Special Feeding Problems in an Emergency

By ROY E. BUTLER, M.D.

Much has been done to investigate the special feeding problems anticipated in a severe emergency, but much needs to be done before we are fully competent to handle them. In discussing special feeding problems, I have necessarily drawn heavily on the writings of others with more experience in these fields.

Those of us who have faced the crises of a severe emergency realize full well that previous plans are often abandoned. Instead of clockwork action, there ensues a period of frantic improvising, when available supplies and personnel are insufficient. However, plans are not wasted if they can serve as a framework for amended plans and thereby expedite a reasonable solution of the problems created by the violent disruption of normal activities. One uses what is available and hopes for the best.

Emergency Institutional Feeding

At the time of disaster, the dietary department of a hospital, and of other institutions as well, can provide prompt emergency food service to many casualties in addition to the patients, hospital staff, and volunteer workers (*1*).

It is essential that the hospital dietary department be represented on any over-all emergency planning committee for coordinating dietary activities with other hospital services. There should also be a planning committee in the dietary department, composed of dietitians and representatives of the nonprofessional hospital staff and of the volunteers.

Detailed plans for an emergency food service would include menus to be served, items to be discontinued, kitchens to be used, foods to be stocked and requisitioned, measures for protecting food from contamination, details of the food service, personnel required and their duties, training of dietary staff for specific duties, instruction on water conservation and accident prevention, preparation of designated infant formulas, and space for each function.

Emergency planning for institutional feeding should also consider the preparation of one-dish meals from customary food supplies.

A useful exercise is to inventory hospital food supplies for any one day. Its usefulness can be increased by planning menus for a 3-day period, using the average population of the hospital, then doubling or tripling that number. Such a hypothetical problem may reveal the need for a limited stockpiling of necessary foods; one example—the supply of powdered skim milk may make the difference between an adequate and an inadequate diet.

Plans for personnel staffing are perhaps the most important item, inasmuch as adequate numbers of well-trained, dependable people will mean the difference in service between efficiency and chaos. A staff of well-trained members is the result of adequate planning and instruction. The staff should be able to function under fairly primitive conditions.

In cooking outdoors over improvised stoves, can the staff maintain sanitary conditions? Will they be alert to possible contamination?

Dr. Butler, a member of the health emergency planning staff in the Office of the Surgeon General, Public Health Service, prepared this material for presentation at the Combined Conference on Administrative and Scientific Aspects of Food in Civil Defense, held in London, November 26 to December 13, 1951 (see Public Health Reports, July 1952, p. 607).

Will they be aware of practicable correctives?

Staff training under simulated emergency conditions will point up areas in which there is lack of understanding and insufficient information.

Special Disaster Diets

Nutritional considerations are included in the therapy of burns, radiation damage, fractures, shock, and other trauma under emergency conditions.

Burns

As a basis for discussing nutrition in the therapy of burns, I have turned to the "Symposium on Burns" of the National Research Council (*2*).

Malnutrition frequently develops after severe burns. Prevention efforts should be instituted early and continued throughout the healing process. A coexisting anemia is associated with burns, which may be partly connected with an improper dietary intake. The treatment of a burn should be directed toward the rapid restoration of the normal anatomical structure.

Of probable importance to an individual's recovery following thermal burns is nitrogen metabolism. Severe burns result in significant nitrogen depletion. The loss of nitrogenous compounds depends upon the degree of the burn, the extent of burn, and the presence of infection. Nitrogenous products are lost from the surface of a burn. There is also an increased urinary excretion of nonprotein nitrogen, which begins a few days after the burn, reaches a maximum in 10 days, and lasts for several weeks.

The negative potassium balance, which is observed during the first few days after the burn, may be overcome by the oral administration of potassium. No relation exists apparently between the potassium depletion and the nitrogen depletion. The former is rapidly corrected while the latter lasts several days to a week or more.

Information is much more complete for sodium potassium and chloride depletion than for the other minerals.

Changes in the carbohydrate metabolism as manifested by hyperglycemia, lactacidemia, and lowered CO_2 (carbon dioxide) combining power are frequently observed following burns. These changes may last for several days and may result from gluconeogenesis and peripheral carbohydrate breakdown.

The vitamin requirements of patients with burns and their metabolism have not received adequate study. Some studies have been made of ascorbic acid, riboflavin, thiamine, and nicotinamide with respect to urinary excretion and load tests for saturation.

The dietary requirements for burn patients seem definitely to be higher than for normal patients. The diet should be well balanced, with adequate amounts of protein, carbohydrate, fat, minerals, and vitamins. Oral feeding of burn patients is preferable, but other methods may be used such as gastric, jejunal, and parenteral feedings, alone or combined. The optimum amounts for feeding have yet to be determined.

There is some lack of agreement about the time of beginning the higher intake of food. Some believe it should be delayed a day or two. Others believe it should be started as soon as possible. However, children were maintained in good nutritional condition following severe burns when they received from the beginning an intake one and one-half times the National Research Council optimal recommendations for normal children. Men who have been given 1.5 grams of protein and 45 calories per kilogram of body weight from the start showed some nutritional depletion. However, they showed less depletion than if the food intake had been started later.

