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PREVENTION AND TREATMENT OF SEVERE MALNUTRITION IN TIMES OF DISASTER

Report approved by the
Joint FAO/WHO Expert Committee on Nutrition
and presented to the
Fourth World Health Assembly

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PREVENTION AND TREATMENT OF SEVERE MALNUTRITION IN TIMES OF DISASTER

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PREVENTION AND TREATMENT OF SEVERE MALNUTRITION IN TIMES OF DISASTER [a]

The Third World Health Assembly briefly considered the subject of the prevention and treatment of severe malnutrition in times of disaster and requested the Director-General to refer it to the Joint FAO/WHO Expert Committee on Nutrition for further study [b] with special attention to the following aspects of the problem :

(*a*) Recommendations concerning the storage of food by governments as well as by private persons, in order to diminish the risk of severe malnutrition and starvation ;

(*b*) The overall measures to be taken in planning the conservation and distribution of available stocks of food so as to prevent starvation and severe malnutrition in populations living under conditions of severe lack of food ;

(*c*) The proper treatment of patients suffering from starvation ;

(*d*) Measures to be taken during relief activities to prevent the deterioration of the physical and mental state of persons suffering from varying degrees of undernutrition in the different types of famine ;

(*e*) The organization of general relief activities in relation to nutrition when famine conditions prevail, and

(*f*) Any other measures that might be deemed recommendable for the prevention of disease and death caused by severe malnutrition and starvation.

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[a] The Fourth World Health Assembly adopted the following resolution :

The Fourth World Health Assembly

1. NOTES the report on the prevention and treatment of severe malnutrition of civilian populations during war periods ;

2. NOTES with pleasure that it was the result of a joint study organized by FAO and WHO ;

3. THANKS the experts for their work ;

4. REQUESTS the Director-General, when arranging for the publication of this report, to change the title to read "Prevention and treatment of severe malnutrition in times of disaster" ;

5. REQUESTS the Director-General to draw the attention of governments and the International Committee of the Red Cross to this report.

(Resolution WHA4.8, *Off. Rec. World Hlth Org.* **35**, 19)

[b] *Off. Rec. World Hlth Org.* **28**, 29

It was considered that, for the purpose of study, the whole problem could be divided into three sections, so that section 1, covering items (*a*) and (*b*), dealt with the broad subject of food management during times of disaster, section 2, covering items (*c*), (*d*), and (*f*), related to the physiological, clinical, and therapeutic aspects of the problem, and section 3, limited to item (*e*), discussed the organizational aspects of relief programmes. The Director-General called together a group of consultants to consider sections 1 and 3, and requested Professor Ancel Keys, Director, Laboratory of Physiological Hygiene, University of Minnesota, Minneapolis, USA, to prepare a preliminary statement on those aspects of the problem in section 2.

Reports prepared by the group of consultants and Professor Keys were considered by the Joint FAO/WHO Expert Committee on Nutrition at its second session, held in April 1951.[c] The reports were endorsed by the committee, which transmitted them to the Director-General of WHO. The committee emphasized the fact that the principles and procedures outlined in the reports would require adaptation to the needs of different countries.

1. FOOD MANAGEMENT [15, 17, 24, 27, 46]

(*a*) Recommendations concerning the storage of food by governments as well as by private persons, in order to diminish the risk of severe malnutrition and starvation;

(*b*) The overall measures to be taken in planning the conservation and distribution of available stocks of food so as to prevent starvation and severe malnutrition in populations living under conditions of severe lack of food.

1.1 Introduction

Both items are concerned with the broad subject of " food management " and involve problems relating to food production, procurement, storage, and distribution. The comments are, however, limited to those aspects which relate to disruption of food supplies subsequent to the outbreak of war in any part of the world or a natural catastrophe such as the failure of crops, earthquake, or drought. No attempt has been made to provide solutions for problems associated with chronic food shortages nor to indicate the steps necessary to raise standards of living.

The following general comments may be made at the outset. Measures can be taken to prevent food shortages or limit their severity before they arise, but shortages may occur in spite of preventive steps, and further measures will then be needed to make the best use of the food supplies that are available. If these fail, and food shortage becomes so severe that an organized programme of relief feeding becomes necessary, a new stage

[c] See *World Hlth Org. techn. Rep. Ser.* 1951, **44**, 34.

will be reached. This will involve special measures which differ from those needed in less severe food emergencies, but problems of production, procurement, and storage do not lose their importance when direct relief is organized ; in fact, the graver the emergency, the more important they become.

Governments cannot accurately forecast the nature and extent of the emergency with which they may be faced. Food shortages may arise from the cutting-off of food imports, disorganization of transport, destruction of crops and farm tools and machinery, scattering of agricultural workers, lack of fertilizers, confiscation of food, and various other causes. Moreover, the impact of these on the food situation in any country will depend on many internal factors, particularly on the degree of self-sufficiency in food supplies and the potentialities for increasing food production.

It is therefore impossible to suggest specific and " model " plans and programmes for meeting food emergencies which will be applicable in all countries and for all eventualities. This can be achieved only by setting up suitable national administrative machinery with necessary power to prepare for and deal with emergencies which might arise. All plans must be flexible and made well in advance. Experience during the last decade has shown that, even when a satisfactory broad plan of action has been formulated and is being followed, new ad hoc action is continually needed to meet current changes in the situation.

Some general principles which can be followed in drawing up and carrying out plans and programmes are outlined below and some indication is given of the appropriateness of these in different circumstances.

1.2 Organization and Administration

The first step in any country is for an appropriate person or body to be given the responsibility for drawing up the necessary plans. This may be an able official or prominent individual, a co-ordinating ministry, or an interdepartmental committee. The administrative machinery adequate for the task of handling an emergency should be organized in the preparatory period. In addition, administrative procedures must be prepared so that plans can be put into effect immediately an emergency arises. The creation of a special Food Ministry or a special Food Department in the Ministry of Agriculture, if this does not already exist, may be a necessary step. It is essential that the responsible official or unit should have sufficient authority to review any situation as it changes and take whatever action may be necessary.

The central organization that carries these responsibilities needs to have standing scientific committees to advise on the nutritional aspects of the food and agricultural programme. The functions of such committees

would include the periodic assessment of the nutritional status and general health of the population.

The organization of an effective total economy under emergency conditions can be brought about only when there is full co-ordination and co-operation between the various branches of government responsible for different aspects of the emergency problems. Priorities need to be established for transportation, manufacture, and other essentials. The needs of the civilian population in relation to military requirements must be taken fully into account.

In a major catastrophe involving several countries, international co-operation and organization are needed for the conjoint planning of food policies and programmes.

1.3 Appraisal of Total Food Requirements

The basis of any emergency plan is knowledge of the total amount of food needed to feed the whole population; this can be assessed in terms of calorie requirements. Initially the amount needed to cover requirements fully must be estimated. The actual level aimed at may fall below this; but the relationship between the actual level and full requirements must be known, so that the effects of feeding at the lower level over a given period of time may be anticipated and assessed.

Average per caput per day calorie-requirement figures may be taken from scales of requirements or "recommended allowances". Many countries have their own scale or use those of other countries, either as they stand or in modified form.

The Committee on Calorie Requirements [21] convened by FAO assessed the requirements of a fully defined "reference" and recommended a system for the determination of requirements from this reference according to variation in body-size, age, activity, and external temperature. The methods described by the committee may be used to calculate the per caput calorie requirements of populations of different types. Another guide that can appropriately be used for setting the level of feeding during the emergency is the average per caput consumption in the country in the pre-emergency period. These consumption figures, calculated from the food supplies available at the retail level, are available, particularly for countries of western Europe.[43]

When plans are being made a decision must be taken on the principal foods which are to constitute the diet of the population at risk during the emergency. This decision will depend on the existing habits and food-consumption patterns and the potential supplies which can be provided through local food production, from stocks, and through importation. In general, it can be said that foods of vegetable origin which give a high

calorie yield will be of primary importance, particularly the staple and familiar foods which fall into this category.

In addition to considering calorie requirements, attention must be given to providing a well-balanced diet, and particularly to a sufficiency of proteins. If the intake of protein is inadequate for a substantial period of time, the importance of the quality of the proteins available is accentuated. In these circumstances pulse and leafy vegetables are of great importance as sources of protein supplementing cereal protein. In times of food shortages in regions such as western Europe, it is likely that every encouragement will be given to the home production of potatoes, vegetables, and fruits. This will help to ensure that the needs for proteins, vitamins, and minerals of the adult population will be met. Suitable measures to keep the intake of nutrients as high as possible should be introduced; these may be concerned, for example, with the fortification of margarine and the extraction-rate of cereals. A high extraction-rate should be enforced, the exact rate chosen differing according to the circumstances in different countries. Arrangements must, however, be made to provide for the special needs of the vulnerable groups—infants, children, and pregnant and nursing women—and in this connexion particular attention must be given to milk. Old people constitute another group whose needs should receive attention, since experience has shown that during periods of food shortage they tend, for various reasons, to suffer severely from under- and malnutrition.

1.4 Appraisal of Production Possibilities

In planning for an emergency the amount of food obtainable from indigenous production must be estimated. This is then compared with the total requirement to give a measure of its sufficiency. The extent to which the provision of supplies from other sources is necessary can then be determined.

In appraising potential production, attention must be given not only to the acreage available, land use, crop yields, etc., but also fertilizers, pesticides, tools, machinery, fuel, livestock feed, etc., on which satisfactory production may largely depend. The labour-force likely to be available must also be taken into consideration.

1.5 Orientation of Production

Food production in times of emergency should in general be orientated towards obtaining the greatest amount of food, in terms of calories, per unit of land used. This means concentration on crops of cereals, potatoes, other vegetables, and oilseeds, for direct human consumption, with a consequent reduction of the animal population. Such a policy implies the

diversion of land from feed crops to food crops, the ploughing-up of pasture, and the slaughter of pigs and poultry, which compete directly with human beings for cereal foods. At the same time, account must be taken of the need to maintain milk supplies at the highest possible level. It must be emphasized that measures of this nature will be appropriate only in times of emergency, to prevent food shortage and starvation.

