moisture content were products which on rehydration and proper preparation became excellent apple sauce, and cranberry sauce, etc.

Cryogenic drying, that is evaporation of water from materials in the frozen state, made possible many products such as powdered orange juice with natural flavor and high vitamin potency. Use of antioxidants prevented the incipient oxidative changes which cause staleness in foods containing unsaturated fats. The use of controlled tunnel drying superseded the sun drying of prunes, peaches, and apricots, and suitable treatments of these fruits with sulphur dioxide preserved their vitamin C content. It was found that drying to much lower moisture content than had been previously done, although more expensive, promoted keeping qualities under adverse temperature conditions and gave much improved vitamin preservation.

These are by no means all the advances which may be ascribed to war research in dehydration, some of which will undoubtedly be carried into peacetime practice. As to the use of dehydrated products in the postwar era, one must be conservative in making predictions.

It is obvious that dehydrated products may find their most practical uses in army feeding, exploration, long voyages, famine, disaster,

and other types of relief, and in mining or other operations remote from abundant sources of fresh foods. The care required in preparation and the equipment and cost of the actual drying does not make them distinctly low-priced foods. Because of small bulk and ease of preparation, they should be especially advantageous for dwellers in crowded apartment districts of our cities. But food habits change slowly and it is probable that no large demand for most varieties of dehydrated products will develop to maintain or increase the industry, or keep plants at war efficiency in output. Many dehydration plants have ceased operation and others have already been dismantled.

Many of the dehydrated foods could be advantageously used, and it may be reasonable to assume that certain vegetables and some of the specialties of high quality will find a fair demand in the postwar era. It is quite certain, however, that they may be in competition with the rapidly developing quick-frozen foods as well as with canned foods. Their successful use often involves realistic thinking and new education and skill in cookery. But inherently well-prepared dehydrated foods can be appetizing and attractive, and when so prepared their nutritional values may equal those of ordinarily cooked food.

While at the moment we may think of them as foods for great emergencies such as wars and devastations, their intrinsic values, convenience and long keeping quality without refrigeration or special conditions of storage other than protection from moisture and damage should not be forgotten. It would be a misfortune if earlier history were to be repeated and if what has been gained by careful and thorough research should again be lost, and an important industry allowed to die.

The Proposed Food Allotment Program[1]

By Chester A. Halnan

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THE UNITED STATES food economy is threatened with the following dilemma:

Total effective demand for food may decline below the available supply while at the same time there will be widespread malnutrition among American families.

United States food production increased about 35 per cent during the war, and is likely to continue near this level during the next few years. Around two-thirds of this increase has been used to meet special war requirements. Total effective demand will fall as these special war requirements taper off rapidly and as consumer incomes inevitably decline from wartime peaks.

Nevertheless, the present level of food production would not be in excess of peacetime requirements if every American family were able to obtain an adequate low-cost diet. Millions of families in the low-income groups are undernourished, even during periods of high national income and full employment. When payrolls decline and unemployment rises, undernourishment reaches serious proportions. Over half of the draft rejections on physical ground were reported to be traceable to malnutrition.

The Food Allotment Program discussed in this report is intended to resolve this dilemma. By supplementing the food purchasing power of low-income families to enable them to obtain an adequate diet, the threat of burdensome surpluses in face of dire want of food would be largely eliminated.

Aims

The proposal for a National Food Allotment Program has two broad aims: (1) to improve nutrition by making it possible for low-income families to purchase an adequate diet, and (2) to assist in maintaining fair farm prices and incomes by expanding and stabilizing the effective demand for food.

By supplementing the food purchasing power of low-income families through the issuance of food coupons, the Food Allotment Program would assure farmers of a sustained effective demand for food that would be largely independent of fluctuations in industrial employment and national income. By making payments at the rate of 40 per cent of its income, each participating family would receive sufficient coupons to cover the cost of an adequate low-cost diet.

If the cost of an adequate diet were $3.50 per person per week, a family of four with an income of $20 per week could obtain food coupons worth $14 per week. This family would pay $8 for these

[1] This paper, presented by Mr. Halnan, does not represent the official opinion of the U. S. Dept. of Agriculture, but was prepared by various officials in the Department, which is reported to be generally sympathetic to the proposed Food Allotment Program. The FAP is based on the Aiken-LaFollette Food Stamp bill.

coupons—40 per cent of its income. If this family earned $25 a week it would pay $10 for the coupons.

The coupons would be spent like money in grocery stores. They would be valid only for the purchase of foods, and a portion of them (not more than one-third) could be designated for buying specified foods—foods in surplus or foods needed to relieve dietary deficiencies.

The Food Allotment Program would thus provide every American family with enough food purchasing power to buy an adequate diet. We have the productive capacity to achieve such an aim. The proposed program would assure continued full use of this productive capacity.

What effect would this program have on nutrition and on farm prices and farm income? How many families would be served by it, and how much would it cost the Government?

By the sale of food stamps at a cost adjusted to family income and size, the National Food Allotment Program proposed in a bill introduced on June 15, 1945, by Senators Aiken and LaFollette (S. 1151) would provide low-income families with the purchasing power to obtain an adequate low-cost diet.

Preliminary analysis indicates that, in addition to making it possible for every American family to obtain an adequate diet, such a program would have the following effects:

Effect on Farm Prices

The program would keep average farm prices of most Steagall commodities safely above 90 per cent of parity. Without such a program, free-market prices of many foods would fall considerably below 90 per cent of parity if there were a substantial decline in employment and consumer incomes.

Effect on Price-Support Operations

The program would largely prevent the difficulties the Government faces in carrying out price-support commitments during the next two years. It would do this by moving into domestic consumption most of the surpluses which the Government would otherwise have to purchase to support farm prices at guaranteed levels. Price-support operations could be confined largely to wheat and cotton.

Participation

At the levels of employment and national income likely to prevail during reconversion, approximately five million families could be expected to participate. During a period of severe unemployment and low national income, participation would rise substantially above that level.

Cost of Program

With a participation of five million families, the cost to the Government would be around $1¼ billion. Over a period of years, the cost would fluctuate between $½ billion during prosperity and over $2 billion under conditions of heavy unemployment.

Anti-Depression Effect

Because Government expenditures under the program would

vary inversely with consumer incomes, the program would have a strong anti-depression effect and therefore would promote the Governments objective of maintaining full employment. Consumer expenditures on food, and hence farm income, would be substantially maintained, regardless of fluctuations in non-farm employment and payrolls.

Effect on Nutrition

Malnutrition is widespread in this country. In 1942, a year of full employment, about one-third of all urban families fell in income groups where the average diet failed to meet recommended allowances for an adequate diet. During depressions this proportion rises rapidly. In 1935–36, almost 80 per cent of all families had diets that were deficient in one or more of the basic nutrients.

The proposed program would largely remove the predominant cause of malnutrition—inadequate purchasing power. The bulk of the additional food expenditures by participating families would be made for protective foods. The percentage of families suffering from malnutrition because of lack of purchasing power might be reduced from the current level of 30–35 per cent down to 10–15 per cent.

Effect on Farm Prices and Income

To raise low-income families in the United States to an adequate dietary standard, food consumption would have to be 35 to 40 per cent larger than pre-war—even higher than wartime food production. Preliminary estimates indicate that the program would keep farm prices of meat animals, dairy products, poultry and eggs, and most vegetables and fruits safely above the support level of 90 per cent of parity during the reconversion period, even under conditions of substantial unemployment and declining national income. The demand for wheat, fats and oils (except butter), sugar, dry beans and peas would be strengthened but little, if at all. This means that the program would greatly reduce the need for direct price support. Support operations could probably be confined largely to wheat and cotton.

If the national income should drop from an annual rate of $165 billion in mid-1945 to $130 billion in 1946–47, cash farm income could be expected to drop from $18 billion to $13 billion and the parity ratio from 115 to 89—in the absence of price support. The proposed Food Allotment Program might be expected to stabilize cash farm income at around $15 billion in 1946 and the parity ratio at around 100.

Cost of the Program

The number of participating families and the average Government contribution per family would rise and fall with the proportion of families in low-income groups. Hence, during depressions the cost of the program would be high and during prosperity it would be low. The range would probably be from $500–$600 million to $2–2½ billion, excluding administrative costs. With a national income of

$130 billion and unemployment of 8–10 million, the cost of the program with the normally expected degree of participation would be about $1.3 billion. If the program were to go into effect on January 1, 1946, the cost for 1946 would probably be between $500 and $600 million because of limited participation during the first year.

Such costs may be compared with appropriations of about $1.8 billion for the current food subsidy program and with AAA outlays in 1939 of nearly $1 billion. The proposed Food Allotment Program would probably outrank those programs in terms of the efficiency with which Government expenditures are reflected in farm income. Under the assumed 1946 conditions, it is estimated that public expenditures of $1.3 billion under the proposed program would increase farm incomes by about $1.5 billion.

Relation to Other Agricultural Programs

The Food Allotment Program would greatly reduce the scope and size of price-support operations during the Steagall period (1) by maintaining a high level of effective consumer demand for food, and (2) by earmarking a portion of the food coupons for foods in surplus supply. A number of important farm products such as cotton, tobacco, and wheat would not be directly affected by the program.

Although the program would not eliminate the need for a *production goal program*, it would strengthen the prices of some products more than others, and this differential effect would encourage desirable shifts in production.

It would complement rather than compete with the *school-lunch program* which offers a direct means of meeting the particular dietary needs of children and adolescents. By promoting desirable changes in food habits, the school-lunch program would strengthen the nutritional education activities which would accompany the Food Allotment Program. The need for *direct food distribution to institutions and welfare agencies* would be reduced since the Government would acquire much smaller quantities of food through price-support operations.