Oral intakes at high levels are well tolerated when given soon after the burn. A delay of several days may be followed by gastrointestinal upsets. In such cases, continuous gastric drip feeding may be acceptable. If the intake levels are increased to 70 calories and 2 grams of protein per kilogram of body weight, continuous gastric feeding will not be tolerated by some adult patients.

Liquid diets with a reasonably acceptable mixture of the nutrients needed are considered practical for treating burned patients over long periods. Protein is provided in liquid diets through the liberal use of milk solids. Additional quantities of carbohydrates, fat, miner-

als, water, and vitamins will make a reasonably complete food. But the possibility of urinary calculi may be aggravated by the presence of calcium and phosphorus in large quantities of milk. Peanut butter has been suggested as a source of protein with a low calcium content.

Gavage feeding through an inlying gastric tube can be used wherever it is impossible, or inadvisable, to take food orally. Feedings of this type should be frequent at first and small in quantity, with a gradual increase in amounts over several days. The gastric tube may be left in place and removed only for weekly cleaning.

The drip apparatus may be used instead of feeding the liquid mixture in intermittent doses. Because of their high solubility and tolerance, hydrolyzed protein preparations are useful in gavage feeding. Tube feedings, either through small-caliber plastic tubing or rubber Levine tubes, may be continued for as long as 3 to 5 months. A liver protein preparation may be used because of its nutritional value and its low calcium content.

Fat supplies 20 percent of the calories in both tube and oral feedings. If fat absorption is impaired or faulty, an emulsifier such as Tween 80 or a finely homogenized oil may be added to the food.

Frederick J. Stare (*2*) has conducted studies on the intravenous and oral use of fat emulsions. He believes that the body uses the fat emulsion efficiently without side reactions. Coconut oil, with most of the particles less than a half micron, is mixed with a phosphatide preparation and a polyglycerol ester of oleic acid, as a costabilizer, to form the basis of the emulsion. Glucose and some water are added to give isotonicity to the emulsion. Stare has also studied the oral use of fat emulsions for increasing the caloric intake.

Radiation

In the event of radiation injuries, the diet should be a well-balanced one, rich in minerals and vitamins. To avoid the development of intestinal ulcers, it would be advisable to reduce roughage in the diet. There is little indication that such hematopoietic agents as folic acid and vitamin B_{12} would be effective. Likewise, iron, or diets rich in iron, would seem useless until blood regeneration is observed.

Available data (*2*, *3*) suggest that individuals in good nutritional status resist radiation injury better and that morbidity and mortality rates are lower for individuals whose nutritional states are maintained at high levels after injury.

The optimum caloric intake and the proper proportion of the nutrients needed has not been determined. If the patient has combined thermal and radiation injury, oral feeding may be difficult because of the gastrointestinal upsets which follow radiation injury.

The urinary output should be maintained by an adequate intake of fluids. The acid base equilibrium can be maintained by laboratory-controlled administration of electrolytes.

A nitrogen deficit may be relieved by amino acid preparations, hydrolyzed proteins, or protein-rich foods. Restricting the sodium chloride intake may assist in preventing edema.

Fractures

In fracture cases, the patient's diet should be adequate, and its caloric content should be consistent with energy expenditures. For many years, diets to expedite the healing of fractures have been debated. Some have favored a high calcium diet because it seemed logical that a greater calcium intake would be beneficial in the presence of lesions. Others have felt that vitamin D should supplement the diet. It can be said, however, that a sufficient amount of calcium or vitamin D is commonly supplied by adequate diets and sunshine. Nor is it thought that a fracture gives rise to increased requirements. Undoubtedly, there are other dietary factors given especial powers by some physicians. Malunion or un-united fractures are sometimes attributed to a faulty diet. Far more frequently, however, the fault lies in the failure to hold bone fragments in alinement.

The immobilization of a limb, or of an individual, may produce physiological difficulties. A leg or arm immobilized in traction or plaster without proper physiotherapy will show evidence of wasting of the soft parts and decalcification of bone. In leg fractures, it was found that disability was reduced by using pins to transfix bone fragments and by placing walking calipers in the plaster cast to permit free movement. When the fracture healed and the cast

was removed, the leg was found to be in better condition than those legs which had been immobilized in plaster for several weeks.

Individuals immobilized for fractures of the femur, it has been observed, are soon found to be in negative nitrogen balance. This condition apparently has no adverse effect on the healing of the fracture, but it may contribute to the weakness and debility which follow the inactivity attendant upon healing. That the negative balance can be changed to a positive nitrogen balance by sufficiently increasing the protein intake is a matter undergoing intensive study.

Shock

Shock is usually treated as a surgical or medical problem in which the therapeutic measures are well established. In an acute emergency there may be, however, shortages of blood, plasma or blood expanders, intravenous sets, and facilities for their use. The Public Health Service has found the oral administration of a salt solution to be of value in treating shock. A simple remedy, the solution uses familiar and readily available compounds: 1 level teaspoonful salt; one-half teaspoonful soda, and 1 quart water. Still the subject of study, and not a substitute for blood, the simple salt solution may temporarily tide an individual over until a transfusion can be given.