In addition, it is important that every encouragement should be given to private individuals to cultivate vegetables and other produce in gardens and allotments and to local authorities to allow vegetable production in public parks and other open spaces.

1.6 Storage of Foods

It is necessary that stocks of food should be available within a country so that the impact of emergency conditions may be reduced at the outset, and so that any gap which may exist between current home production and import of foods still possible during the emergency, and the minimal needs of the population, may be filled for a given time. The accumulation of stocks will enable governments to ensure that there is a supply of food to the people during the period that is needed to put the country on the emergency economy.

The quantities of food which should be stored in any country " in order to diminish the risk of severe malnutrition and starvation " will depend on the food production resources and the imports likely to be possible during the emergency, i.e., on a forecast of the relation between current supplies and requirements during the emergency period. The forecast must consider geographical location, particularly transportation time from the sources of import, military considerations, and numerous other factors.

The kinds of foods that should be stored are those which give a high calorie return per unit of weight and are staple and familiar foods. They should also be foods which can be stored without deterioration over long periods of time. This means cereals, sugars, oilseeds, fats, and oils, in the case of many countries. There should also be accumulation of foods of specific nutritive value to fulfil the needs of vulnerable groups, e.g., processed milk, cod-liver oil. In storage programmes there should be concentration on accumulating stocks of foods which normally are imported, as it can usually be anticipated that there will be a reduction or cessation of imports because of differing degrees of isolation of countries during emergencies.

In addition it is very desirable to accumulate stocks of foods which are of psychological importance to the population, e.g., coffee in certain countries.

In most countries the responsibility for the storage of foods would be shared by the government (civil and military), various branches of the trade

(importers, producers, manufacturers, wholesalers, and retailers), and by private householders. Buffer stocks held by families can play an important part in certain circumstances. The presence of stored food in the household can help to offset the first effects of emergency conditions, preventing a drain on retail and wholesale sources, and a sudden rise in prices, during the time that the economy of the country is being re-orientated. A programme of this type, however, calls for extensive guidance to the householders to ensure that they know how to handle, store, and periodically change stocks of foods placed in their hands.

The most important factor in the building-up of stocks of food is that of time. A decision to build up stocks must be made well ahead of anticipated emergency, otherwise it will be too late and the buffering effect of food on hand will be lost.

Consideration needs to be given to storage facilities at appropriate points in the country. It is important to disperse stocks because of possibility of destruction and transport difficulties.

Steps must be taken to ensure that the foods do not deteriorate in storage. There are many technical aspects of the storing of foods to prevent deterioration. A considerable amount of work has been done in many countries on these problems, and numerous technical books and reports, covering all aspects of the subject, are available.[10, 18, 19, 20, 39, 44, 45, 62, 63] In general it can be stated that in the storage of grain moisture content is important, as are precautions against infestation by insects, rodents, etc. In the case of fats, special precautions are needed to prevent oxidation and thus the development of rancidity. Recent advances in this field such as the use of anti-oxidants should be followed, and full use made of new techniques. Storage of potatoes must be such that germination is avoided. The selection of appropriate places for storage and the use of appropriate chemical agents can help to ensure that potatoes keep well.

1.7 Utilization

The proper use of foods—those produced locally and those imported—is an essential part of an effective food programme.

A decision must be made on the most important usages of foods and how they can be processed, account being taken of the probable need for economies in transport and labour. Whether foods are to be directed towards human consumption or are to be used for animal feeding-stuffs will be a decision that must be made in every country, taking into account the particular characteristics of that country. Controls may be needed to ensure that various foods are used economically and effectively. For example, the use of grain for alcoholic beverages may have to be controlled, the extraction-rate of flour raised, and the use of oils and fats for the

production of various industrial products regulated. The utilization of milk may have to be strictly controlled. Foodstuffs normally used in the manufacture of luxury items such as ice-cream and chocolate may have to be deflected for human consumption in a more direct form.

Most foods have to be processed in some way before they are ready for consumption. Even when the chief foods produced are limited to cereals, oilseeds, and sugar, together with potatoes and vegetables of various kinds, the cereals have to be milled, the sugar refined, the oilseeds extracted, and the oil purified into forms suitable for consumption (margarine, etc.). Other foods available in smaller quantities need appropriate handling to ensure that there is no waste or hazard to health. The curing of meat, the manufacture of cheese, the pasteurization of milk, and the processing of fruits and vegetables may all need attention. Such resources as fuel and transport are involved in these operations, and the form in which food is ultimately made available for consumption will depend on the availability of these resources.

Controls in the utilization of food are directed towards obtaining the greatest nutritional advantage from the foods available. In the case of cereals, an extraction-rate of 80%-85% for wheat, for example, makes it possible to allocate to human consumption the maximum food available from the original grain. The remaining 15%-20% forms an admirable feed for livestock. The keeping qualities of such high-extraction flours must be taken into consideration. In some countries a higher extraction-rate may be appropriate.

Where facilities exist for the extraction of the cereal germ during the manufacture of the flour from the cereals, full use should be made of this product. The germ, however, requires treatment, usually some form of heat treatment, to destroy the enzymes and thus ensure good keeping qualities. Wheat germ thus treated can be used in the manufacture of bread and other foodstuffs.

It may be desirable to dilute wheat flour with other cereals, e.g., rye or barley, or with potato flour, to ensure that these other foods are fully used. It is, however, to be noted that for the manufacture of a satisfactory loaf it is desirable that the wheat flour contain a relatively high percentage of flour from hard wheat. The decision to dilute wheat flour with other cereals and potato flour must be taken after due consideration has been given to the dietary patterns of the people, and to whether or not a better diet can be achieved by this procedure or by the use of the foodstuffs separately in their original form.

1.7.1 *Waste*

Ignorance or negligence can mean the loss of thousands of tons of food in the course of a year. A particular effort must be made by govern-

ments and all concerned with the handling of food to prevent deterioration and waste. This includes losses of nutritive value of food through improper methods of preparation and cooking in the home and in catering establishments.

Consideration should be given to reclaiming deteriorated stocks, e.g., rancid fat and oils, and the use of inedible parts of foods for industrial purposes, e.g., bones for lime. In addition, food scraps can be collected for use as animal feed or, after proper treatment, as fertilizers.

1.8 Procurement

Foods must be distributed through a rational system which ensures that all groups in the population obtain a fair share. But no system of distribution can operate unless the foods required for distribution through appropriate channels are available and under the control of the authorities. Reference has already been made to imports and stocks, which can be distributed without great difficulty. Food stocks can be requisitioned by the appropriate authority and arrangements can be made to ensure that food is imported only under licence, or, alternatively, the government itself may become the importing agency and handle all food imports directly.

Attention is drawn to the freight difficulties which inevitably precede and are associated with any international crisis and may result in preventing the building-up of adequate stocks. It is obviously important that when transport space is limited the food carried should be food which gives a high return of calories and nutrients per unit of weight or volume. The foods which have to be transported must be available in appropriate form in the exporting country or countries, or, if not, arrangements must be made to ensure that they are made available. Technical co-operation between food technologists and manufacturers in the exporting and importing areas is needed to solve problems of processing, packaging, and storage.

The procurement of indigenous foods for distribution presents difficulties of other kinds. Numerous measures and devices are needed to ensure that such food is distributed through the right channels and does not pass to the black market.

Experience has shown that black markets develop readily in time of food shortage in countries in which attempts are being made by the government to regulate food procurement and distribution. During and after the war black markets in food flourished in varying degrees in countries of western Europe and in countries elsewhere in the world in which governments were striving to control the food situation. Their extent depended on numerous factors, including the efficiency of the administration and

the adequacy of food regulations. More important, however, were the degree of food shortage and the attitude of the people. An important factor in the control of black markets is the establishment of a policy of ood distribution which ensures that the available supplies are distributed equitably. The greatest voluntary co-operation of the people is obtained when the policy is firm and fair.

The production plan for the whole country should be set up by the governmental authorities, taking into account the potential capacity and fertility of the soil, importation and exportation of foods, and the needs of the population. The execution of the plan should be assured by an appropriate price policy according to the idea " it is easier to forbid than to order the production of certain foods". The most difficult problem in the procurement is the collection of the production. General rules cannot be established for the maximum collection of agricultural products. It depends on the governmental organization and on the collaboration of the farmers. A possible method would be to ask the farmers in advance their production plans, which could be checked by a local committee made up of representatives of the administration and the farming community. At an appropriate time the actual yield would be checked by the same committee. It would thus be possible to determine the agricultural production from each farm, and that part of the production which the farmer might retain for his domestic use and for the farm, and that part which should be delivered to the common pool. Delivery of each farm's allotted portion could be organized by compulsory methods but other ways might give better results, particularly the establishment of contracts between the producer and the administration by which the latter would guarantee to supply to the farmer fertilizers, feeding-stuffs, and equipment in return for food. These incentives might be used to encourage the farmer to deliver any unforeseen surpluses to the common pool.

This method of determining the situation for every farm extends to the registration of animals and poultry, including the recording of fluctuations in numbers, the incidence of diseases, and other factors which might alter the production of meat, milk, etc.

Finally, the price policy followed by the government will exercise a great influence over the production and delivery of agricultural products.

1.9 Distribution

The next stage after procurement is the distribution of foods through an appropriate system to wholesalers, retailers, and consumers. Distribution to consumers through a rationing system usually calls for considerable changes in normal distribution procedures, but it is desirable that such changes should be reduced to a minimum. Existing channels should be used as far as possible.

Within the limits of effective controls needed to ensure equitable distribution of the foods available, the system should allow for maximum enterprise on the part of the food industry—manufacturers, wholesalers, retailers, and caterers.

The organization of transport in local units may be desirable, and, in addition, economies in transport and labour must be effected. A system of " zoning " all movement of food—from warehouse, factory, or farm to the wholesaler, and from the wholesaler to the retailer—together with restriction of retail delivery, can bring about important economies.