General Economic Policy

The Food Allotment Program would go far toward eliminating the malnutrition that persists even during full employment. During periods of mounting unemployment, an increasing number of families would participate as their incomes decline, and the program would expand automatically. The resulting increase in the Government contribution would tend to maintain total food expenditures and to retard a downward swing in farm prices. Because of this counter-cyclical effect, expenditures under this program could play an important role in developing the "National Budget" provided for in the Full Employment Bill now before Congress.

Operation of the Program

Senate Bill S. 1151 defines the basic food allotment as "the following amounts of food per person per week or the equivalent thereof in nutritional value and approximate cost as determined by the Secretary:

Milk, or its equivalent in cheese, evaporated milk, or dry milk	5¼ quarts
Potatoes and sweet potatoes	3 lbs. 7 ounces
Dry beans, peas and nuts	8 ounces
Tomatoes and citrus fruits	1 lb. 10 ounces
Green or yellow vegetables, such as green cabbage, kale, snap beans, and carrots	1 lb. 9 ounces
Other vegetables and fruits	2 lbs. 6 ounces
Eggs	4 (no. of eggs)
Meat, poultry and fish	1 lb. 12 ounces
Flour and cereals (enriched or whole grain)	4 lbs. 4 ounces
Fats and oils	14 ounces
Sugar, sirups, and preserves	11 ounces

The Secretary may add to or delete commodities listed, or may change quantities in the several categories if he deems such changes necessary or appropriate in view of the new research in nutrition, and may increase the basic food allotment for those individuals or groups who are in need of special nutritional supplements.''

The bill further provides that ''the Secretary shall determine at least semiannually the prevailing retail cost of the basic food allotment for households within each size classification, taking into consideration the purchasing practices of families with low income.''

There are essentially two methods by which the value of the food allotment might be determined: (1) the standard low-cost diet described in the bill could be priced by multiplying the quantities specified by their respective average retail prices as reported by the BLS; or (2) on the basis of a family-expenditure survey, the amount of total food expenditures could be determined which, at the time of the survey, actually provided a low-cost diet nutritionally equivalent to the diet described in the bill.

The first method has a serious weakness: it offers little opportunity for allowing necessary adjustments for prevailing food habits and various imperfections in the shopping process which make it difficult at any given time for a housewife to buy precisely the kinds of food that would make up a balanced diet. Such a theoretically priced diet, therefore, does take into consideration ''the purchasing practices of low-income families'' as provided in the bill, and understates the cost for the average participating family. The second method has the disadvantage that family-expenditure studies are expensive to undertake and keep up-to-date.

Perhaps the most feasible approach would be a combination of these two methods. The actual food expenditures of families barely achieving adequate nutrition might be determined from the most recent family-expenditure data available on a national scale. At the same time, the standard diet might be priced by using the average retail prices quoted for

the year in which the expenditure study was made. The percentage excess of such actual food expenditures over the theoretically priced diet would indicate the approximate magnitude of the necessary upward adjustment in the latter.

This method has been used in determining what the value of the basic food allotment would have been in the spring of 1942. On the basis of average retail prices, the diet would have cost $141 per person per year. On the basis of actual food expenditures the cost of an equivalent diet was $180, or 28 per cent more. Since some small families in the low-income groups averaging $180 per capita undoubtedly had diets above the minimum requirements, an allowance of 20 per cent was added to the value of the theoretically priced diet. On this basis, the value of the basic food allotment in urban areas for the first half of 1942 would have been $170 per person per year (or $3.27 per week).

This figure represents a national average applicable to urban families. The bill provides that "if he deems it necessary, the Secretary, in determining the prevailing cost of the basic food allotments, may provide for regional differentials and differentials by size and type of community." Such differentials in value would probably be necessary as between several major regions, and at least between urban and rural communities within each region.

The semiannual adjustment in the value of the allotment might be based upon changes in the retail food price index currently computed by the BLS. Hence, for the latter half of 1945, the value would be 13 per cent above the first half of 1942, or $192—provided that changes in the food habits of low-income families or in price relationships among the various foods have not been so radical as to require a new pricing of the components of the allotment.

Applying for Participation

Any family could apply for participation by submitting two statements of fact: (1) the number of members in the household, and (2) the monthly household income. The "household" is defined as "one person who alone, or a group of two or more persons who at a common table, customarily consume food prepared by or for him or them in a home or noncommercial, nonpenal institution." "Household income" is defined as "the total amount of money received by all persons in a household and available to pay the ordinary expenses of the household," less such portions of public-assistance payments and of amounts received by persons other than the head of the household as the Secretary may deem it equitable to exclude.

It is important to minimize any social stigma that might attach to participation. Elaborate means tests should be avoided by depending in the first instance upon "self-certification." Applicants would fill out simple forms similar to the short income-tax form, listing members of the household and all income received by them. Some spot checking would be advisable, but this need be no more elaborate than the checking done to prevent evasion of income taxes. Records of

the Social Security Agency, the Bureau of Internal Revenue, and various State agencies could be used for checking the income declarations of many participants.

To avoid applications by families whose income is so high that they would not benefit from participation, the application form could carry the monthly income for households of various sizes which would result in a purchase price for the food coupons that is equal to their face value. For instance, if the food allotment were valued at $16 per person per month, a family of three with a monthly income of $120 would have to pay $48 (or 40 per cent of its income) for food coupons worth also $48. In the following pages, families with incomes less than 2½ times the value of their food allotment will be referred to as "eligibles."

To prevent the program from reducing incentives to seek employment, the bill provides that the Secretary "may require any unemployed male member of a household applying for food-allotment coupons, who is between the ages of 16 and 65 and is not attending school or disabled, to submit (1) a certificate from a public employment office that he is registered for work, and (2) an affirmation that he has not within the past six weeks refused suitable work."

Purchasing the Food Coupons

In principle, the food coupons should be sold for an amount equal to the normal food expenditures of the participating family. To use our previous example, if a family of three has been spending $30 per month for food, it could buy $48 worth of coupons for $30. In this case, there would be no diversion to non-food uses of money formerly used for food. If a family formerly spending $40 for food could buy $48 worth of coupons for $30, it could divert $10 to clothing or furniture and still obtain an adequate diet. In terms of the general welfare this might not be objectionable; in terms of the purpose of the program, however, it would mean that only $8 of the $18 contributed by the Government to improve nutrition would actually be used for this purpose. Conversely, if a family normally spending $20 for food were required to pay $30 for coupons, it might find participation impossible or unattractive as it would have to reduce non-food expenditures such as rent or clothing by $10.

Administratively, it would be most difficult to determine precisely how much each applicant normally spends for food. It would be necessary, therefore, to determine each family's contribution on the basis of some average amount which represents the prevailing spending habits of participating families. Several expenditure surveys indicate that low-income families with a moderately adequate diet spend on average of about 40 per cent of their money income for food. In the lowest income groups where diets are highly inadequate, the proportion spent on food averages around 50 per cent. On balance, it appears that 40 per cent of each family's money income would be an equitable charge which would minimize diversion of income from food to non-food uses on the one hand, and would encourage participation by families in the lowest income brackets on the other.

The bill provides that the prices charged to various households "shall be not less than 25 per cent of the face value of the coupons" and "shall not be more than 40 per cent of the household income or 25 per cent of the face value of the coupons, whichever may be the greater."

Following our example, a family of three with less than $30 monthly income would be charged the minimum price of $12 (i.e., 25 per cent of $48), because 40 per cent of its income would be less than 25 per cent of the allotment value. This provision is intended to prevent shiftless families from receiving food practically free of charge. A family of three with an income of $30 or more would be charged 40 per cent of its income, since that price is higher than the minimum charge.

Upon receipt of an application in the local office, the amount of coupons to be allotted would be calculated on the basis of the declared size of the household, and the purchase price for the coupons would be determined on the basis of the declared household income. A purchase form would be returned to the applicant, stating the terms of participation, the amount of coupons allotted and their price, and the place where the coupons could be bought upon presentation of the purchase form. Since many applicants will not be able to pay in advance for a whole month's food allotment, weekly or semimonthly payments might be permitted.

Redemption of Food Coupons

Food coupons would be issued in convenient denominations and would be accepted as legal tender by any food dealer who has been authorized by the Secretary to receive food coupons. Redemption of the coupons would be arranged "through the cooperation of the Treasury Department, the General Accounting Office, and banking institutions throughout the Nation." The bill contains specific provisions regarding issuance and redemption of the coupons and for preventing abuses.

Designation of Coupons for Specific Foods

The bill proposes one limitation on the general rule that coupons could be exchanged for any kind of food. In order (a) to channel local or temporary market surpluses into consumption and thus prevent spoilage or undue depression of prices, or (b) to stimulate the consumption of certain foods in which the diets of participants are found to be seriously deficient, the bill gives the Secretary authority to "(1) require that each household . . . use not more than 33⅓ per cent in face value of such coupons to buy specifically designated foods, or to buy any one of a group of foods, or (2) include with food-allotment coupons sold other such coupons which from time to time may be used in exchange for specifically designated foods. The aggregate value of free coupons issued shall be not more than 10 per cent of the aggregate value of coupons sold in the preceding six-month period or estimated as likely to be sold in the current six-month period."