The National Research Council subcommittee on shock has recommended the manufacture of dextran as a blood expander in the treatment of shock. Dextran is thought to be well metabolized in the body and can be administered with relatively few side reactions. Other promising substances are under investigation.

Therapeutic Diets

Peptic Ulcer Patients

A regimen of frequent feedings of milk and cream for peptic ulcer patients would not be possible during the disruption of war. For their treatment these patients would find it necessary to depend upon antacids and coating substances. The danger of hemorrhage would not increase much with this course of action. Obviously, surgery should be reserved only for extreme cases.

Many ulcer patients, if not seriously ill, would want to assist in civil defense. They would be expected to eat whatever food was available. The enthusiasm of some ulcer patients for their civil defense duties might even lead to the complete disappearance of the ulcer symptoms.

Diabetic Patients

According to estimates, there are about one million known diabetic patients in the United States (*4*). As many again are believed to be undiscovered or not under medical care. About 70 percent of the known patients are taking insulin daily, a percentage which would undoubtedly be increased in an emergency: burns and other injuries would increase insulin requirements.

Patients who control their diabetic condition can serve usefully in civil defense or in industry. Complete understanding of their own disease and its treatment is their best safeguard.

For prompt recognition in an emergency, a diabetic patient should carry proper identification. To protect himself, he should also have a reserve stock of insulin sufficient to last a month or two, a simple test kit for glycosuria, and an extra insulin syringe and needles.

The education of the diabetic patient should be directed to the end that each one will be fully aware of the measures he must take before any emergency arises. He should know how to control his diabetes by diet alone if insulin is not available. Personnel with the task of feeding evacuees and casualties should receive rudimentary instructions on diets for diabetic patients. Such training applies more to personnel in emergency hospitals than to those in general hospitals where personnel and facilities for the proper handling of diabetes are likely to be present.

All diabetic diets should be nutritionally adequate. The diet most commonly used by physicians is one with protein (1 gram per kilogram), carbohydrate from 120 to 250 grams, and fat contributing 40 to 55 percent of the calories. In this diet protein meets all requirements. A pint of milk supplies the necessary calcium. Vitamin requirements are met without difficulty.

Another commonly used diet has fat supplying 20 to 25 percent of the calories; carbohydrate, 60 percent. With a diet supplying be-

tween 1,600 and 2,400 calories, the carbohydrate intake would amount to 240 to 380 grams a day.

There is a third type of diet which does not differ from a normal diet, where fat would contribute 35 percent, and carbohydrates, 50 percent of the calories.

Tuberculous Patients

In an emergency, the rich diet of the tuberculous patient must necessarily be restricted. During normal times, his diet would be high in calories and well balanced as to mineral and vitamin content, with emphasis on the protein component. Only an approximation of this diet may be available in an emergency, and the degree attained will depend on the food stocks at hand. Supplemental vitamins and minerals may bolster a diet otherwise lacking in these factors. For short-term emergencies, moderate to severe deprivation probably will not result in irreparable damage. Patients with fever will have an increased metabolism which will accentuate the need for additional food.

Conclusion

In general, I am in agreement with the philosophy of the Federal Civil Defense Administration as expressed in the manual on "Health Services and Special Weapons Defense" (*5*).

The Federal Civil Defense Administration recognizes that special therapeutic menus need not be provided immediately after a major disaster. For experienced nutritionists and dietitians to be assigned at such a time to the procurement of special foods would be impracticable. Conditions for which special diets are usually prescribed could be controlled temporarily with drugs and medicines until an orderly flow of food supplies is re-established.

REFERENCES

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(*3*) Cronkite, Eugene P.: Radiation illness: Its pathogenesis and therapy. *In* Atomic medicine, by C. F. Behrens. New York, Thomas Nelson and Sons, 1949, pp. 146–162.

(*4*) Emergency medical care of diabetics in civilian defense. Statement by the Committee on Emergency Medical Care of the American Diabetes Association, Inc. J. A. M. A. 147: 1350–1354 (1951).

(*5*) U. S. Federal Civil Defense Administration: Health services and special weapons defense. Washington, D. C., U. S. Government Printing Office, 1950. Manual AG–11–1.

New Chief of Division of Dental Public Health

Dr. Thomas L. Hagan was appointed chief of the Public Health Service's Division of Dental Public Health in June 1952. He succeeds Dr. John W. Knutson, who was named chief dental officer of the Public Health Service.

Entering the Public Health Service in 1929, Dr. Hagan became a member of the commissioned corps in 1930. He has served as dental clinician in Public Health Service hospitals in Boston, New York, Pittsburgh, and Louisville, as dental consultant in regional offices in New Orleans and Atlanta, and since 1950, as assistant chief of the Division of Dental Public Health and dental consultant for Federal Security Agency Region III.

Dr. Hagan graduated from the Georgetown University Dental School and obtained a master's degree in public health at the University of Michigan.