In times of shortage it is essential for the food available to be distributed to consumers in relation to nutritional needs. Experience has shown that it is not satisfactory to try to organize this by a system of quotas based on the pre-emergency volume of trade consumption. A system of consumer rationing must be introduced immediately the emergency arises. There are several general points to be noted in consumer rationing:

(*a*) The system should be as simple as possible, while taking into account the different physiological requirements of various age-, sex-, and activity-groups in the population. The method of establishing a basic ration for the " normal " consumer and making special provisions for other groups appears the most satisfactory. There should be provision for substitution of foods within the normal ration so that the needs for special foods of certain groups, e.g., the sick, the aged, and young children, can be covered. The special provisions above the normal ration include extra calorie supplies for " high activity " groups and extra protective foods for the vulnerable groups.

(*b*) Food in general consumption, where supplies are not sufficient to meet demand, should be included in the rationing system to prevent inequitable consumption, e.g., the acquisition of larger quantities of certain foods by economically privileged groups. Staple foods, such as cereals and potatoes, should however, if possible, be left unrationed. These act as a "buffer", i.e., they enable consumers themselves to adjust their food intake to requirements, and their availability has excellent psychological effects.[d]

(*c*) The ration for any commodity should be set at such a level that, according to reasonable expectations, it can be honoured throughout the emergency period. The psychological effects of failure to supply established

[d] This principle is difficult to apply among populations which are dependent for the greater part of their calorie needs on a single staple food, e.g., among rice-eating populations. The primary aim of a rationing system covering such populations will usually be the rationing of the staple food. While the consumption of other foods by the mass of the people is normally very small, the rationing of some of these is advantageous from the nutritional standpoint and should be instituted if feasible.

rations will be serious. The population loses confidence in the organizing authorities, and the danger of black markets is increased. Therefore the authorities should do their utmost to supply the announced rations. The extension of the duration of the validity of a coupon is preferable to a failure to supply.

(*d*) The most common methods of arranging for the fulfilment of the needs of "high activity" groups have been the provision of extra ration-cards for foods according to different " work categories " and the supply to workers of meals, off the ration or "coupon-free", in community kitchens or in industrial canteens, state restaurants, etc.

(*e*) The handling of rationed foods in catering establishments and institutions must be considered. In all cases, the supply of the necessary food must be controlled. During the last decade three methods of dealing with this problem have proved satisfactory.

One method consists of controlling the supply of foods to the establishments according to the number of meals usually served and allowing the consumers to obtain these meals without surrender of coupons. This can substitute to a certain extent additional activity-rations to heavy workers. A second method consists of supplying foods to the establishments in exchange for fractional coupons from the ration-cards, which the consumers must surrender to obtain their meal. The third method is similar but requires special meal coupons, which the consumer can obtain from his local food-office in exchange for parts of his ration-cards. This third method reduces considerably the number of coupons in circulation and permits a more flexible method of allocation to establishments.

(*f*) The special requirements of the vulnerable groups—pregnant and nursing women, adolescents, infants, and schoolchildren—for protective food can be appropriately covered by supplementary feeding programmes, such as school-lunch programmes, and by the controlled priority distribution to these groups of such foods as milk, eggs, cod-liver oil, citrus fruits and juices. Their requirements must be taken into account when planning the orientation of local agriculture, the stocking of foods, and the procuring of imports. Measures to cover the needs of adolescents and old people must also be considered. Individuals suffering from disease for the treatment of which special dietary regimes are required form a special problem to which much attention was given in the second World War. The experience gained in dealing with these problems is available to guide action in any emergency situation which may occur in the future.

(*g*) It is important to avoid as much as possible rigid solutions to the problem of consumer rationing. Flexibility which leaves an element of choice on the part of the people in obtaining the daily rations helps to enable them to arrange their meals within their normal food habits.

1.10 Public Information and Advisory Services

The successful operation of programmes designed to make the best use of available resources during times of shortage will depend to a large extent on the co-operation that is obtained from the different sections of the population. The most satisfactory situation is when there is voluntary adhesion to the measures taken by the authorities—measures which of necessity have restrictive effects.

In order to enlist the aid and co-operation of the various groups—agricultural organizations, the food processing and distributing industries, and the consumers, especially the housewives—it is essential that they be kept informed and given advice on the part it is necessary for them to play.

The task of carrying out this work should be given to some service which could cover in its operations the various important aspects of the food and nutrition problems, i.e., aspects relating to agriculture, medicine, and domestic economy. Its responsibilities would include :

(*a*) helping the population to understand the overall food problem ;

(*b*) instructing the public on the need for equitable and controlled distribution of food ;

(*c*) publicizing the need to prevent wastage of food by applying proper methods of storage and handling of foods ;

(*d*) teaching the public how to make the best use of the food available, both by taking account of the physiological needs of individuals and by wise planning of home economy. This might include instruction in the economical planning of household budgets and in catering and cooking methods, so as to increase palatability, avoid monotony, and preserve nutritional value ;

(*e*) giving information about the methods of obtaining rations, priority foods, and additional meals ;

(*f*) informing producers and the food industry in general of the reasons for the existing regulations and of the need for regular and complete delivery of agricultural and food products to the competent authorities.

It is clear that this service should have at its disposal all the available scientific information required for the fulfilment of these responsibilities. It should be in a position to review the situation as a whole from time to time and adjust its services accordingly. In addition, it must be able to interpret this scientific information in terms which can be appreciated by the general public and the special agricultural and industrial groups concerned.

1.11 Price Control

The economic aspects of price control need not be considered here. Price control is, however, of great importance in ensuring that the lower economic groups are not at a serious disadvantage in times of shortage, nor unable to obtain their rations because of lack of purchasing power. The system of control should take into account the nutritional importance of certain foods, e.g., milk, so that, if necessary, subsidies are given to ensure that the price brings them within the range of all.

2. PHYSIOLOGICAL, CLINICAL, AND THERAPEUTIC ASPECTS

(*c*) The proper treatment of patients suffering from starvation;

(*d*) Measures to be taken during relief activities to prevent the deterioration of the physical and mental state of persons suffering from varying degrees of undernutrition in the different types of famine;

(*f*) Any other measures that might be deemed recommendable for the prevention of disease and death caused by severe malnutrition and starvation.

2.1 Introduction

2.1.1 *Goals of treatment*

The proper treatment of patients suffering from starvation should attempt, so far as possible, to achieve the following succession of goals: (*a*) preservation of life, (*b*) prevention of irreversible damage to body and mind, (*c*) establishment of nutritional and general metabolic conditions conducive to ultimate maximal recovery, (*d*) restoration of morale and promotion of a psychologically healthy state of mind and emotion, (*e*) rebuilding of the wasted tissues of the body to the nearest approximation to the pre-starvation or "normal" state, (*f*) attainment, ultimately, of total rehabilitation so that the patient may secure a happy and effective place in the community. These goals are the same in a community or in a hospital, but in the former case we speak of the "population" instead of the patients.

2.1.2 *Practical aspects*

In practice, the programme and the specific measures to be provided for these purposes must be adjusted to the available supplies, facilities, and personnel. At one extreme is the individual patient in a modern hospital with unlimited supplies and under competent medical direction. At the opposite pole is the situation of a town or district during widespread

famine associated with the chaos of war or other great economic and political dislocation. Differentiation must be made, then, between " ideal " treatment and " proper " treatment, this latter being understood to be the best treatment which can be provided in a given situation.

It is presumed that the demand for the present discussion arises from the contemplation of past experiences. Any realistic projection of the future from the past, including the past decade, suggests that problems, such as those created by the second World War, in Greece, the Netherlands, Leningrad, Bengal, and in various prisons and concentration and internment camps, may again arise, as a result of either war or natural catastrophe. The present report attempts to provide practical advice for the treatment of the victims of such conditions. In the great majority of instances it must be expected that there will be serious shortages of doctors, nurses, and hospital equipment. In many instances there will be serious limitations of all supplies, including foods.

Suffering and death among starving patients and in the general population during famine are not solely the direct result of food shortages and calorie inadequacy. Whenever there is mass starvation there is apt to be a breakdown in sanitary and public-health control with the consequent danger of widespread infections and epidemics. Programmes for the prevention or amelioration of the ill effects of famine must, then, give prominence to other public-health measures as well as the basic matter of nutrition. Particularly is this important in underdeveloped and in tropical countries, where sanitary control may be imperfect even in non-famine periods or where insects and other disease-vectors abound. Vaccinations, anticholera inoculations, malaria control, purification of drinking-water, and similar measures must be pursued with vigour from the start of any programme for the control and relief of famine.

2.1.3 *Present state of knowledge*

Scientific and medical knowledge on the treatment of starved or otherwise severely malnourished persons is incomplete. The accumulated evidence from the field is most striking in the indications that serious mistakes are easily made and of the fact that ordinary hospital experience in the treatment of cachectic persons in connexion with neoplasms, extensive surgery, burns, appetite failure, or chronic systemic infection, may be misleading for attempts to deal with the problems created by previous nutritional fault alone.

The present discussion is a synthesis of information in the world literature and of the considered opinions of experts who have had personal experience in the treatment of starved persons. Major sources of information are listed in the bibliography at the end of this report (see page 54).

2.1.4 *Status of the patient*

All treatment should be adjusted to the status of the patient. Where large numbers of patients must be treated, complete diagnosis and evaluation for each individual may be impossible, but there can be segregation into groups of persons with common nutritional histories which have produced relatively uniform pictures and for whom common patterns of prescription can be provided. The situation is similar to any major epidemic where blanket rules of treatment may work reasonably well with only a modicum of medical attention to individual peculiarities. The evaluation of the status is made on the basis of the history, the presenting appearance and complaints, a physical examination, and such laboratory and functional tests as can be provided.

It is useful to classify the varieties of starvation and malnutrition. This is done in the following section.