For instance, if a seasonal surplus of potatoes or eggs should develop in a certain region, the

Secretary could designate allotment coupon No. 9 or a free coupon labeled "C" to be used for the purchase of potatoes or eggs only, for a period of one month. Similarly, if local health authorities in a certain area should detect an acute deficiency of vitamin C in the diets of low-income families, allotment coupon No. 12 or free coupon "E" might be earmarked for the purchase of citrus fruits and tomatoes.

To insure that this earmarking of coupons is kept well within the limits of a nutritionally balanced diet, the bill provides that at no time shall more than one-third of the coupons be restricted to specific foods, or more than one-tenth of the value of the allotment coupons be issued free for the purchase of specified foods. It also instructs the Secretary to "provide for the appointment of a Council on Nutrition to advise on nutritional aspects of the food-allotment program."

This designation of coupons for specific foods would involve difficulties of enforcement. But even if compliance were far from perfect, the earmarking of coupons would still improve the effectiveness of the program in preventing surpluses and improving nutrition. Some conflict may arise occasionally between these two objectives, but they are essentially complementary rather than conflicting, since increased food consumption by low-income families will improve nutrition as well as expand food markets.

Educational Program

Since the food allotment program represents a public investment in the Nation's health, the Government would have a legitimate concern in the way participating families spend their food coupons. Accordingly, the bill instructs the Secretary to "provide, in cooperation with existing agencies of the Federal, State, or local governments, or private persons or groups, an educational program for improving the buying habits, food-utilization techniques, and food-preservation methods of the participants in the food-allotment plan."

Educational material could be distributed with the food coupons which would provide simple instructions and advice regarding the wisest way coupons could be spent to obtain a balanced diet. Discussion meetings and demonstrations on nutritional problems might be arranged in areas of heavy participation in the program. By radio, newspapers and other information channels, participants as well as other consumers could be advised regarding the foods that are in ample supply and relatively low in price at any given time and place.

The Food Allotment Program could serve as an effective vehicle for disseminating nutritional information among those parts of the population that need it most and yet have the least access to such information. By offering participants the concrete benefit of being able to buy *more* food, an opportunity would be provided for increasing their understanding of what constitutes *better* food—i.e., the composition of diets that are best adapted to needs which vary with age, occupation and other factors.

The Aiken-LaFollette Food Stamp Plan

By U. S. Senator George D. Aiken of Vermont

THE NATIONAL FOOD ALLOTMENT BILL is not a "welfare" or a "farm relief" bill, although the effect of it would go far towards removing both of these unfortunate needs from our national economy.

The purpose of the bill is to put a floor under levels of nutrition for our Nation's families and at the same time provide a large and stable market for food products. It is an attempt to see that, in this great agricultural country of ours, we will never again tolerate such conditions as bring about wholesale bankruptcies among the farmers because they grow too much, while teeming millions of our citizens suffer from malnutrition because of their inability to buy those foods necessary to maintain an adequate minimum diet.

Right now there is an adequate market for nearly all foodstuffs, but it is inevitable, unless history ceases repeating itself, that a few years hence we will again experience over-production of certain farm crops, with disastrous low price levels, unless steps are taken to prevent such a recurrence.

In the immediate future, the problem is likely to be one of maintaining adequate diets and nutritional standards for our low-income people, rather than one of finding markets for farm products.

American agriculture is now geared to a high level of production. Food production last year was more than a third higher than the average for five years before the war and this enormous production was achieved with far less labor on the farm than we had in pre-war days. As labor becomes more available, it is likely that production of many crops will be maintained or actually increased. Therefore, we must look ahead in order to provide an outlet for farm production which may be expected to exceed our needs in future years.

Coincidental with falling farm markets will come increasing unemployment and diminishing earning power among industrial workers and other city consumers.

The Food Allotment Bill is based on the conviction that adequate diets for all families and better markets for farmers are in the national interest, and that it is a national responsibility to assist consumers and farmers in achieving that end.

Basic Principles

The basic principles of the Food Allotment Program are simple.

First, the level of nutrition needed to keep an average person strong and healthy is scientifically determined and then translated into actual amounts of lower cost foods.

Next, it is determined what the value of the low cost adequate diet will be at current retail food prices. This cost would be determined at least once a year and would be known as the "food allotment."

The third step is to supplement the buying power of those families that are not able to afford a low cost adequate diet. To carry out this third step, it will be necessary to use Federal funds in the most effective way to raise levels of nutrition and improve farm markets.

It has already been determined that the average low-income family spends about 40 per cent of its income for food. Under the proposed program, they would continue to spend the usual amount for food, but this amount would be supplemented by the Government for the purchase of additional food. This would be done by offering any family with an income below a certain pre-determined level food coupons with a face value equal to the food allotments for the entire family for about 40 per cent of the family income. The value of the food coupons would remain fixed, but the amount that a family would pay for them would be determined by its income, with the Government bearing the difference between the family contribution and the face value of the food coupons.

If the food allotment per person is $15 a month, a family of four could buy food coupons worth $60. If the family has an income of $100 a month, it could get the coupons by paying 40 per cent of its income or $40. If the income of the family is $150, then the cost of the coupons would be $60 for $60 worth of coupons and there would be no advantage gained in participating.

The Government's contribution would largely represent a net increase in the family food consumption. This means that whereas a family of four with an income of $100 a month may now spend $40 a month for food, that under the allotment program the family would spend $40, plus the Government's contribution of $20, or $60 in all.

The figures I am using are, of course, approximate and easy to work with. The actual figures would vary from time to time according to variations in the family income and the value of food.

The program would be handled by local agencies designated by the Secretary of Agriculture. It would not be necessary to use the same agency in every locality because different parts of the country might be better handled by different agencies.

A family desiring to participate would make a simple declaration of income, similar to that now required in connection with the Federal income tax, and its eligibility would be determined by the local agency handling the program. Participation would not be limited to people in cities and towns. Low-income farm families would also be eligible. In many parts of our country malnutrition is even more prevalent in rural areas than in our cities due to the inability of farm families to purchase certain items of diet necessary to maintain health.

The suggestion has been made that the food allotment program might induce shiftlessness by providing food handouts to people who do not like to work. The number of such families would be a very small percentage of the total. Furthermore, it is undoubtedly true that malnutrition itself is a pri-

mary cause of shiftlessness in certain families—even coming down from generation to generation.

The fact that no food coupons are given away, but must all be paid for, is a safeguard against the misuse of public funds. Furthermore, if the local committee feels that any participating family is taking unmerited advantage of the program, then all employable male participants may be required to register for jobs with an employment agency.

One feature of the program would make it possible to earmark up to one-third of the coupons for special foods or groups of foods. This provision would be an aid in disposing of particular farm products in times of heavy surplus or it could be used to induce families suffering from malnutrition to purchase the right kinds of food in the interest of their health.

There is also a provision that a small amount of free coupons may be issued for certain foods which are in heavy surplus or which are particularly needed in the diets of the participating families.

Except for these two provisions, each family would be permitted to exchange the coupons for any foods they wish. Probably some families would use them more wisely than others, but this latitude in the program is in keeping with our democratic system.

In every case participation would be purely voluntary and any person buying coupons could spend them with any food dealer who registers his desire to participate in the program. The fact that all coupons would be spent for the purchase of food through the normal channels of trade has aroused much favorable interest on the part of food processers and distributors.

Purpose of the FAP

It is the purpose of the program to eliminate such a disruption of trade as often resulted from the distribution of free foods during the depression years of the 30s. The unfair competition to which market men and dealers were subjected by the political distribution of free foods tended to retard economic recovery. By planning ahead for the normal marketing of low-cost foods, it will be possible to avoid much of the confusion and irritation which the general distribution of free food by extraordinary agencies of Government would bring about.

The question is often asked—How much would the food allotment program cost? The answer is that it would cost considerable—

The Food Stamp Plan has aided children of low income families.

probably ranging from three-quarters of a billion dollars in ordinarily good times to two billion dollars or more in the event of a severe depression. However, the cost would certainly be less than the cost of permitting farm prices to collapse and millions of people in our cities to go on relief.

Other gains from the food allotment program cannot be measured in dollars and cents because the health of our children—in fact, the health of all our people, would be improved in value far beyond any amount the program itself is likely to cost.

In good times Government spending under the program would contract and in bad times it would expand and counteract the tendency towards shrinking markets.

We are naturally interested in how the program will affect the Nation's diet. We can get the best answer to this by looking back to what would have happened in the past had the program been in force.

According to the experts of the United States Department of Agriculture, if the program had been in effect in 1942, participating families would have used 60 per cent more tomatoes and citrus fruit, 30 per cent more milk, meat, poultry and fish, substantially larger amounts of vegetables and other fruits, eggs, potatoes and sweet potatoes. Purchases of grains, fats and oils and sugar would have remained about the same as they were.

Such a pattern of increased purchases among our low-income families would automatically result in better nutrition. A broad program of education, such as the bill provides, would help consumers to make selective purchases that would raise the nutritional level of their diets considerably higher.

The economic effect upon our agriculture has also been estimated by departmental experts. They estimate that a Government contribution of a billion dollars to a food allotment program in 1942 would have increased the farm income for food products by about one and a half billion dollars.

The Federal Government is legally committed to support farm prices and farm income after the war. The soundest way of doing this is to insure a large and stable market for agricultural products. As a Nation, we cannot long avoid a balance between supply and demand. During the late depression, we attempted to reach this balance by a compulsory crop reduction program. Food supplies were reduced while millions of people were going hungry. The proposed food allotment program is an effort to do by means of a voluntary increase in food consumption what was done 10 years ago through a compulsory crop reduction program. Certainly, no one can claim that crop shortages and hunger are preferable to a generous production to be consumed by people who would otherwise suffer for the lack of it.

