

Need for Research in Nutrition

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Civil defense planning, both in broad general outlines and in terms of each community, should include provision for emergency feeding of all segments of the population under a great variety of conditions that may reasonably be anticipated. The problem includes consideration of such factors as economic costs, organizational requirements, provision for adjustments of authority, equipment and supply requirements, utmost sparing of unnecessary risks to health, and the maintenance of civilian morale and efficiency.

Plans must be developed to meet possible emergencies on the basis of knowledge at hand, but there are many important specific areas in which research is needed to permit improvements beyond the measures that can be agreed upon at present.

Nearly all of the topics cited below are being studied in one or more laboratories. On the basis of anticipated rates of progress, however, it is believed that increased research is urgently needed to guide improvements in plans for food production, processing, distribution, stockpiling, and especially for efficient disaster service.

Bombing, Plant Explosions, and Incendiarisms

Burns

Recent findings, such as those of Rosenthal, have indicated that even simple measures, like the copious drinking of salt-and-soda water, are of practical advantage as early therapeutic measures for burns. Several investigators have reported that there is need for generous ingestion of good quality protein foods and an adequate source of calories to supplement blood

transfusion and other emergency measures (S. M. Levenson et al.).

Additional information is needed with regard to (a) electrolyte metabolism and therapy, including consideration of potassium, sodium, magnesium, calcium, and acid-base balances; (b) the time factors for each of the related therapeutic measures to promote convalescence through successive periods after initial emergency treatment; and (c) the most favorable times for supplying protein, fat, carbohydrate, and vitamin intakes after the initial emergency period, and the optimum quantities of these substances, to promote convalescence. The high protein foods, such as milk, eggs and meat, offer physiological advantages, but they also present many difficulties with regard to cost, storage, sanitation, service, and acceptance under disaster conditions of feeding. Parenteral administration of fat offers promise as an emergency measure in supplying calories, but extensive research and testing are still necessary before introduction of such products into widespread clinical practice.

A careful study should be made of the optimum physiological use of foods, and then of the specific food commodities that would afford maximum practical utility under disaster conditions of feeding. This area of research should include, first, special consideration of the critically injured, but it should also include the less severely injured infants, children, and mothers, the sick, and the aged.

Traumatic and Surgical Shock

Additional information is needed concerning the specific nutrients and practical foods that would be of greatest value in promoting convalescence from shock and concerning the rates at which high caloric feeding should be resumed after initial emergency treatment. These therapeutic measures should be studied independently of research on burns, even though the findings might be very similar in

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specific instances. There is information to support the use of foods high in protein, but the ratios to available carbohydrates and the rate of increasing the caloric content are not well defined.

Radiation Sickness

Numerous claims have been reported in the literature concerning practical benefits to be derived from increased protein, vitamin, and other nutrient intakes. Most of the claims, such as those involving polyphenols, vitamin B₁₂, ascorbic acid, glutathione, cysteine, glucuronic acid, and methionine, have not been adequately confirmed or disproved either for animals or for man. Hence, a systematic study of the individual vitamins and other nutrients should be undertaken to supplement the information that has been reliably established. Each substantial lead should be tested clinically at the earliest opportunity under the auspices of investigators whose work will be widely accepted. The nature of the problem makes it evident, however, that most of the work must be done with experimental animals, rechecking with different species.

Both preventive and therapeutic aspects of the problem should be studied, first in terms of specific nutrients and then with reference to acceptable and available commodities.

Biological Warfare

Special diets were found to have a significant bearing upon convalescence from infectious hepatitis during and after World War II, but there does not seem to be adequate evidence concerning emergency and convalescent diets that would be of benefit in the event of biological warfare attacks. Biological warfare agents which might be used include bacteria, toxins, hormones, and viral agents. At least one very promising lead has developed with regard to virus infection injury and another dealing with bacterial infection. In neither case has the specific nutrient been identified.

Prospects to be studied should include the large-scale use of sulfa drugs and antibiotics. Assured techniques, qualified personnel, and specific plans for rapidly sampling and testing foodstuffs, soil, water, and the atmosphere for

actual or suspected contamination should also be made available.

Chemical Warfare

Emergency and convalescent diets should be evaluated for each major type of chemical warfare agent that can be anticipated. There is reasonable expectation that the dietary measures that would be effective in aiding recovery from exposure to the various types of chemical warfare agents, such as nerve poisons, respiratory poisons, surface irritants, and specific kinds of radiation poisoning, would differ.

Frost Injury and Cold

Claims have been made for dietary measures that afford significant protection against impairment from exposure to cold, or that promote convalescence following injury. A few of the findings appear to be reliable and of practical value, but most of the reports have not been verified (or disproved) to a degree that would guide practical measures. If there should be prolonged warfare in arctic, subarctic, or high-elevation areas, or during a winter season in the temperate zone, information of this type would be of value to both civilian and military personnel. Among the nutrients for which claims have been made, for example, are high-carbohydrate meals, ascorbic acid, vitamin B₁, vitamin B₁₂, pantothenic acid, and vitamin B₆.

Starvation

Presumably there is little immediate risk of severe or chronic starvation of the civilian population within such areas as the United States and Canada. This Nation, however, may be called upon to feed large masses of partially starved civilians in other areas or to feed released civilian groups from military areas, so it is of critical importance that reliable information be at hand to guide feeding practices (a) during recovery from starvation; (b) during periods of severe demands upon total food resources when work output is urgent; and (c) to permit the most efficient adjustment of international food resources in all allied areas, in-

cluding those from which shipments are made.