2.2 Varieties of Starvation and Severe Malnutrition

2.2.1 *Factor of duration*

Duration of the malnourishment is important in regard both to treatment and to prognosis. A given degree of cachexia may be the result of a few weeks of fasting or of many months of undernutrition. By and large, the prospects for complete return to health are best when the inanition has been of short duration and the proper duration of treatment is directly related to the duration of the malnutrition. In some specific deficiencies, such as athiaminosis, irreversible destruction of tissues takes place slowly though very severe signs and symptoms may develop very much more rapidly.

For most purposes it may suffice to classify starvation and severe malnutrition of adults in terms of duration as : (*a*) brief—of the order of a month or less, (*b*) moderately prolonged—from one month to one year, (*c*) very prolonged—from one to five years, (*d*) chronic or extremely prolonged—more than five years. For some purposes it may be well to restrict this designation and provide one last category : (*e*) lifelong—where marked undernutrition or severe malnutrition has characterized the person since early infancy.

The foregoing classification requires a somewhat different time-scale for infants and children. In general, the effects of food deprivation and malnutrition are produced more rapidly in children and this effect is something like in inverse proportion to the age. For a child of ten, the designation " chronic " might be applied, for example, to severe malnutrition which has persisted only for a year or two.

2.2.2 *Factor of nutritional quality*

In the western world a severe food shortage tends to result in a reduction of consumption of most types of foods, but particularly of foods of animal origin. At the same time, there is usually an increased consumption of locally grown vegetables and all kinds of fruits, berries, and nuts, a relative increase in the use of bread and white potatoes, and a change from highly milled cereal products to higher extraction in milling. These are the natural results of attempts to economize in overall production, transportation, and distribution, and to increase the use of foods which can be had or produced locally. Rationing programmes tend in the same direction, and the nutritional result is a diet which is far more deficient in quantity than in quality. The vitamin and mineral content of the diet does not tend to be greatly deficient. The protein content is reduced, particularly in animal proteins, but the use of a variety of foods helps to ensure that protein deficiency is not extreme. The commonest kind of starvation in the western world is primarily a shortage of calories.

At the opposite extreme may be the situation which can develop in many tropical and semi-tropical areas where there is large cultivation of plants which yield foodstuffs of very low protein and vitamin content. In such areas, a precarious margin of nutritional safety is normally maintained by the use of a variety of vegetables and small amounts of foods of animal origin, pulse, and fruits. Anything which seriously dislocates the economic situation in such areas tends to force greater dependence on the foods of low nutritional quality as well as to reduce the total calorie intake. The result is malnutrition in which either poly-vitamin or protein deficiencies, or both, are of great importance.

A rough classification of varieties of starvation in terms of the most important deficiencies is essential:

(*a*) *Simple starvation* (and simple undernutrition)—where the calorie deficiency is of major importance and a simple increase in the total diet would provide at least tolerable nutrition. Simple starvation may be recognized by the presence of emaciation, bradycardia, and the other stigmata of calorie undernutrition (polyuria, weakness, depression, hypotension, hypothermia) and the absence of signs of polyneuritis, glossitis, extreme oedema, extreme anaemia, definite night-blindness, severe gingivitis. Slight to moderate anaemia and dependent oedema are common. Tendon reflexes may or may not be reduced. The special senses and the intellect are usually unimpaired, but the prevailing lethargy and apathy give the impression of dullness or even of stupidity. The major complaints are hunger, weakness, fatigue, dizziness, irritability, and sensitivity to cold.

(*b*) *Primary protein deficiency*—where either the total protein content or the quality of the proteins constitutes the most serious defect in the

diet. The major presenting picture is that of severe macrocytic anaemia and hypoproteinaemia without comparable emaciation or signs of vitamin deficiency. Oedema is pronounced and there may be ascites or general anasarca. The possibility of sprue, and liver and kidney disease must be considered in the diagnosis. In contrast with simple starvation, there is often a progressive failure of appetite in primary protein deficiency.

(*c*) *Primary B-complex deficiency*—where a serious deficiency of a number of members of the B complex of vitamins constitutes the major defect of the diet. This category, which may include "lightning foot", "camp eyes", and the like, is important because in some parts of the world famine conditions tend to produce a mixed B-vitamin deficiency of great severity without equivalent deficiencies in other nutrients. For the purposes of treatment, this category is useful because therapy with mixed B vitamins is safe and practicable and may be applied without regard to the difficult and even insoluble problems of differential diagnosis between different B-vitamin deficiencies. The diagnosis may be applied where there are cutaneous, mucous-membrane, neurological, and special-senses complaints and signs which are apparently related to nutrition and where calorie or protein deficiency is clearly less important.

(*d*) *Classical deficiency diseases*—where unequivocal diagnoses of beriberi, of scurvy, of pellagra, or of vitamin-A deficiency can be made and where other nutritional deficiencies are not severe enough to present large separate problems.

(*e*) *Mixed deficiencies*—where the status of the patient apparently reflects, in something like equal degrees, several major deficiencies which call for something like equal attention in the treatment. Mixed deficiencies are common wherever there is malnutrition and, in case of doubt, all severely starved or malnourished patients may be treated as though they have a mixture of nutritional deficiencies. For example, where the requisite materials are or can be made to be in relatively adequate supply, a high protein diet fortified with moderate amounts of supplementary vitamins may be supplied to all such patients as a measure of both convenience and safety.

(*f*) *Nutritional deficiency plus trauma or disease*—where an important degree of malnutrition or starvation accompanies serious injuries or disease. In these cases the therapy must be twofold. It must aim at the treatment of the nutritional state, with due allowance for possible extra demands created by the disease or injury, and the injury or disease must be treated directly.

2.2.3 *Degree of deficiency*

The practical organization of large-scale treatment is aided by the use of some agreed rough classification of degrees of nutritional deficiency.

The classification proposed here attempts to put emphasis on practicality. It must be realized that failure to observe the signs and symptoms listed here is not proof of the absence of deficiency. For example, protein deficiency may exist without marked subnormality in the level of the plasma proteins because the plasma is not a sensitive index in this regard.

(*a*) *Mild deficiency*—may be treated with the patients on an ambulatory basis, by simple dietary measures with a minimum of detailed observation and supervision. Mild simple starvation may be considered to be that condition where the body-weight (of the adult) has declined by not more than 15% or where the body-weight is not less than 85% of the ideal weight for height; oedema is neither marked nor common. Mild primary protein deficiency should be suspected in an adult non-cachectic male when the total proteins in 100 ml of plasma amount to between 5 g and 5.5 g and the haemoglobin value is of the order of 12 g per 100 ml of whole blood. In such cases there will usually be a moderate degree of dependent oedema. Mild vitamin deficiencies are not easily described and recognized with surety, but may be inferred from the dietary history and a combination of several signs and complaints which are often related to vitamin deficiencies: gingivitis, follicular keratitis, glossitis, cheilosis, appetite failure, paresthesias, conjunctivitis, muscular weakness, mild polyneuritis, and so on.

(*b*) *Moderate deficiency*—of calories corresponds to a weight loss or weight deficit from 15% to 20% of the pre-starvation or ideal weight; slight to moderate oedema is common. Moderate primary protein deficiency may be reflected in a total plasma protein concentration between 4.5 g and 5.0 g per 100 ml and a haemoglobin level of the order of 10 g per 100 ml of whole blood (adult male). Oedema is well marked (+2 to +3 on a scale of 0 to 4) but marked emaciation is absent. Moderate vitamin deficiencies correspond to more definite and pronounced signs and symptoms of the type noted under sections 2.2.2 (*c*) and 2.2.2 (*d*) above.

(*c*) *Severe deficiency*—of calories is considered to be represented by a weight loss or weight deficit of more than 20% of the ideal weight. Mild to moderate dependent oedema and mild anaemia are present as well as all the other classical signs of well-marked semi-starvation. Severe deficiency of proteins is indicated by marked hypoproteinaemia and anaemia—below 4.5 g of total proteins per 100 ml of plasma and less than 10 g of haemoglobin per 100 ml of whole blood. Oedema of considerable degree is always present in severe protein deficiency unless there is general dehydration. Severe vitamin deficiencies are indicated by very pronounced signs and symptoms such as are generally considered to be sufficient for the diagnosis of definite scurvy, beriberi, pellagra, rickets, or vitamin-A deficiency.

(*d*) *Extreme deficiencies*—may be diagnosed when the clinical picture indicates the imminent danger of death from starvation or malnutrition

or when major signs and symptoms are present in highly exaggerated degree. Examples would be a body-weight of only 60% of the ideal, nutritional oedema of the degree corresponding to gross anasarca, beriberi, heart failure, extreme polyneuritis, and so on.

2.3 Characteristics of Starved Persons

2.3.1 *Physical signs and appearance*

The typical severely starved person, without other complications, is emaciated, with a pallid, greyish visage and apathetic, depressed expression. Neglect of personal appearance, indifference to the impression made on others, and slow movements and speech give an impression of stupidity. Blotchy pigmentation on the face or elsewhere may be mistaken for simple dirt. This pigmentation sometimes may be ascribed erroneously to pellagra. Slight to moderate dependent oedema is almost always seen if the degree of starvation is more than moderate, unless diarrhoea has produced dehydration. The skin is dry, cold to the touch, rough, and follicular pouting is common, particularly on the extensor surfaces of the arms and legs. The hair is dry and lifeless or "staring". Skin infections, scabies, body and head lice, may or may not be common, depending on the personal hygiene of the patients. Slight cyanosis of the nail beds, less frequently of the lips, is characteristic of the severely starved person. A persistent non-productive cough is frequently evident.

On detailed examination the typical findings include moderate anaemia, sinus bradycardia, arterial and venous hypotension, slight hypothermia, and a concentration of plasma proteins in the low normal range. There are no specific abnormalities in the chemistry of the blood and urine except for hypoglycaemia. A tendency to show slightly elevated levels of lactate and pyruvate in the blood is sometimes observed but does not indicate thiamine deficiency. The neurological examination is typically negative except for a high frequency of decreased or absent tendon reflexes. There are no important specific abnormalities in the blood morphology, though a tendency to slight leucopaenia with relative lymphocytosis is not uncommon. The basal metabolic-rate is markedly depressed, values of —30% or lower being common on the usual standards. Roentgenological examination is not often remarkable except in the infrequent patients who have nutritional osteopathology. Typically, the lungs are clear, the heart is small, and the stomach is low in the abdomen when the patient is in the upright position.