No Cure-all

It must not be expected that the food allotment program will be a cure-all for low farm prices. Markets for cotton, wool, tobacco and other non-food products would not be affected. The demand for cereals would not be stimulated to any ex-

tent, other than the increased use of grains for production of dairy, meat and poultry products.

It is perfectly obvious, however, that the food allotment program would not only have a marked affect upon the market for meats, dairy and poultry products, but also fruits and vegetables. The increased demand for these foods would enable many farmers in the South, where the income from cotton has been distressingly low, to shift their production to other more profitable crops.

The program we propose is a new kind of program. It is very different from the old pre-war food stamp plan. It should be started soon in order to develop and perfect the necessary administrative details so that when the time comes that farm surpluses begin to weigh heavily upon our economy and low purchasing power begins to tell upon the health of the consuming public, the program may be put into full force to combat the twin evils which have long plagued both farmers and consumers.

Municipal Marketing Services

By Mrs. Frances F. Gannon

Director, Division of Consumers' Service, New York City Department of Markets

To put a real value on the work which we in the Consumers' Service of New York City's Department of Markets are doing, it is always well to turn the leaves of the calendar to the year 1934 when the Honorable F. H. LaGuardia began his 12 years as Mayor of this city. He was deeply concerned then about the hardships of the people of the city as a result of depression years. The gluts of food in the market presented another problem—the easing of this situation would benefit the health and economic levels of the citizens, as a whole. And so when he appointed me as a Deputy Commissioner of Markets, he was very specific in defining my duties—to keep the housewife advised of the plentiful, seasonable and reasonable foods in the market each day.

Up to this time housewives had been buying their food without any comprehensive knowledge of the day's market conditions, in fresh products especially. Where economy is important such a knowledge of the best "buys" is useful, as it helps to get the most for money expended. This gives the housewife the same advantages as all large institutions, government departments and business agencies. And women are entitled to this knowledge, as they are the ones who manage the family income, the greatest proportion of which is spent on food.

The consuming public has always been largely influenced in purchases, through advertising, by a scanty knowledge of the science of food and by his own or friends' experience. The housewife with all her ability has neither the time, the training nor the desire to do the necessary research to make such planned buying possible. We, in effect, set out to be the scientific buyer for the housewives of New York City. We wanted to be practical and to be accurate. To reach the housewife, we chose the radio as our first means.

Use of Radio

So, beginning with 1934, every morning from Monday through Friday, at 8:25, any radio tuned in over the metropolitan area brought our five-minute talk to housewives as we had a hook-up served through WNYC that included the major stations. This brought immediate and tremendous response. This service was extended for three and a half years, and as it became a popular listening hour as well as a topic, there came the question of sponsors. Naturally, the good of our service would have been hampered by this, but we have found that we are reaching a very large, if not as wide, an audience through the facilities of the Municipal Radio Station.

The radio is a point to consider. The talks are factual, they are advisedly short, they must be interesting, and to serve their purpose must maintain and increase the audience. We talk to the house-

wife, but we reach the farmer, the wholesaler and the retailer as well, as they all have been directly aided through the increase in the consumption of food.

Through the knowledge gained by housewives, they tell us they have corrected their "hit or miss" shopping, they feel independent of the grocer as to what are good "buys," and some have actually changed food habits. Some of the advice we give from time to time includes—shopping early—buy by weight—watch the scales—be kind, not only toward the merchant because he does need consideration, but to the perishable fruits and vegetables as well. Poking, pinching and pulling are not earmarks of an experienced shopper. In reality they increase the cost of food as they bring about spoilage which entails a loss to the retailer, which eventually will be made up on sales. Be watchful to avoid waste —there is a saying "That a woman can throw out by a teaspoon more than a man can bring in by a shovel."—There is no royal road to marketing, if you want to get the greatest return in food and dollar value.—What you must learn to do is to fill the market basket with the right food to keep the family fit, avoiding faulty marketing, faulty food habits, as well as faulty cooking habits.

Covering the Market

In formulating our plans, we turned to the wholesale market as a common means—realizing that as prices fluctuate from day to day there, they should be reflected in the retail stores that day or surely the next day. Such information places an intelligent responsibility on the housewife.

Two inspectors start their day right down at Washington Wholesale Market at two o'clock in the morning—and that doesn't just happen when the night is clear and fairly warm—come rain, sleet, hail, wind, thunder and lightning—they are there. The reports they make and present along about 6:30 A.M. break down the information as to quality and price of each quality—sharp rise, as well as dull demand —and scarce and plentiful items. They are understandable reports and form the basis for the radio talk at 8:25, as well as the press release we issue. These go out to over a hundred persons on our daily mailing list.

Contacts were made with the wholesale meat market, the butter, egg and poultry markets, as well as trade papers. Through these we were in a position to learn each day of price fluctuations and supply and demand for the various products.

Careful surveys were instituted of retail food markets by two other inspectors, in order to ascertain if the retail dealers were following the trend of the wholesale market. Retail prices were recorded twice weekly and a Comparative Price List was prepared, and we had on our mailing list all New York newspapers, food editors, institutions and others whose interest warranted their receiving it. This Price List showed the comparison of the current week with the same week of the previous year.

By carefully watching the trend of prices in the wholesale market, and comparing it with conditions in

the retail market, we have been able to bring down the prices of some commodities on several occasions, using the radio, the press, and our cooking classes to inform the housewife of out-of-line spreads. This is just one of the many instances of the wide public relations service the bureau performs working with food editors and public and private agencies.

Questions arise in the minds of consumers: — for instance, are prices higher or lower today than last year at this time—if so, why? Or, how do prices compare with those of any period since 1934? The answers were had almost immediately through the records of the bureau. Is a certain fruit or vegetable to be had at present? Is it scarce or plentiful? Where is it coming from? All were readily responded to by our inspectors acting in the capacity of food reporters.

In our very alertness for the consideration of the consumer, we, some years ago, discovered the misrepresentations being extensively practised throughout the city. We called this to the Commissioner's attention at the time, and he then began the campaign that is so successfully being carried on today by the department's Division of Enforcement. This includes not only foods, but all other consumer goods, such as furniture, wearing apparel, laundry, carpet cleaning, etc. The law under which the department operates is section 421 of the Penal Code, which deals with misrepresentation and misleading advertising.

So that all aspects and phases of food will be covered, we invite every Tuesday as guest speakers, outstanding authorities on food—economists—and representatives of the various branches of the food industry.

During the war years, we offered our Tuesday guest time to the "Mealtime in Wartime Program." These talks were planned and guest speakers secured by the Radio Committee of the New York City Food and Nutrition Committee. As Director of the Consumers' Service Division of the department, I served as chairman of the group. These talks, 160 in number, proved a valuable contribution to the war-stressed consumer. Outstanding authorities in nutrition and rationing fields kept them abreast with the latest thoughts on "good health through right feeding." Each Tuesday they were also provided with balanced menus and enticing recipes that met with wartime food restrictions.

Free Cooking Classes

We also render service to the housewife through our free cooking classes conducted several days a week, covering the various boroughs as circumstances permit. Women have found these classes really worthwhile. They are taught modern cookery, the essentials of nutrition to guide them in the preparation of balanced meals for their families, and the care and selection of perishable foods—how to use lesser known fruits, vegetables, fish, cheaper cuts of meat, all grades of eggs, and how to bring variety into the economical preparation of the every day foods. Moderate Cost Menus and Recipes are prepared and distributed at each class. We have prepared twelve recipe booklets, in addition to a

Food Purchasing Guide which over the years have been distributed to hundreds of thousands throughout the entire country—even to once thought of as "far away lands"—England, France, Tahiti, Hawaii and Iceland.

Our consumer interest has been recognized more and more by public and private agencies. Only last March we were judged by the Sixteenth Institute for Education by radio, of Ohio University. The judges felt this would be a very practical series, especially in these days of consumer confusion. "The program is well organized and presented and generally interesting." They were amazed at the amount of valuable information packed into the talk and felt that it is a real public service, and other cities would do well to have something similar.

Local Consumer Service

In an effort to have other cities do similar educational work, the Consumers' Guide, a monthly publication of the United States Department of Agriculture, carried an article in its July 1945 issue. The story is really worth reading. And going back to 1940, this same publication in its November issue said "A Consumer Market News Service, then, isn't a frill. It is an important final cog in the market machinery. For lack of it there are gluts which pile up spoiled food—there are losses to dealers, needlessly lowered returns to farmers and short consumer rations when they are not necessary at all. New York's Radio Market News Service is a part of the city's Department of Markets and is maintained out of city funds. It is not the only consumer market news service in the country. It is, however, the most complete of its kind."

To sum up, I think, a reading of the November, 1940, issue of the Consumers' Guide would be quite helpful in establishing a consumer market service in smaller communities, as it indicates the need of government, state or city support in order to make such a program feasible and free from the suspicions of undue interest.

We recommend, as we grounded well, in accuracy, in timeliness of our food facts, in the true dissemination of food values, in the understandable and practical presentation of material that these will be the foundation stones of the future Consumer Services in the State of New York.

Public Policy and Reduction of Food Distribution Costs

By Dr. Frederick V. Waugh*

Office of War Mobilization and Reconversion

FOOD DISTRIBUTION plays a significant part in nutrition. As these words are written millions of people are starving in Europe and in Asia. They are starving partly because of reduced food production; but, even more, because we have been unable to distribute food supplies widely enough and quickly enough. Even in peace times—even in the United States—millions of families are undernourished. The reasons are many; lack of information on nutritive values, lack of income, inefficient food production, and inadequate distribution are probably the most important. To meet this situation there must be close cooperation between the experts in nutrition, economics, farm management, and food distribution.