A major consideration in this field of research is the merit of foods high in animal protein, vitamins, and mineral elements (recommended by many experienced clinicians) compared to low-cost, high-calorie foods, such as the cereals and oils, in achieving optimum convalescence from general starvation. More specifically, the problem is one of having available adequate data so that agreement may be reached among scientists, military officers, and civilians regarding an optimum adjustment of the ratio of calories to other nutrients under widely varying conditions of economic and physiological stress.

Another area for research deals with the requirements to conserve reasonable work output, health, and morale among population groups, adapted to varying degrees of limitation in food resources. This problem may become of strategic importance in the Far East, Near East, and many other sections.

Intravenous Feeding

For convalescent feeding of nearly all victims of simple starvation, intravenous feeding is not advised. However, for relatively rare individuals who cannot ingest food, there is need to develop satisfactory materials and procedures for intravenous feeding to prevent severe body weight loss and extreme weakness. Encouraging headway has been made in the use of fat emulsions, but the problem is not solved to an extent that would permit efficient large-scale production of materials.

Protein Deficiency

There is need to develop an objective and reasonably specific measure of protein deficiency that could serve both in mass nutrition studies and in individual studies. Serum albumin and globulin values do not furnish a satisfactory index of protein adequacy. Possibly electrophoretic and ultracentrifuge studies would permit identification of definite fractions whose variation would correspond in reasonable degree with the quality and quantity of protein ingested.

These studies could well be coordinated with

a comparable approach to identification of the specific blood protein changes during severe catabolic and delayed anabolic phases of protein metabolism induced by stress.

Resistance to Stress

Adrenocortical functions appear to be of major importance in recovery from severe stress and shock induced by burns, trauma, hemorrhage, toxic materials, emotional stress, and exposure to cold. There is incomplete evidence that specific nutrients or groups of specific nutrients, including pantothenic acid, ascorbic acid, pyridoxine, polyphenols, riboflavin, vitamin B₁₂, choline, glucuronic acid, amino acids, fatty acids, and electrolyte balances, are important factors in building and protecting the defense mechanisms. Basically, each essential nutrient is probably necessary for normal functioning of all body tissues, including the specialized organs, but there is immediate need to gain a more specific and quantitative appraisal of the effect of transitory or long-continued high- and low-nutrient intakes upon resistance to specific stresses and upon the subsequent course of recovery. Quantitatively, at least, there is wide variation among the specific nutrients and among the different tissues.

Dehydrated Milk

Of the food commodities that have greatest promise of meeting civilian needs for disaster feeding, in addition to meeting demands for national health and economy during a long period of war or threatened war, dehydrated whole milk of high acceptability and dry, non-fat milk solids are perhaps the most crucial. Both products are needed as supplements to fresh, frozen, sterilized, and evaporated milk.

A specific problem beyond nutrient and flavor changes, in great need of solution, is to find how to dehydrate milk in a manner that permits rapid and satisfactory rehydration, free from visual defects and "chalkiness." This problem merits increased attention by scientists highly trained in colloid chemistry, working in liaison with others who are familiar with the biological and engineering aspects of the problem.

Emergency Testing

Simple, rapid clinical tests that could be used by technicians and nursing personnel should be developed for use in disaster areas, to gauge the status of emergency patients and thus facilitate their proper immediate care and establish priority of assignment to professional medical personnel. It is impossible for physicians in a given area to reach, examine, and diagnose patients rapidly enough to permit efficient care. Life and death decisions must be made quickly, and there now is no basis upon which to act with sufficient rapidity and accuracy.

Antibiotics

Intensive and prolonged use of antibiotics and sulfa drugs can have a marked effect, either favorably or unfavorably, upon nutritional requirements. These relationships should be studied as a guide in practical situations and as a means of discovering the basic relationships that underlie the observed effects. Furthermore, in the event of biological warfare or tropical warfare, this area of subject matter is likely to have first-rate importance.

Nutrition Surveys

Long-continued stress upon food resources would greatly increase the need for conducting and interpreting systematic nutrition surveys in diverse parts of the world. The requisite techniques, personnel, and plans should be developed, and initial surveys should be made to provide a reliable background for appraising trends in nutritional status.

Reference Data

Reference data pertaining to emergency care should be assembled, distributed, and used as a basis for training in each local and larger area. Broad and general plans can be developed on a national or international scale, but such plans alone will not suffice. Food resources, service facilities, stocked supplies, procedures, reserve transportation, and personnel will vary greatly from one community to another, so the available resources cannot be used efficiently unless the requisite data are properly assembled, organized, and distributed to responsible personnel in advance, on a community basis. Furthermore, there is the possibility that major fractions of entire communities may be rendered nonavailable for service, in a matter of seconds.

Conclusion

It is recognized that much work is under way relative to the topics outlined above, but there is urgent need for extending current activities in the directions indicated. On the more comprehensive and more urgent problems, additional groups should be organized to complement work already initiated.

It is respectfully suggested, also, that specific provision be made for coordination of food and nutrition research, including the independent universities and colleges, government agencies, and fund-granting agencies, to provide the greatest possible efficiency in the placement of funds and in the correlation of progress by independent groups working toward common objectives.

Other Papers on Conference

In addition to the papers from pages 607 to 643 other material on nutrition and emergency feeding problems, presented at the London Food Conference, will be published in subsequent issues of the *Public Health Reports*. Among these are "Special Feeding Problems in an Emergency," by Dr. Roy E. Butler, "Dietary Standards in the United States," by Dr. L. A. Maynard, and "Family Food Consumption Studies," by Dr. C. M. Coons.