In the most severe stage of uncomplicated starvation either dehydration with shocking emaciation and obvious muscular atrophy or definite but not extreme oedema with equal but less visible muscular atrophy is to be seen. The metabolic-rate sinks to —40 to —50 or below, but there is

either no progression or a regression in bradycardia. Basal heart-rates which were 30 to 50 per minute in moderate starvation may rise, but the blood-pressure falls further and the appearance suggests actual or impending shock. At this stage definite hypoproteinaemia is usually evident but the increased severity of the anaemia may be concealed by a diminished blood-volume.

The foregoing descriptions apply to uncomplicated starvation and are accompanied by complaints, more or less in proportion to the degree of starvation, of weakness, hunger, fatigue, sensitivity to cold, depression, dizziness on arising, a sense of being old, and polyuria. Substantial deviations from this picture, including other signs or symptoms than those mentioned, indicate other complications—specific nutritional deficiencies, infection, or other concomitant disease. Paresthesias may suggest thiamine and possibly other B-vitamin deficiencies but the possible role of circulatory factors must not be neglected. Great oedema suggests specific protein deficiency, liver disease, heart failure from causes other than simple starvation, or renal disease. Pain referable to the bones with complaints usually centred in the pelvis and the spine indicates the possibility of nutritional osteopathology, which can be checked by x-ray examination. Visual or auditory defects may be ascribed to vitamin deficiencies. Extreme anaemia suggests the presence of blood-destructive infection, specific blood diseases, or iron deficiency; the latter may be indicated by hypochromia. Severe gingivitis, with bleeding, may indicate ascorbic-acid deficiency which should be confirmed by a search for other diagnostic features. There is an increased incidence of hernias and of thrombophlebitis.

In starving children characteristic findings include a facial appearance resembling old age, loose folds of hanging skin, protruding abdomen, feeble crying, and sudden death with acute laryngeal weakness and respiratory failure.

In the attempt to explain unusual findings in starved persons, allowance must be made for the frequency with which there is recourse to peculiar foods in famine. A yellow skin may reveal carotenaemia from eating large quantities of plants rich in carotene. Mucus and possibly blood in the stools may be explained by coarse and irritating items in the diet such as crude soy-beans, the shells of nuts, sand, and so on. Excessive use of certain pulses, particularly the chick-pea, makes lathyrism a problem in some areas such as India and Spain.

Finally, the presence of severe starvation may conceal the presence of serious infection because the usual febrile response to the infection is diminished or absent, particularly in cold weather. The diagnosis of tuberculosis, for example, may be delayed or missed on this account. In general, the starved person is relatively unreactive, possibly because of

adrenal exhaustion or of vasomotor unresponsiveness. Allergic phenomena are often reduced and a sharp reduction in the incidence of rheumatic fever has been reported.

2.3.2 *Functional characteristics*

Starvation produces obvious changes, which are of practical importance, in muscular and psychological characteristics. Early in the course of starvation there is loss of muscular endurance with relatively little loss in fine co-ordination or simple muscular strength. Definite large loss of simple muscular strength comes later but this is always less impressive than the decline in endurance. There is evidence that the loss in endurance is at least partly a reflection of a diminished respiratory-circulatory function, in which the circulatory contribution is most important. The reduction in ability to make small rapid movements is not great up to the more extreme stages of starvation, but the voluntary use of this ability is generally greatly restricted.

In simple starvation short of the most extreme conditions the visual and auditory functions do not deteriorate. Kinaesthetic sense and taste likewise do not seem to be impaired.

A reduction in cardio-circulatory function is large and progressive but this is not greatly disproportionate to the basal metabolic demand. The margin of safety, however, is reduced and the starved patient, though not suffering from heart failure, is closer to it than in the healthy state. Sudden great exertion, then, may be dangerous for such patients.

Changes in purely respiratory function are not of critical importance in simple starvation. The same is true of digestive, excretory, and renal function. Digestive and excretory disturbances are common, however, and may be of critical importance; they may be explained by emotional disturbance, the use of coarse and indigestible foods, and by faulty food sanitation.

It is not clear what may be the fault of the thermo-regulatory function in starvation. Apparently the limited circulation is increasingly restricted to the more vital organs. In any case the patient becomes intolerant of cold and relatively poikilothermic.

In severe states of simple starvation there may be interference with locomotion because of excessive ankle oedema and fluid in the knee joints. This can occur in the face of relatively normal plasma protein levels and is not necessarily an indication of specific protein deficiency.

2.3.3 *Psychological characteristics*

The psychological characteristics of severely malnourished or starved people are conditioned by the other factors in the total emotional scene. But the more severe the degree of starvation, the more consistent is the picture and the less is the influence of other factors. The general tendencies

are progressively more marked in progressively more-serious starvation until the comatose state supervenes. Just preceding the latter there may be delirium.

The most outstanding emotional characteristic is depression and apathy. This tends to become so overwhelming that other characteristics are not readily seen. The passive patient who is apparently sunk in a state of mindlessness is actually psychologically sensitive and irritable to an exaggerated degree. Early in starvation the patient's world of concern shrinks and becomes limited to fewer persons and events. In severe to extreme starvation almost the only interest is in the person himself and the question of food.

These changes are reflected in the behaviour. Depression and apathy, combined with weakness and recognition of easy fatiguability, result in very slow movements and avoidance of all movement if possible. His withdrawal to a world within himself may make him seem indifferent even about himself. These factors lead to accident-proneness; for example, the starved person moves away too late from the path of the oncoming vehicle or he may repeatedly trip and stumble simply because he drags his feet and pays little attention to the obvious obstacles in the way. Social niceties quickly disappear and these are followed by progressive abandonment of moral niceties as well. Callousness about others, and theft, especially of food and clothing, become common. Crimes of violence and passion, however, tend to become infrequent.

Under such circumstances, social and political organization and even mutual self-help at an elementary level are difficult or impossible to maintain without strong leadership from non-starving persons.

Though neurotic tendencies are exaggerated and some real neuroses may develop, there is little tendency to develop real psychoses or psychotic behaviour. Suicide is uncommon. It is surprising that basic intellective capacity is not importantly altered except, perhaps, in the most extreme starvation. Intellective activity, however, is reduced much as is physical activity, so it is easy to misjudge the actual mental capacity.

The psychological characteristics of starved people are important in their management, of course. It must be realized that the apparently uncomprehending, indifferent, starving man may very well be fully aware of all that is said and done and may be unusually irritable. When refeeding is under way the return of strength allows the accumulated resentments and irritations to have outlet. At this stage the patient is far more troublesome than when he was actively starving.

Severe deficiencies of B-complex vitamins alter the psychological picture, notably deficiencies of thiamine and of nicotinic acid which produce more alarming and violent alterations in the personality. The dementia of pellagra is, of course, well known.

2.3.4 *Capacity for work*

The extremely starved person is incapable of any useful work and even may be unable to tend to his simplest personal wants. In less extreme states, however, starved persons can do work adjusted to their limitations and this may be of importance in emergencies, but constant stimulation and supervision may be necessary. The moderately starved man has very little endurance in heavy manual labour, but he is still able to do, with only small impairment, jobs which require no large muscular effort or prolonged standing. In clerical and similar desk jobs the major limitation is the difficulty of maintaining motivation and attention. Since eyesight, auditory acuity, and the ability to make small movements are well retained, all work dependent on these factors is possible. Even jobs which call for an occasional muscular effort of considerable magnitude may be possible because the reduction in simple muscular strength for a very brief exertion is far less than the reduction in endurance.

2.3.5 *Mortality*

In famine conditions the total mortality may be increased from three causes: (1) direct-starvation deaths, (2) deaths from infectious diseases, which are increased because of sanitary faults, and (3) a general increase in deaths attributed to other causes. The death-rate is greatly increased by physical exertion. From experience in the second World War it appears that the maintenance of good sanitary and public-health conditions can prevent any rise in infectious disease; epidemics need not come in the wake of famine. The deaths attributable directly to starvation under famine conditions may actually account for only a small part of an increased mortality at such times. The lowered state of nutrition seemingly allows many diseases to have a more dangerous and mortal character so that the vital statistics show rising mortality from many causes listed on death certificates. While such statistics may reflect errors in judgement on the part of the attending physicians, it must be realized that the combination of severe malnutrition and other disease or injury is apt to be most serious.

The mortality-rates from all diseases are not raised in times of famine. Diabetes mellitus, of the adult type, is a notable exception in which mortality is generally reduced. In some famine conditions, at least, there seems to be also a reduction in deaths from coronary disease, and from hypertension. Such data as are available indicate no rise and possibly a slight fall in deaths from neoplastic diseases. On the other hand, in famine there are usually large increases in the number of deaths attributed to all respiratory diseases, to gastro-intestinal diseases, to "senile decay", and to violence. Tuberculosis in all forms is a major threat.

The available data indicate some interesting age and sex differences in mortality during famine. Among adults, females almost everywhere

seem to withstand these conditions better than males and this holds for all ages. Among both males and females the older persons, especially those beyond middle age, usually show a much greater increase in mortality than any other segment of the population, with the possible exception of infants less than one year of age. Contrary to some expectations, children survive well but this is probably in part the result of special efforts to protect them. The highest mortality is observed among elderly urban recluses.

It must be noted that the mortality data reflect both the inherent resistance of the individuals and the social and economic provisions for them in rationing schemes, food allocations in schools, factories, community kitchens and the like, and the custom within families. It seems probable, however, that in the great majority of conceivable famine conditions the greatest threat is to the males, to the elderly, and to the youngest infants.

2.3.6 *Children in famine*

The mortality among children has been mentioned. Other special interest attaches to children because of natural human sentiment and the important questions of their growth.