The Bureau of Agricultural Economics recently estimated that in the pre-war years, 1935–39, American consumers spent 14.3 billion dollars a year for food. Farmers got 5.7 billion dollars of this. The remaining 8.5 billion dollars went to pay the costs of processing, storing, transporting and marketing. The farmer got 40 cents of each dollar spent by the consumer for food. Or, to put it differently, the consumer paid $2.50 for food that was worth $1 at the farm level.

The marketing bill is large. The size of the bill is important to consumers and to farmers alike. High costs of food distribution mean to the consumer less food at higher prices; and to the farmer they mean smaller markets at lower prices. Efficient marketing is essential if farmers are to be prosperous, if food supplies are to be adequate, and if city food prices are to be within the reach of millions of families with low incomes.

The first World War was followed by an agricultural depression. There is considerable evidence that one of the major causes of that depression was the rise in food marketing costs during and immediately following the war, and the failure of marketing costs to fall sufficiently during the 1920's. Two Cornell professors—Warren and Pearson—published a detailed analysis of the evidence 15 years ago. Marketing costs have risen again in World War II. Now that the war is over many pressures are developing that may push costs still higher. In some cases increased marketing charges may be entirely justified; for example, to provide decent wages in sub-standard industries. But the farmer and the consumer have a right to insist that marketing costs are not inflated to cover unnecessary inefficiencies.

* The writer is on loan from the U. S. Department of Agriculture. This paper expresses the writer's own views rather than the views of any government agency.

Is our present food marketing system efficient or inefficient? There is no simple, easy answer to this question. The usual criticisms of the marketing system are unconvincing. Food passing through a large number of middlemen does not necessarily mean inefficiency; it may, in fact, mean real savings through specialization. Transportation from distant areas may not be inefficient; it may lead to lower costs through intensive, commercialized agriculture. Speculation in the current sense is a sound, necessary, and efficient means of adjusting prices and shifting risks.

Distribution Inefficiencies

If we measure efficiency in such basic terms as the number of man-hours required to distribute a carload of food, our marketing system in the United States probably would compare favorably with the system in most other countries. Moreover, there is some evidence that it was becoming gradually more efficient in the decade before the war. Americans have been quick to exploit the economies inherent in mass production, mass distribution, commercialized agriculture, and good transportation.

But many inefficiencies remain in our food marketing system. Our city, State, and Federal agencies must develop more adequate policies for dealing with these inefficiencies.

For example, the University of Connecticut has recently published a remarkable series of studies of milk collection and distribution. They show an amazing degree of unnecessary (and expensive) overlapping and duplication. Thorough studies have been made of city terminals for perishable foods, such as fruits and vegetables. They demonstrate the existence of great inefficiencies in many citys, including New York City. A good, modern food terminal in New York City would pay for itself in 15 years and would be of lasting benefit to farmers, to consumers, and to food dealers. Retailing is probably the most expensive link in the chain of food distribution, and there is room for great progress in this field. Consumers, themselves, are often very inefficient, wasting money on expensive packages and filling their garbage pails with good wholesome food.

Such inefficiencies are well known and well documented. The problem is not to find inefficiencies, it is to do something about them. It can be done if farmers, dealers, and consumers all understand their own interests and cooperate with one another to develop sound public policies. It can not be done if we tolerate known inefficiencies simply because they give unearned advantages to minority groups.

There are three general approaches to this problem of public policies to encourage efficient food marketing: competition, Government regulation, and cooperation between food trades and Government agencies. We shall need all three approaches.

Competition

Competition is the traditional American way. In most cases it will still work well if we let it. For competition to work well in the modern food marketing system

we must first provide such public services as grades, inspection, market news, and the enforcement of honest trade practices. Real progress was made along these lines between the two World Wars, but much remains to be done. Especially these services must be readjusted to meet the needs of decentralized marketing resulting from distribution of foods by motor truck.

If we are to expect competition to result in efficient food distribution we must be very careful to allow full and free trade. We must ruthlessly stamp out the wave of "trade barrier" legislation that has sprung up in recent years to hinder interstate trade in farm products. We must not penalize any healthful food if it is honestly represented—even if it competes with locally-grown products. We must allow new kinds of business to grow—even if they drive out old established firms. We must allow price competition—even if it means hard going for many small and worthy businessmen. We must not allow any form of racketeering or featherbedding—even if these practices make work.

This road of competition is not an easy road to travel. But it is the traditional American road, and it will still lead to progress along many lines if we are willing to follow it courageously.

Government Regulation

Not all our problems can be handled by competition. Government regulation is needed in some cases, at least. The most important area for Government regulation is in the field of monopoly. Governments must take a hand in setting rates for public utilities such as railway transportation, and they must prevent abuse of monopoly powers by any group of food processors or dealers. Our aim should not be to penalize large corporations, but should be to see that farmers and consumers get reasonable shares of any benefits that may be inherent in large-scale methods of processing or distribution.

Cooperation

Perhaps the most promising approach of all is that of cooperation between the food trades and Government agencies. We don't want the kind of competition that results in overlapping and duplication, or that forces the consumer to pay for unwanted services. Could not the food industries cooperate with Government agencies to continue the economies inherent in every-other-day delivery of milk, to eliminate waste of bread through consignment selling, to reduce unnecessary cross-hauling, and to bring about hundreds of similar economies?

A small start has been made in this direction by the Federal Government and by several State Governments. The Federal Government has entered into marketing agreements with distributors of milk, fruits and vegetables, and has enforced the agreements by orders. Present legislation limits these agreements and orders to a few specific functions such as the setting of milk prices and the regulation of shipments of fruits and vegetables. Much more might

be done if the legislation were broadened to include other foods and to authorize agreements to improve methods of distribution.

A somewhat similar approach is represented by market authorities. Market authorities have been set up in several cities in up-state New York to provide adequate terminal market facilities and to supervise their use. The State Government is represented on these authorities, but they are owned and operated by local people for the benefit of the general public.

Through cooperation with trade groups it may be possible not only to reduce costs to the general public, but also to carry on many programs for the special benefit of undernourished groups. Curb markets and pushcart markets have helped bring low-cost foods to low-income families in many cities. Before the war when there was widespread unemployment and when farmers' incomes were depressed it was necessary for the Federal and State Governments to develop active programs for improving the diets of undernourished groups. Many of these programs, including the former Food Stamp Plan, were carried out in close cooperation with food manufacturers and distributors. These programs accomplished a great deal, both by improving diets and by providing markets for surplus foods. As the wartime boom subsides and when the foreign relief feeding job is done the Federal and State Governments may again need to develop programs of this general character. If they build upon the experience obtained before the war, we can probably develop food programs that will be much more effective, both as a means of improving nutrition and also as a means of maintaining a full and steady market for farm products.

United States Standards and Government Inspection Aids In Food Distribution

By Miss Elinore T. Linderer
Standardization Section
Fruit and Vegetable Branch
U. S. Production and Marketing Administration

Food distribution involves many phases of marketing that might be analyzed in an effort to arrive at the most efficient way in which this important part of our economic structure could be conducted. The study of agricultural distribution problems is new as compared with that made to solve production problems. Prior to 1914 little work of the U. S. Department of Agriculture was concerned with the distribution of farm commodities. Marketing was regarded largely as a local problem, and regulation and assistance as being under the jurisdiction of the states and municipalities.

With the rapid development of transportation, refrigeration, and large-scale production, producers had to seek markets farther and farther away from home. As this spread grew between the producing and marketing centers, the need arose for standardized terms to describe quality and condition. In urgent need of standard measurements for quality, farmers, dealers, and bankers turned to the Federal Government for help.

In 1902 Congress appropriated money to the Department of Agriculture to investigate the varieties of wheat in order to standardize their names. In 1906, it authorized a special investigation into the grading of grain; and in 1912, it passed an act establishing apple standards. These actions were followed by legislation, in 1913, authorizing research on all farm products to determine quality differences; in 1914, by enactment of the Cotton Futures Act; and in 1916, of the U. S. Warehouse Act. In 1915, Market News Service was inaugurated; in 1917, potato grades were established; and finally in 1931, the first canned fruit and vegetable grades were promulgated and a few years later grades for dried, frozen, and many other canned products were issued.

This brief history of the Department's role in standardization indicates in only a limited way its many contributions to orderly distribution, and the subsequent reduction in the cost of marketing. As a specific example of these contributions, this presentation is confined to the standardization and inspection of processed fruits and vegetables as conducted by the Processed Products Standardization and Inspection Division of the Production and Marketing Administration's Fruit and Vegetable Branch.

Development of U. S. Standards

The U. S. Standards for processed (including canned, dried, and frozen) fruits and vegetables issued by the Department are for permissive use of growers, processors, distributors, consumers, and other financially interested persons or organizations. Since 1931, 85 U. S. Standards—each for a different processed fruit and vegetable commodity—have become effective for such uses. They are also incorporated in the Federal Specifications for Processed Foods and therefore are the grade specifications for all processed fruits and vegetables bought by Federal agencies.

U. S. Standards may be considered as yardsticks with which the quality of a product may be measured, since each grade within the standard represents clearly distinguishable quality differences. Among the commodities[1] for which these standards have been established are canned apples, dried apples, canned peas, frozen peas, canned green or wax beans, raisins, peanut butter, canned tomatoes, tomato catsup, dried prunes, canned pineapple, and canned grapefruit juice.

These standards are developed by the Department in co-operation with growers, processors, financing agencies, distributors, and consumers. As requests for standards come from these groups to the Department, research is conducted to determine a basis for a preliminary draft of standards for the specific product. This research includes the study of experiences of farmers, the trade, and consumers in producing, selling, and buying problems; analysis of physical characteristics of the product and pertinent data available; consideration of marketing practices, competing areas, and varied interests; and tests to determine the practicability of the standards under commercial conditions. Suggestions and recommendations from interested producer, consumer, and industry organizations, and Federal and State agencies are preliminary considerations. The initial draft is subject to further study and collection of pertinent data, review by the users of the standards, and refinement, as experimental use or results of laboratory tests may indicate. Even after adoption as a Tentative U. S. Standard, it is subject to further amendment and revision as experience in its use, advances in food processing, and improvements in methods of inspection may demonstrate changes to be desirable.

This Division has simplified the grade names in most of these standards in terms of Grades A, B, and C, and for foods below Grade C in quality. Although the quality names for a few products may vary slightly, the general terms are:

Grade A or Fancy
Grade B or Choice (for fruits)
Grade B or Extra Standard (for vegetables)
Grade C or Standard

[1] A complete list of the products for which United States Standards have been issued, as well as copies of any one or all standards, may be obtained without charge upon request to the United States Department of Agriculture, Washington 25, D. C.

Quality names for foods which are lower than Grade C or Standard may vary, because of mandatory labeling laws and the terminoligies commonly used in the processing industry.

All United States standards for frozen and canned fruits and vegetables include a scoring system; but in dried fruits, allowances in terms of percentages are used instead. The scoring system for the theoretically perfect canned or frozen product would be 100 points. Each grade, however, is allotted a range of score points, depending upon the product. For example:

	Canned tomatoes	Canned red sour pitted cherries	Frozen lima beans
Grade A or Fancy..	90 to 100 points	85 to 100 points	90 to 100 points
Grade B or Extra Standard.....	75 through 89 points	(No Grade B or Choice)	80 through 89 points
Grade C or Standard.....	60 through 74 points	70 through 84 points	70 through 79 points

This scoring system is based upon specific factors which reflect the quality characteristics of the finished product. In general, the quality factors for processed vegetables are color, size, excellence of workmanship, and succulency; for fruits the important factors are color, size and shape, excellence of workmanship, and ripeness. Flavor, of course, is considered in standards for all processed commodities.

Inspection

As the need for a Federal agency to determine and certify officially the quality and condition of processed fruits and vegetables was recognized, the Department was granted authority by Congress to perform official inspection when requested by financially interested parties. U. S. Standards serve as the basis upon which these inspections are performed and certificates of quality are issued. The certificates of quality, bearing the seal of the United States Department of Agriculture and signed by an official inspector, are admissible in all courts of the United States as prima facie evidence of the truth of the statements contained therein.

An official inspection will be made of samples of processed foods submitted to an inspection laboratory by the applicant himself, or of samples drawn by the inspector from a specific lot at the request of the applicant. Inspections may take place at canning plants, in a processor's laboratory, in warehouses, in freight cars, or at any of the 40-odd laboratories of the Department located in processing and marketing areas. The samples may be one or more in number and samples may be combined for inspection, depending upon the commodity and its characteristics or the analyses required for it.

Samples that are sent to an inspection laboratory or selected by the applicant for inspection are termed "unofficially drawn samples." Certificates cover the inspection of the individual samples only

when samples are submitted by the applicant. Samples that are selected by a Federal or Federal-State inspector are termed "officially drawn samples." The samples thus selected are chosen and drawn at random in such manner that they are representative of the lot from which taken. That means that the official inspector must select samples of sufficient number to be representative of the size of the lot; and the samples must be chosen from the top, sides, bottom, and center of the warehoused lots to obtain samples so that the inspection will give a true picture of the lot inspected. Inspection certificates on samples drawn in this manner include the entire lot and indicate the number of samples examined.

The number of samples drawn varies according to the type of commodity—canned, frozen, or dried—and to the size of the containers. The number of samples from 1,000 cases (or 24,000 cans) of No. 2 size container, a common size purchased by housewives, would be 12 cans. For dried fruits, samples are chosen from representative boxes and the full sample is examined. For frozen foods in the smaller packages the samples are similar in number to those chosen for the canned products. If in bulk packages or barrels, samples are taken from these containers and examined.

In addition to grading the product in accordance with the U. S. Standards, the inspector determines any facts that are necessary to give an inquirer an accurate description of the quality and condition of the samples. Every factor having a bearing on the market value of the lot is considered, including statements about damaged labels or shipping containers, leaking packages, or rusted or dented containers. Special analyses, in addition to the usual ones to determine the requirements of quality, are made upon request.

Continuous Inspection

Another inspection service which is made available by the Production and Marketing Administration is continuous inspection. Under this type of inspection, an inspector is present to check all steps in processing from the arrival of the fresh product from the growers to the warehousing of the finished commodities. The inspector also keeps an "eagle eye" on the sanitation and housekeeping practices in an effort to help the packer process fruits and vegetables under the same sanitary conditions that would prevail in the kitchen of the most exacting housewife.

Continuous inspection service was conducted on an experimental basis in one plant during the canning season of 1939. The Department wished first to find out if consumers and the industry would react favorably to this program before it was made a permanent service. The number of plants using this service has increased steadily and there are now more than 100 plants approved to operate under it. Plants approved to operate under this service are carefully considered as to physical plant properties, excellence of plant equipment, proximity of plant to processing crops, and willingness of the management to co-operate with the Department in improving the quality of their product.

Fees

Fees are charged to reimburse the Government as nearly as possible for the actual cost of inspection services. These fees are deposited into trust fund accounts from which salaries and expenses are paid.

Uses of Standards and Inspection

With this background of standardization and inspection of processed fruits and vegetables, the following specific examples of the application of these services to distribution problems may be of interest.

Warehousing

U. S. Standards for canned fruits and vegetables were promulgated originally with the view to affording a basis for which loans might be safely made on canned merchandise. In the early 1930's it was frequently necessary for processors to obtain loans to finance their operations. The amount of money advanced to borrowers on such commodity loans had to be predicated upon some understanding of the quality of the merchandise pledged. It thus became readily apparent that loans had to be based upon grades on which the merchandise might be readily marketed. Otherwise, the financial interests of the country would not advance money to the industry.

Thus, official inspection certificates, based on United States standards, have come to have an important use to processors in financing operations. Loans may be obtained on the basis of these official documents or contracts may be consummated on the basis of the quality certified.

The use of grades outlined in U. S. Standards are valuable as a basis for intermediate trading, that is, as the goods pass from canner to wholesaler and from wholesaler to retailer. It is frequently difficult for the seller to submit samples of his merchandise to prospective buyers. Neither is it practicable for the buyer to have a representative personally examine each lot of merchandise he wishes to buy. Nor is this necessary, if specific grades are incorporated in contracts of sale. Thus, U. S. Standards may be used by the wholesaler and retailer as well as the processor in buying and selling. Contracts based on a specific grade of merchandise often require that an official certificate accompany the invoice as evidence of the quality of the goods to be delivered.

Government Purchasing

All processed fruits and vegetables for the armed forces were purchased on the basis of Federal Specifications which embody as quality requirements the grades in the U. S. Standards. All of this merchandise was inspected by the Production and Marketing Administration to determine the quality prior to its purchase by the Government purchasing agency. The Army, the Navy, and the Veterans Administration generally prefer Grade A and Grade B products, although they purchase some Grade C products if the supplies in the upper grades are short or if a particular use can be made of a lower grade merchandise. For example, they may purchase Grades E or F peaches, which are not of high quality but which are

very good for pie or jam manufacture.

Institutional Purchasing

Institutional purchasers also make use of official grades, and often stipulate the grade in terms of U. S. Standards in their purchasing contracts with other specifications as to style and type of product, size and kind of containers, drained weight, count or size of product, and packing medium, such as, "heavy sirup" or "water pack." For example, a cafeteria director might prefer vegetables of Grade C quality as they hold up better than those of the higher grades when held over a steam table for any length of time. On the other hand, a hospital dietitian may specify a specially prepared product of very high quality; such as, peeled apricot halves or a Grade A "water pack" fruit for diabetic patients.

Home Purchasing

U. S. Standards which may serve as a basis for marketing transactions for the producer, warehouseman, wholesaler, and retailer, are also designed to serve the buying needs of the homemaker who purchases for use in her own home. There is no doubt that this group can, both directly and indirectly, contribute much to the conservation of food and the efficiency of distribution through careful and intelligent purchasing. It is upon their choices that the food processing industry is dependent.

Consumers who purchase fruits and vegetables by grade may make specific uses of each grade. Thus, for example, they may save the difference between the price of a Grade A product and a Grade C product when the Grade C product is satisfactory for a specific purpose. Such would be the case in purchasing canned tomatoes for a mixed vegetable soup. A can of Grade C tomatoes, which might contain a large percentage of pieces, would be more economical for this purpose than Grade A tomatoes which were whole or almost whole. Grade C products are considered "thrifty buys" for dishes in which appearance is not important and in which the product requires further cooking, such as for casserole dishes, pies, sherbets, and soups.

Grade B processed fruits and vegetables are of suitable quality for most menus and are good "everyday" buys. Grade A products command a higher price and are near perfection as to size, color, and ripeness or tenderness. Because of their fine appearance they are best suited for special dishes, fancy desserts, and for combinations, such as fruit salads.