Only the most severe starvation suffices to suppress entirely the linear growth of children, but the weight growth is very sensitive to the nutrient supply. In many situations a practical index of the nutritional status of the entire population may be gained from periodic measurements of the heights and weights of schoolchildren. However, allowance must be made for the normal seasonal periodicity of growth in both height and weight and for the food supplements provided in the schools. It is fortunate that normally a large part of the energy expenditure of children is devoted to voluntary activity; this promptly diminishes in undernourishment. A simple observation of children at play can often allow a shrewd estimate of the level of prevailing undernutrition.

There is no valid information on the particular hazards to children, besides the stunting of growth, of simple caloric undernutrition. When a good diet is afforded such children their recovery of both energy and growth-rate is rapid and in a few years they tend to have regained the full stature and weight which would be expected in the absence of a period of food shortage.

2.4 Personnel, Supplies, and Equipment for Treatment

2.4.1 *General features*

The treatment of patients suffering from starvation depends on personnel, supplies, and equipment, as well as basic facilities of shelter, heat, water, power, and sanitation. The majority of the items needed are those required for any ordinary medical service. In mass catastrophic situations—including

the sudden reception of starved former prisoners, rescue missions, an influx of starved migrants, as well as famine in a city, province, or state—all of the requirements for treatment will ordinarily be in short supply or desperately inadequate. Improvisation will be the rule but this will be the more successful according to the degree of knowledge and of previous planning which is brought to bear.

2.4.2 *General organization and facilities*

Where there is a mass-starvation problem a single agency or organization should be in charge of the treatment of starved persons in the area involved and the effective direction must be given to experts in medical nutrition. This agency must have responsibility and authority over the selection of patients and hospitals or treatment centres, over the recruitment, assignment, and direction of professional, nursing, and other personnel, over the requisitioning and allocation of supplies and equipment, and over the general policies and methods of treatment. In a city where several hospitals, hotels, and other structures or areas are designated as starvation-treatment centres, a single body, agency, or board must have authority over all these facilities. Such centralization of power is essential both for efficiency and to prevent large discrepancies in the aid given to patients in equal need. All food gifts and food distribution by welfare agencies must be rigorously controlled for the protection of the patients themselves, who may be seriously harmed by over-zealous feeding.

Regular hospitals should be used so far as possible but in catastrophic situations only a small proportion of the patients can be treated as hospital residents. The latter should be restricted to patients with complications or who are so ill as to render their survival dubious in any other place. All other patients must be treated in improvised hospitals, nursing-homes, treatment camps, and on an outpatient basis.

The arrangements provided for all patients, including those on an outpatient basis, should be made with full recognition of some elementary facts about starved patients. Those persons are weak, very quickly fatigued, and are frequently troubled with polyuria and diarrhoea. Their great sensitivity to cold must be considered. The facilities, then, should provide adequate warmth, toilets should be close at hand, there should be no stair-climbing, and standing in queues by patients should be avoided. Furthermore, since a loss of sense of moral values is common in starvation, care must be taken to protect the patients' possessions, their clothes, and their food, from each other as well as from dishonest staff personnel, other officials, and the general public. Petty thievery and callous indifference to the weak unfortunately is always rampant in times of famine.

Sanitary precautions must be rigorously taken and enforced. Famine victims are almost universally careless and untidy about themselves and

their surroundings, and the prevalence of diarrhoea often makes the maintenance of elementary sanitation difficult. Under such circumstances the major dangers are tuberculosis, typhus, and all manner of sewage- and food-borne infections. All efforts should be made to ensure adequate supplies and use of disinfectants, pesticides, lousicides, soap, clean water, and basic garments for the patients.

2.4.3 *Personnel*

The most serious shortage of personnel for the treatment of starved patients is apt to be at the professional level—doctors, trained nurses, technicians, and nutritionists. Every available doctor will be pressed into service but many or even most of these doctors will be inexperienced in the care of seriously starved patients. General medical direction must be entrusted to the doctor who is most clearly competent to deal with the type of patients involved. His responsibility should include fixing the general treatment policies so that most of the patients can be treated by fixed programmes with a minimum of professional judgement on an individual-patient basis.

In most situations where there is to be treatment for large numbers of starved persons it is essential to press into service for nursing persons with little or no experience. Willing and humane persons of this sort can be extremely effective with some supervision and with clear instructions and a programme of work. The need is to keep the patients clean, warm, and fed and to report alarming developments to a more experienced person —doctor or nurse. The feeding alone is a major task with severely starved patients who should receive frequent small meals, often by spoon-feeding.

For every major installation caring for starved or malnourished patients there should be provided, if at all possible, at least one nutrition specialist and one sanitary officer who have no or minimal direct responsibilities for particular patients and who report directly to the medical chief of the installation. Other specialized personnel will include, where feasible, surgeons, radiologists, chemical, serological, and pathological technicians, and so on. Chaplains and other persons of suitable temperament and experience for patient counselling are highly useful in working with starved patients. The immediate past history of such patients is usually one of great emotional distress and this adds to the psychological problems created by the nutritional state alone. A special requirement for interpreters must be foreseen in some circumstances. A social-service worker is of great value especially if this person is personally familiar with the local community.

In many cases the patients should be utilized to help one another and to aid in general maintenance. These activities should be supervised by designated nurses or other responsible personnel. Such utilization of

patients is not merely an expedient to eke out an inadequate staff; for many patients this activity is psychologically valuable.

2.4.4 *Special facilities and arrangements*

Ideally, the hospital or treatment centre for starved patients would have all the facilities of a good modern hospital plus enlarged diet kitchens and feeding facilities, and provisions for handling and rehabilitating ambulatory patients. In practical situations, however, it is important to consider minimal rather than unattainable optimal provisions. The special facilities to be installed in a hospital or treatment centre, which has been improvised by taking over ordinary buildings or even by the use of tents and temporary structures, will be discussed here.

The basic needs are heat, shelter, plenty of potable water, cooking facilities, beds, and toilets, all arranged with a view to maintaining sanitation and to the different requirements of patients in several major categories. The first differentiation of patients is into those who are or should be strictly bed-patients and those who are, or may be very shortly, ambulatory. The bed-patients, in turn, may be subdivided into those who are desperately ill and require the most constant nursing and care, and those who present few problems. The ambulatory patients likewise may be subdivided into those who can aid their fellows or otherwise contribute to the hospital work, and those who cannot. The bed-patients should be provided with regular hospital beds or at least beds or cots elevated high enough to make nursing care and examinations convenient. The ambulatory patients should have some recreation and sitting space in addition to their beds which can be, in fact, merely crude cots or pallets well insulated from the cold floor and from draughts. Padding of some kind should be provided for the chairs and benches used by very emaciated patients. These persons have lost most of the natural cushion of the buttocks and find that sitting on wood or stone surfaces is painful and fatiguing.

In situations of mass catastrophe there are many family units of patients. Wherever possible the family units should not be broken up, and this should be provided for in the housing and feeding arrangements. This is particularly applicable to the ambulatory patients and to family groups in which several members can aid in the care of relatives who are confined to bed. The maintenance of family units is of great emotional value to the patients and can make an important reduction in the nursing care to be provided by the staff.

Every hospital or treatment centre handling starved patients should have provisions for surgery, for at least minimal laboratory tests, and for diagnostic radiology. None of these is special or peculiar for starved patients. Autoclaves and other arrangements for sterilizing must be

provided and the x-ray facilities will be in constant demand. A fluoroscopic unit is most valuable because of the time saved in developing and in keeping track of films and the probable shortage of films.

Identification of patients is always a problem in mass medical care under emergency situations. Identification tags or tattoo marks and an efficient record system are important. In default of any better device, intracutaneous injections of indian ink are useful markers.

The body-weight of the starved patient is important both for diagnosis and as an index of the progress of treatment. Every centre handling starved patients should be equipped with scales for weighing and for measuring the body-length. The thickness of the skin folds may be an even better index of calorie nutritional status and simple calipers for this measurement will be useful.

In planning the facilities for hospitals and treatment centres primarily for starved and malnourished patients, it is helpful to consider the differences from military hospitals which likewise must be prepared to care for great numbers of patients on an emergency basis. The starvation centre will require much less in the way of facilities for surgery and will have more ambulatory or semi-ambulatory patients. The patients in the military hospital are mainly men between the ages of 18 and 60; the starvation centre will have equal or greater numbers of women and large numbers of children and the aged.

2.4.5 *Amount of foods*

The number of patients to be treated and the efficacy of their treatment are strictly dependent upon the food and feeding supplies of the centre for the treatment of starvation. Though some semi-starved adults may demand, and may eat when offered, as much as 5,000 or 6,000 Calories (Cal.) a day, calculations as to the real needs for starved patients under treatment can be made at a far more modest level. For a mixed population of ambulatory patients of both sexes and all ages, none of whom is doing heavy work, a supply level of 3,500 Cal. a day should be ample, unless there is excessive waste, and 3,000 Cal. should suffice to allow fairly rapid rehabilitation if the distribution is properly adjusted to the size, age, sex, and activity of the patients. These figures cover estimated waste not exceeding 10% and are proposed for a temperate climate and people of the size of ordinary north Europeans. The figures may be adjusted up or down by some 10% for a very cold or very warm climate and may be adjusted further according to average body-size.[21] If much of the food supplied is apt to be wasted because of spoilage or because it is otherwise not acceptable, the supply requirement should be adjusted accordingly. For bed-patients, the total food requirements are less in spite of the fact that they may have a greater total calorie deficit to overcome.

Suppose that an emergency hospital to care for 1,000 semi-starved patients, half of whom are ambulatory, is to be set up and that these patients will correspond to the usual age- and sex-distribution of civilians needing treatment for starvation in a situation of general famine. It should be expected, then, that more than half of the patients will be females and that a large percentage of the total will be made up of infants, small children, and elderly patients. A gross food provision of 3,000,000 Cal. a day, plus the allowance for the staff, is the general order of magnitude for requisition for a population of large stature in a temperate climate. With a population of small stature in a hot climate a requisition of 2,500,000 Cal., or even somewhat less, may be equivalent.