In buying most processed fruits and vegetables, the homemaker must rely solely on the label as her guide. She is not in a position to contract for the quality desired or examine bid samples as large-scale purchasing agencies are, and the label statements are the only means by which she can determine what is inside the container. With labels playing such an important role in the merchandising of processed foods, the Department believes labels should be sufficiently comprehensive to adequately serve the needs of the consumers.

In addition to the brand name and the statements required on the label by law, the following information may be included voluntarily for the benefit of the ultimate consumer:

(1) A truthful, concise statement of grade—preferably such simple terms as "Grade A," "Grade B," and "Grade C," or the synonymous terms of Fancy, Choice or Extra Standard, and Standard.

(2) Additional descriptive information that may be appropriate for the product, such as the number of pieces in a can of peaches, the sieve size of peas, the strength of sirup on fruit, and the number of servings.

Packers who now voluntarily label their products in terms of grades may use the U. S. Standards as a basis for these statements. This does not mean that all products bearing a statement such as "Grade A" or "Fancy" are inspected by the Department. A packer may evaluate the quality of his own fruit and vegetable products, or he may submit samples for official Federal inspection if he desires. In either case, however, quality-labeled products must comply with the requirements of the grade set forth in the United States standards for the product, or the packer or distributor is subject to penalties for misbranding under the Federal Food, Drug, and Cosmetic Act.

Processors operating under the Department's continuous inspection service are privileged to display the prefix "U. S." in addition to the quality, such as, "*U. S.* Grade A" or "*U. S.* Fancy". Continuously inspected merchandise may also be identified by the statement "Packed under continuous inspection of the U. S. Department of Agriculture."

Objectives

These examples have been given to indicate how U. S. Standards and Government inspection may promote efficiency in marketing processed fruits and vegetables. In developing these standards and inspection services it is the earnest desire of the Department—

(1) To develop United States Standards for voluntary use in co-operation with industry and consumers, that

  (a) faithfully reflect the differences in market value, and

  (b) bring about a uniform quality description in simple, easily understood terms upon which satisfactory trading can be accomplished.

(2) To improve quality and processing techniques under the voluntary inspection service so that—

  (a) farmers and growers will be encouraged to deliver better raw products so as to receive market prices commensurate with quality;

  (b) high standards of sanitation may be maintained in processing consumer foods;

(c) packers and distributors may voluntarily label containers for better enlightenment of the buyer; and

(d) processors operating under the Department's continuous inspection may distinguish their products from others by use of the prefix "U. S." to indicate that the product was under inspection both during and after processing.

APPENDIX A

RESOLUTION CONTINUING THE JOINT LEGISLATIVE COMMITTEE ON NUTRITION

FEBRUARY 7, 1946

By Mr. Desmond:

Whereas, The join legislative committee to study nutritional problems, created by resolution adopted April sixteenth, nineteen hundred forty-two, continued by resolutions adopted March twenty-six, nineteen hundred forty-three, and March eighteenth, nineteen hundred forty-four, and further continued by resolutions adopted March thirteenth, nineteen hundred forty-five, has been actively engaged in studies and investigations of problems relating to nutritional deficiencies and their effect upon the health of our people, and

Whereas, The Committee has investigated the need for factory canteens, vitamin feeding of industrial workers, organization of the state's nutritional services, fortification of bread, need for school milk and lunch programs, and other nutritional problems, and

Whereas, Its reports to the Governor and Legislature have been highly commended by foremost nutritional scientists of the country, and

Whereas, Now in the post-war period there is grave danger that the tremendous strides made in the field of nutrition during the war will be lost, for federal food agencies lack a post-war nutrition program, and local nutrition committees throughout the state are in danger of collapsing, and

Whereas, There is an urgent need not only for the continuation of these nutritional activities but an expansion, particularly the development of a post-war nutritional program and the translation into state policy of many new and useful findings of scientists, and,

Whereas, Scientists in this state recently have developed a nutritional assay that permits for the first time accurate, quick appraisal of nutritional status of individuals, and this will provide an accurate determination of the nutritional needs of our people, and now, therefore, be it

Resolved (if the Assembly concur), That the joint legislative committee to study nutrition problems is hereby further continued with all its powers and duties as contained in the original resolutions, and that such committee shall submit its report, together with such legislative proposals as it may deem necessary, on or before March first, nineteen hundred and forty-seven, and be it further

Resolved (if the Assembly concur), That such inquiries shall, if feasible, include: (1) a nutritional assay of a cross section of the chil-

dren of this state; (2) a nutritional assay of expectant mothers; (3) a nutritional assay of factory and office workers; and (4) a nutritional assay of a cross section of the entire population of the state, and be it further

Resolved (if the Assembly concur), That the sum of twenty-five thousand ($25,000), or so much thereof as may be necessary, is hereby appropriated from the legislative contingent fund and made immediately available to pay expenses of the committee, including personal service, in carrying out the provisions of this resolution. Such monies shall be payable after audit by and upon the warrant of the Comptroller on vouchers certified or approved by the Chairman of the committee in the manner provided by law.

To Finance Com. Mar. 12 Rept. Adopted. In Assembly. Rules Com. Mar. 26 Rept. Adopted.

APPENDIX B

STATE OF NEW YORK

Nos. 405, 1803, 2703 Int. 404

IN SENATE

January 17, 1946

Introduced by Mr. DESMOND—read twice and ordered printed, and when printed to be committed to the Committee on Finance—committee discharged, said bill amended, ordered reprinted as amended, and when reprinted to be recommitted to said committee—committee discharged, said bill amended, ordered reprinted as amended, and when reprinted to be recommitted to said committee

AN ACT

To provide state aid for school milk and school lunches, and making appropriations therefor

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

Section 1. Statement of fact and purpose. It has been conclusively demonstrated by authoritative surveys and investigations that widespread malnourishment exists among the children of this state. This "hidden hunger" existing in childhood has been a major contributing factor to the development of many ailments in adult life and has resulted in large numbers of our youth being rejected as unfit for service in the military forces of our country. The serving of milk and lunches in our schools has been an effective means of combating this malnourishment. It has also served to encourage proper utilization of agricultural commodities, to aid farmers in long-term development of better domestic markets and to help farmers dispose of agricultural surpluses.

It is the purpose of this act to promote the health of our children by establishing the provision of school lunches and milk as a permanent function of our state government and it is the intent of this act to help give every school child access to a well balanced lunch.

§ 2. The sum of two million dollars ($2,000,000), or so much thereof as may be necessary, is hereby appropriated to the education department from any moneys in the state treasury not otherwise appropriated for the purpose of contributing toward milk and lunches in the elementary and secondary public schools of the state. Of the amount hereby made available, one-half shall be spent to provide milk for school children and one-half shall be spent to provide complete school lunches. One-half

of each such separate amounts hereby made available shall be allocated to schools in cities having a population of one million or more, and the balance shall be allocated to school districts outside of cities having a population of one million or more. The commissioner of education shall apportion each of such amounts so allocated among the school districts entitled thereto on a basis of the daily average number of meals served to pupils in each such district, and shall pay the amount so apportioned in the same manner as other public school moneys are paid under article eighteen of the education law. The moneys so apportioned and paid shall be in addition to any moneys otherwise available for the same purpose. The commissioner of education may in his discretion withhold from a school district the whole or a portion of the sums to be apportioned as herein provided for a failure on the part of the school authorities thereof to comply with such reasonable rules and regulations as he may prescribe.

§ 3. The sum of five hundred thousand dollars ($500,000), or so much thereof as may be necessary, is hereby appropriated to the education department from any moneys in the state treasury not otherwise appropriated for the purpose of contributing toward milk and lunches in the elementary and secondary school of the state, other than public schools, operated on a non-profit basis. The commissioner of education shall apportion each of such amounts so allocated among the schools entitled thereto on a basis of the daily average number of meals served to pupils in each such school, and shall pay the amount so apportioned to the school authorities thereof at the same time as public school moneys are paid to public schools under article eighteen of the education law. The moneys so apportioned and paid shall be in addition to any moneys otherwise available for the same purpose. The commissioner of education may in his discretion withhold from any such school the whole or a portion of the sums to be apportioned as herein provided for a failure on the part of the school authorities thereof to comply with such reasonable rules and regulations as he may prescribe.

§ 4. No portion of the moneys so allocated and paid as provided in sections two and three of this act shall be expended to provide more than one meal for the same child on the same day. No school district shall, because of the receipt of payments under this act, decrease in any way its contribution to school lunch programs. All schools receiving payments under this act shall offer milk or meals to children in attendance thereat, without cost to any child unable to pay, and without distinction or segregation of any sort between paying and nonpaying children. All payments made under this act shall be used only in extending the school lunch program, in providing free lunches to needy children, in reducing the price of meals to paying children or improving the quality of the meals.

§ 5. The sum of fifteen thousand dollars ($15,000), or so much thereof as may be necessary, is hereby appropriated to the education department from any moneys

in the state treasury not otherwise appropriated, for administrative expenses, including personal service, maintenance and operation and travel, necessary to carry into effect the provisions of this act.

§ 6. The several sums hereby appropriated shall be paid out of the state treasury on the audit and warrant of the comptroller, on vouchers certified or approved in the manner prescribed by law.

§ 7. If any clause, sentence, paragraph, section or part of this act be adjudged by any court of competent jurisdiction to be invalid, such judgment shall not affect, impair or invalidate the remainder thereof, but shall be confined in its operation to the clause, sentence, paragraph, section or part thereof directly involved in the controversy in which such judgment shall have been rendered.