Such estimates could be adjusted according to the stage of refeeding and this may be practicable because of the differing character of the foods needed at different stages. In the first week or two of refeeding a severely starved population, the total calories supplied per patient may be less than later and the foods should be more of the type generally used for invalids.

2.4.6 *Food items*

The actual food items to be supplied should be selected with regard to the nutritional characteristics which the diet should have, the probable acceptability to the patients, the cooking and feeding facilities at hand, and, of course, the foods available or procurable. The general character of the diet should always be aimed at a high-protein, low-residue diet. If the diet can be high in vitamins and minerals, so much the better, but these nutrients can be supplied as separate supplements if need be.

Simple foods which are bland in flavour—potatoes, bread, barley, rice, meats, eggs, fish, and dairy products—are most useful. The calorie content may be increased by the addition of fats and oils but the total fats should not provide more than 30% of the total calories. Garden vegetables may be used with discretion, having in mind the fact that they are generally bulky and somewhat slow to digest. Beans and other pulse have the advantage of providing considerable amounts of proteins but they also provide much indigestible material. Salted, smoked, dried, and pickled meats and fish should also be used with discretion because of possible difficulties in digestion, because the strong flavours may not be acceptable, and particularly because of the danger of sodium retention with consequent tendency to heart failure.

It is difficult to overestimate the value of milk and milk products for such patients. In most situations where mass treatment is necessary there will be no possibility of providing the desired amounts of whole milk, buttermilk, fresh cream, and cottage cheese. But dried skim milk can be used in a multitude of ways, particularly as an addition to soups, bread mixes, gravies, stews, and puddings. Shaken up with water and a

little sugar it may be drunk or spoon-fed in substantial amounts. A daily allowance of 50 g to 100 g of dried skim milk for each patient would not be excessive during early refeeding. The spray-dried skim milks are generally far superior to roller and other heat-dried preparations. Evaporated and condensed milks are likewise of great value though they have stronger and less acceptable flavours and are often excessively loaded with sugar. Dried whole-milk preparations are, as yet, seldom fully satisfactory though technological improvement is continuing.

Butter is a valuable food and, when fresh, the flavour is generally superior to that of any margarines. But there is no nutritional advantage in butter as compared with good margarine properly fortified with vitamin A. Butter and margarine, as well as all good edible oils (olive, corn, lard, cotton-seed, sesame, peanut or ground-nut, coconut, and soy-bean oils) are all valuable to increase the calorie intake. The total supply of visible fats and oils of all these types may be set at from 15% to 25% of the total calories in the diet.

Eggs provide extremely valuable nourishment for the malnourished patient but in the fresh form are seldom available in quantities adequate for mass treatment of starvation. Dried powdered eggs of the best quality seem little inferior to fresh eggs if scrupulous sanitation is maintained in reconstitution. There is, however, great variation in the quality of dried powdered eggs and they should be ordered and examined with care. Where it is possible, the daily provision of two to four whole eggs, or their equivalent in the dried form, is a desirable allowance for the starved patient.

In general, cheese is an excellent food for malnourished patients but it is not universally acceptable ; in the Far East it may be refused, even by hungry people. The simpler cheeses, with the least exotic flavours, are safest for mass feeding.

Sugar and sweets such as jam, jelly, candies, chocolate, and cocoa are generally much favoured by starved people and their high energy-value entitles them to an important place in the diet. It is important that their use be controlled so they do not have an adverse effect on the protein intake in the diet. Glucose is valuable not only for intravenous use but also for oral feeding in place of ordinary sugar (sucrose) ; the difference in sweetness is such that more energy may be accepted in the form of glucose than as sucrose. The provision of sugars should be controlled in thiamine-deficient areas because of the possibility of precipitating acute polyneuritis.

Besides the food items mentioned, a wide variety of other foodstuffs are useful and many local fruits and vegetables should be included in the supplies of the centre for treatment of starved patients. Bananas, citrus fruits, and tomatoes are particularly desirable. Other fruits are also useful

but should be used in moderation because of the possibility of producing gastro-intestinal distress and diarrhoea. This restriction applies less to cooked apples (baked or as a sauce) than to raw apples or to many other fruits.

Attention should be paid to the particular food predilections of the patient population in the provision of both foods and beverages which either contribute some nourishment or may enhance the pleasure and interest in eating. Tea, coffee, wine, garlic, soy sauce, and similar items are not negligible in the total treatment of these patients.

Besides the use of all ordinary foods, questions arise as to the desirability of special nutrient substances for starved patients. Generally speaking, special concoctions and patented or exclusively marketed food preparations are unnecessary and expensive and are often unacceptable as well. There are no magic formulas, and so-called " complete diet " foods are usually impractical. These strictures, however, do not apply to simple vitamin and protein preparations.

Casein is an excellent protein which can be incorporated in limited amounts into baked foods and stews. The characteristic flavour, offensive to most people, may not be detected if the amount of casein in the food mix is of the order of 5%. For feeding starved persons it has similar but fewer virtues than dried skim milk. Much the same holds for protein preparations made from soy-beans. Defatted and debittered soy-bean flour is a high-protein food item which can be used up to about 6% or 8% in bread-flour mixes and may be added to gravies and stews as can dried skim milk. Fat emulsions now being developed in the USA for oral use give promise of affording a palatable means of providing large calorie intakes without gastro-intestinal distress.

Large stocks of vitamins should normally be provided at every treatment centre for starved persons where there is any evidence that the diet has been qualitatively as well as quantitatively bad. To be on the safe side, this assumption may be made for most tropical areas when no other information is available. The quantities to be used will depend on the estimated degree, kind, and frequency of vitamin deficiencies and the nature of the diet to be provided. Since the more important vitamins are now available in stable form at relatively low cost it may be well to rely on administration of the vitamins as such rather than to attempt to ensure vitamin adequacy of the diet when fresh foods are limited. Ascorbic-acid tablets, tablets or capsules of B-complex mixtures, cod-liver, halibut, or other fish-liver oils for vitamins A and D should be on hand in amount sufficient to supply all patients with a daily intake from these sources alone of not less than 50 mg of ascorbic acid, 1 mg of thiamine, 1.5 mg of riboflavine, 10 mg of nicotinamide, and 4,000 international units (IU) of vitamin A. For all infants and children up to puberty a daily intake of not less than

500 IU of vitamin D should be provided. It may be, of course, that these vitamin supplements are not required by many patients if the rest of the diet is of good quality, but the excess supplies of vitamins may be useful for patients who exhibit real signs of avitaminosis and for outpatients.

A large supply of other vitamins or of nutrient minerals does not seem to be of great importance for the treatment centre. A few patients with concomitant liver dyscrasias may need vitamin K, which may also be desired by the staff doctors for pregnant women about to deliver. Limited amounts of whole yeast, of whole-liver extract, of folic acid, of vitamin B_{12}, and of therapeutic iron preparations should be on hand for patients who have anaemias other than those induced by starvation.

In many instances it is necessary to guard against the development of the belief, among either patients or staff, that special foods, vitamin pills, etc., have remarkable properties as substitutes for ordinary foods. Practical instances are on record in famines where rumours of extraordinarily " condensed " food or of the power of vitamins to replace regular foods have created administrative and operative difficulties as well as serious misapprehension.

2.5 Treatment Schedule and Prognosis

2.5.1 *First few days*

Immediately on admission of the starved patient to the hospital or treatment centre the natural impulse is to feed him as much as possible, that is to begin vigorously that part of the treatment which is by far the most obviously important. The first tasks, however, are tentative classification as to the degree of medical urgency, the initiation of supportive treatment in critical cases, and the beginnings of diagnosis. While a small feeding of soup or milk may be supplied at once, caution should be exercised both in the initial feeding and in the feeding programme for the next few days. Moderation should be the rule, particularly in the amount of food given at any one feeding and in the kinds of food provided. The patient who seems to be moribund, or nearly so, may be treated as a medical emergency for whom emergency measures—mainly supportive and to maintain and restore the circulation—apply. For the other patients, however, there is little or no danger in a thoroughly conservative approach. In any case, it is better that the first feedings underestimate rather than overestimate his ability to assimilate and utilize food. Large feedings, or even what seem like moderate feedings, may cause bloating, diarrhoea, dyspnoea, tachycardia, and even heart failure.

Patients who are ambulatory and not very emaciated may be put directly on any available diet which is readily digestible and nutritious, but in no case is it wise to exceed 2,000 Cal. on the first day or to exceed 3,000 Cal. in any day of the first week. If the patient's condition would allow him

to have more than this with safety, he should not be in the hospital or he should be there on grounds other than starvation.

The best guide to the feeding programme for the first few days is probably the estimate of the dietary intake of the preceding few days. If this is considered to have been of the order of 1,000 to 1,500 Cal., it may be safe to increase this by 50%. If the patient is extremely cachectic, even this modest amount should be provided in five or more daily feedings of highly digestible foods, chiefly liquid.

For the patient whose condition and history suggest that his diet immediately preceding has provided less than 1,000 Cal. daily, the first day's quota may be set at 1,000 to 1,500 Cal. divided into five or more feedings of liquid, highly digestible food.

The whole feeding programme should be devised to increase the nutrient intake as rapidly as is consistent with safety and comfort to reach the maximal rate at which the body can really utilize the food. Surpassing this rate means at best either gastro-intestinal problems or excessive fat deposition or both. Unlimited crowding of either calories or proteins in the diet into the body does not mean necessarily any gain in tissues rebuilt or strength restored. The dietary supply should be reduced with the appearance of any sign of indigestion, cardio-circulatory embarrassment, or appetite surfeit.

The great majority of patients with simple starvation will have an adequate—or too ambitious—appetite and a real problem will be to restrain their wish for repletion. A lack of appetite is to be taken as a bad portent or an indication of avitaminosis, possibly athiaminosis. For such patients an injection of 5 mg to 10 mg of thiamine followed by careful spoon-feeding or even tube-feeding may be required. It must be realized, of course, that in a famine relief hospital some truly moribund patients may be received. If there is no improvement in a day or two on this regimen, with the addition of a blood transfusion, a more heroic programme is unlikely to succeed in doing more than to hasten the end.