§ 8. This act shall take effect April first, nineteen hundred forty-six.

EXPLANATION—Matter in *italics* is new; matter in brackets [ ] is old law to be omitted.

APPENDIX C

STATE OF NEW YORK

No. 411 Int. 410

IN SENATE

January 18, 1946

Introduced by Mr. DESMOND—read twice and ordered printed, and when printed to be committed to the Committee on Finance

AN ACT

Making an appropriation to the education department for promoting and supervising school lunch programs

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

Section 1. Statement of fact. It has been conclusively demonstrated by authoritative surveys and investigations that widespread malnourishment exists among the children of this state. This "hidden hunger" existing in childhood has been a major contributing factor to the development of many ailments in adult life and has resulted in large numbers of our youth being rejected as unfit for service in the military forces of our country. School lunches have served not only to make nutritionally efficient food available to the children of this state but also to help farmers dispose of agricultural surpluses and to aid farmers in the long term development of better domestic markets for agricultural commodities.

§ 2. The sum of thirty-five thousand dollars ($35,000), or so much thereof as may be necessary, is hereby appropriated to the education department out of any moneys in the state treasury not otherwise appropriated, in addition to all other appropriations heretofore or hereafter made to the education department, for the employment of school lunch supervisors, and necessary stenographic and clerical employees, and for other incidental expenses, including travel, which may be necessary for the promotion and supervision of the school lunch program.

§ 3. The moneys appropriated by this act shall be payable from the state treasury on the audit and warrant of the comptroller on vouchers certified or approved in the manner provided by law.

§ 4. This act shall take effect April first, nineteen hundred forty-six.

EXPLANATION—Matter in *italics* is new; matter in brackets [ ] is old law to be omitted.

APPENDIX D

STATE OF NEW YORK

No. 2408 Int. 2123

IN SENATE

March 6, 1946

Introduced by Mr. DESMOND—read twice and ordered printed, and when printed to be committed to the Committee on Finance

AN ACT

To amend the executive law, in relation to creating a nutrition council, defining its duties and powers, providing for the compensation of its members and employees and making an appropriation therefor

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

Section 1. Chapter twenty-three of the laws of nineteen hundred nine, entitled "An act in relation to executive officers, constituting chapter eighteen of the consolidated laws," is hereby amended by adding thereto a new article, to follow article fourteen, to be article fourteen-a, to read as follows:

ARTICLE 14-A

NUTRITION COUNCIL

Section 175. Statement of policy, findings and purpose.

176. State nutrition council.

177. Personnel.

178. New York state nutrition committee.

§ 175. Statement of policy, findings and purpose. Medical authorities report that large numbers of our people do not receive a diet adequate for vigor and health. At the same time our farmers are plagued recurrently with surpluses which are urgently needed by large segments of our population. Therefore, it is the intent of the legislature that every person in the state shall have access to an adequate diet, and that the administration of nutritional policies become a permanent and major function of state government. It is further intended that all of the state's nutrition work be integrated in a central agency which shall correlate and give direction to the nutritional activities of the various state departments and other agencies receiving state funds. This central agency should promote the proper usage of surplus farm products in diets and embark on a broad promotional campaign to improve the diets of workers in offices, stores and factories, families receiving low or moderate incomes, pregnant women and other special groups needing special nutritional attention.

§ 176. State nutrition council. 1. There is hereby created a state nutrition council which shall act as the central nutritional policy-making agency in the state. It is hereby vested with authority to coordinate all of the state's nutritional activities; conduct research or allocate a portion of its funds for research in nutrition; recommend reorganization of the state's nutritional activities; launch a widescale advertising, publicity and promotional compaign of instruction of the elements constituting a sound diet and the proper use of such farm products as may become surplus from time to time; to do such other things as the council may deem essential for improving the nutritional status of the people.

2. The council shall consist of three members, one of whom shall be the state commissioner of health and two shall be appointed by the governor. Of those appointed by the governor, one shall be from the faculty of the school of nutrition or college of home economics at Cornell university; and the other shall be a nutritional authority not presently in the state government. The state commissioner of health shall receive no additional compensation for his services as a member of the council but the members appointed by the governor shall receive the sum of twenty-five dollars per diem for each day they are actually engaged in the performance of their duties and all members shall be reimbursed for all necessary expenses incurred.

3. Each member shall serve for a term of three years and a vacancy in the council shall be filled for the unexpired term in the same manner as the original appointment was made.

4. The council may adopt such rules and regulations and perform such other duties as may be deemed necessary to carry out the provisions of this article. Once each year the council shall make a report to the health commissioner of its activities and findings.

§ 177. Personnel. The council shall appoint a nutrition coordinator who shall receive the sum of ten thousand dollars per annum, to administer the policies of the council. The coordinator shall appoint such clerical, technical and professional assistants as shall be necessary to effectuate the purposes of this article.

§ 178. New York state nutrition committee. The New York state nutrition committee as presently constituted is hereby continued. The committee shall advise with the state nutrition council, hereby created by this act, concerning any and all matters that come within the purview of this article.

§ 2. The sum of one hundred thousand dollars ($100,000), or so much thereof as may be necessary, is hereby appropriated to the state nutrition council in the executive department out of any moneys in the state treasury not otherwise appropriated, for the purpose of carrying out the provisions of this article. Such moneys shall be payable on the audit and warrant of the comptroller on vouchers approved in the manner prescribed by law.

§ 3. This act shall take effect immediately.

EXPLANATION—Matter in *italics* is new; matter in brackets [ ] is old law to be omitted.

APPENDIX E

STATE OF NEW YORK

G. O. 1091 Nos. 2411, 2811 Int. 2126

IN SENATE
March 6, 1946

Introduced by Mr. DESMOND—read twice and ordered printed, and when printed to be committed to the Committee on Agriculture—reported favorably from said committee and committed to the Committee of the Whole. Committee of the Whole discharged, bill amended, ordered reprinted and recommitted to said Committee of the Whole

AN ACT

To amend the agriculture and markets law, in relation to inspection of food used in state institutions

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

Section 1. Section two hundred eighty-four of chapter forty-eight of the laws of nineteen hundred twenty-two, re-entitled by chapter two hundred seven of the laws of nineteen hundred twenty-seven "An act in relation to agriculture and markets, constituting chapter sixty-nine of the consolidated laws," as amended by chapter two hundred seven of the laws of nineteen hundred twenty-seven, is hereby amended to read as follows:

§ 284. Examination of food used in state institutions; farms at state institutions. The commissioner [may] *shall* examine food or food products produced or secured for use in the state institutions *including the inspection of premises where and the conditions under which food is prepared, processed, served or stored in such institutions* and make or cause to be made such other examinations as he may deem wise or as the facts seem to necessitate and warrant relative to such food and food products and relative to the agricultural methods at all farms connected with the state institutions under the jurisdiction and control of the department of charities, the department of mental hygiene, the department of correction and the division of military and naval affairs in the executive department and report the results of such examinations and make recommendations thereupon to such departments and division respectively. For the purpose of assisting the commissioner in the performance of duties au-

thorized by this section, the heads of such departments and division respectively shall secure and transmit to the commissioner such available appropriate information and render such other assistance as the commissioner may call for.

The commissioner shall give such directions as in his judgment are deemed best to each superintendent, warden, or other person in charge of the several farms connected with the state institutions above mentioned as to proper care and development of farm lands and as to kind, production and disposition of crops, stock and produce and all other matters connected with the management of such farms; which directions when issued shall be made effective by such superintendent, warden or other person in charge of such farms.

No land shall hereafter be purchased by the state for farm purposes connected with any of the above institutions without the approval and appraisal of the commissioner.

§ 2. This act shall take effect immediately.

EXPLANATION—Matter in *italics* is new; matter in brackets [ ] is old law to be omitted.

APPENDIX F

STATE OF NEW YORK

No. 2409 Int. 2124

IN SENATE

March 6, 1946

Introduced by Mr. DESMOND—read twice and ordered printed, and when printed to be committed to the Committee on Finance

AN ACT

To amend the correction law, in relation to the appointment of a nutritionist, and making an appropriation therefor

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

Section 1. Chapter forty-seven of the laws of nineteen hundred nine, re-entitled by chapter two hundred forty-three of the laws of nineteen hundred twenty-nine, "An act in relation to the correction and detention of persons in state correctional institutions, constituting chapter forty-three of the consolidated laws," is hereby amended by inserting therein a new section, to be section fifteen-c, to read as follows:

§ 15-c. Nutrition. The commissioner may appoint a director of nutrition and fix his compensation within the amount appropriated therefor. The director of nutrition shall be a person qualified by training and experience to perform the duties of his office. The director shall advise the commissioner as to the most improved methods of purchasing, preparing and storage of foods for use of the inmates in the state correctional institutions.

§ 2. The sum of five thousand dollars ($5,000), or so much thereof as may be necessary, is hereby appropriated to the correction department out of any moneys in the state treasury not otherwise appropriated and made available for personal service in carrying out the provisions of section fifteen-c of the correction law, as added by this act. Such moneys shall be payable from the treasury on the audit and warrant of the comptroller upon vouchers approved by the commissioner of correction in the manner provided by law.

§ 3. This act shall take effect immediately.

EXPLANATION—Matter in *italics* is new; matter in brackets [ ] is old law to be omitted.

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Additional copies of this report are available free of charge by writing to State Senator Thomas C. Desmond, Chairman, New York State Joint Legislative Committee on Nutrition, 94 Broadway, Newburgh, New York