Liberal supplies of vitamins, in crude concentrates, and vitamin-rich foods as well as pure preparations, should be provided routinely in the first few days. This saves effort to establish a diagnosis about the vitamin status and will do no harm at worst. During this early period the salt intake should be restricted unless the patient is dehydrated.

2.5.2 *First few weeks*

After the first few days many immediate dangers and problems will have been surmounted but the succeeding few weeks also bring difficulties. If the patient is responding properly he will clamour for more food, will be apt to complain about his treatment and may be as troublesome as

his strength will allow. This is normal, but tact and firmness may be required to meet it. As a result of the loss of oedema fluid the patient's weight may fall and his emaciation may seemingly fail to respond for some weeks. This tends to discourage both patient and those who minister to him. But both may be assured that definite evidence of his improvement will come in a few weeks and that, actually, great improvement is shown by the loss of oedema and the reduction in apathy.

During the first few weeks, however, recurrences of oedema are not uncommon. They may be caused by over-exercise, by excessive salt ingestion, by infection, or may seemingly arise without cause. In the latter case over-eating, with a resultant tendency toward heart failure, may be suspected. If an elevated venous pressure confirms the suspicion of heart failure, this should be treated, conservatively, as such. A recurrence of oedema calls for bed rest, salt restriction, and dietary reduction, but not necessarily any alarm. Small amounts of diuretics may be given if the oedema is persistent and marked.

The feeding programme for the first few weeks should continue to be conservative. For a severely starved man whose normal body-weight would be 65 kg and who is ambulatory but not labouring or continuously active, an average intake of 3,000 Cal. daily for the first month is probably ample and anything over 3,500 Cal. is excessive. For women and for older men the diet should be correspondingly less.

If possible, it is desirable to continue the division of the daily diet into more than three meals. Mid-morning, mid-afternoon, and evening snacks will be helpful and are usually received with enthusiasm.

The character of the diet is not of critical importance in this period. It should, of course, be readily digestible and contain a good provision of proteins and vitamins. A goal, which may be unduly luxurious, could be a daily average, for all persons beyond 10 or 12 years of age, of 100 g of proteins, 2 mg each of riboflavine and thiamine, 20 mg of nicotinamide, and 100 mg of ascorbic acid, together with 15 mg of iron and 1 g of calcium. If the daily equivalent, in any form, of a quart of milk, two eggs, and a large portion of meat, together with a variety of any other foods to make up the remaining calories, can be provided, there need be no concern about dietary adequacy.

During this period, that is after one or two weeks, it is time to institute a cautious programme of mild exercise for all patients for whom it seems safe to attempt it. Feeding alone will not restore strength and wasted muscles are not rebuilt without exercise. Care is needed, however, because many patients may tend to overdo it in their pleasure at the sense of returning strength.

2.5.3 *Subsequent months*

After a month of such treatment the most severely starved patients will still be extremely weak, definitely anaemic, and in no condition to do without much care, either in the hospital or in the hands of sympathetic relatives or friends. The less severely starved patients may be ready to care for themselves on an outpatient basis but should receive dietary and medical guidance and should be protected from heavy work or exposure to inclement weather. As a matter of fact, they will not be fully recovered for many months to come, during which time the programme should continue to be one of good but not over-abundant diet, plenty of rest, and regular but mild exercise. If the normal body-weight of an adult is regained in less than five or six months the body composition will be excessively high in fat and in no case can one expect complete restoration of proper body composition and function in less than this time or indeed short of eight or ten months. During all this time a relatively high intake of proteins, vitamins, and minerals is advisable. The calories, however, should be reduced as the body-weight approaches normal and should be sharply reduced if the weight tends to increase further.

Where the previous malnutrition involved specific deficiencies, the diet and adjuvants such as vitamin pills will have been adjusted accordingly. Otherwise any good diet will suffice. In no case should there be allowed a high consumption of sweets or of fats.

It is expected that the majority of patients during this period will return to work or take up some useful employment; this should be encouraged so long as the work is not heavy labour. With or without a job, the patient must be assured of regular exercise if he is to be really rehabilitated.

Over this period of one to six months after starvation a young man who was moderately to severely starved and whose normal body-weight would be 65 kg should have an average daily intake of around 3,500 to 4,500 Cal., depending on his age and activity. By the end of six months the intake should be reduced to 3,000 to 4,000 Cal. or less unless there is still substantial underweight. Women and older persons should, again, subsist on less.

2.5.4 *Feeding and treating a community*

The problems and principles of caring for a starved community are entirely similar to those outlined above for patients in a hospital or treatment centre. Feeding centres, outpatient clinics, visiting nurse and doctor teams, should attempt to provide similar food, medicines, observation, and advice in a less convenient and larger environment. While generous distribution of food is desirable, there must be care to prevent hoarding,

inequitable distribution, and excessive zeal at refeeding of patients by relatives.

If at all possible, all the severely starved persons, together with some of their abler relatives pressed into service as aides, should be collected in a hospital or treatment centre or at least congregated where they can be reached and aided by the relief workers. Patients with tuberculosis and other infectious diseases should be isolated at once. These arrangements are even more imperative in attempting to bring relief to a township, county, or any area larger than a town or section of a city.

An important task in dealing with a community or an area is to discover the patients most in need of help and to appraise the nutritional status of the population. Specially trained teams of nutritional experts, doctors, nurses, and social workers must be provided for these purposes. At the start of efforts in a community a rapid survey and search is essential and this should be continued and extended throughout the first critical week or two of operations. Thereafter, systematic surveys and searches for needy patients should be repeated at regular intervals. A diminishing schedule of frequency is suitable unless a critical food shortage continues. A reasonable schedule would be fortnightly for a month to six weeks and then monthly as long as conditions warrant.

Street surveys, or surveys of schools or of workers in factories, are fairly easy and quick to carry out. A cursory physical inspection, a recording of height, weight, and age, and a brief question as to major complaints, can provide valuable information but the distinct limitations must be recognized. Not only is there the possibility of missing important facts about the people examined ; the most serious limitation is in the sample of the population thus obtained. The persons most in need of care are least likely to be seen in such surveys because their very illness keeps them off the streets and out of the schools and factories.

In any case proper provision must be made for the clerical work involved in all surveys. In a rapidly changing situation as in famine and its relief, it is imperative that the findings be tabulated and roughly analysed with an absolute minimum of delay.

The items for inclusion in any survey should include, besides records of height and weight (with specification as to the allowances, if any, for clothes), the following points : age, sex, oedema (graded 0 to 4), apparent emaciation (likewise roughly graded), major complaints (diarrhoea, weakness, cough, pain, paresthesias, cold, hunger, vomiting, etc.), heart-rate, skin, oral, and eye abnormalities, and present occupation. For more ambitious programmes, or where special questions arise, the survey may include blood haemoglobin, serum protein, qualitative urinalysis, chest x-ray, body temperature, and special tests for infectious diseases and parasites and for the diagnosis of avitaminosis.

For most situations in which community relief is to be provided, attempts should be made as quickly as possible to organize the following:

(1) a central public-health office to direct all operations and maintain central records;

(2) an emergency hospital which may serve also as a central storehouse of medical supplies and special foods;

(3) a nutritional and medical survey team;

(4) services of a chief sanitary officer and assistants;

(5) a community kitchen with medical supervision;

(6) an isolation hospital for communicable diseases;

(7) an outpatient clinic;

(8) a special clinic for pregnant women, for nursing mothers, and for infants;

(9) a transport section to move patients, supplies, and facilities.

2.5.5 *Prognosis*

The prognosis has been alluded to in various places in this report. In general, the prognosis is better than the condition of the patients might suggest; with proper treatment the great majority will probably recover and will regain substantial physical normality within a year. The main residues are apt to be neurological and these are to be feared only when major neurological disorders are apparent at first examination or when it is known that serious avitaminosis has long prevailed. For most adults, with the possible exception of the older people, much improvement, including ability to engage in at least some work, may be expected in three months and recovery in all except some functional factors (e.g., endurance) and in muscle mass may be expected in six months, with complete recovery in a year. With less than adequate food and treatment there will be delays, of course. The recovery of children may be more rapid.

Patients with tuberculosis, with famine osteomalacia, and with neurological and sensory defects attributable to diet, will recover more slowly. The more serious neurological and sensory defects may, in fact, be irreversible. Patients who have been very long extremely malnourished may present complaints of weakness and fatigue for years; it is uncertain to what extent such complaints have physical or psychological bases. Patients with tuberculosis which developed under famine conditions often make very impressive improvement in the first few months but relapses and delay in final arrest are often reported.

Children whose growth has been retarded by undernutrition may be expected to regain their normal height and weight for age, together with full vigour, within two or three years on a good diet without any special therapy.

2.6 Parenteral Therapy

2.6.1 *General considerations*

In modern hospitals parenteral therapy, including intravenous infusions and transfusions, is so commonly used that it might seem reasonable to give it a major place in the treatment of severely starved persons, where the primary needs are to give the tissues an ample supply of nutrients and to support the circulation. However, for uncomplicated inanition and malnutrition, under all conditions and particularly when there are large numbers of patients, all considerations point to the advisability of keeping parenteral therapy to a minimum. Disregard of this restriction may lead to deplorable results.

Parenteral feeding is an expedient to be resorted to only when other methods of feeding are clearly inadequate or inapplicable. Intravenous infusions are always attended by some risk and this is much increased when it is applied under conditions less ideal than those of a good modern hospital. Besides the obvious possibility of infection, there is real danger of circulatory embarrassment, pulmonary oedema, and sudden heart failure. In the severely starved person this danger is great so that unremitting vigilance and careful nursing are demanded if a high incidence of complications and mortality is to be avoided.

In general, all intravenous infusions given to starved patients should be administered much more slowly than to well-nourished patients and should be discontinued at the first sign of circulatory embarrassment. Since the latter may develop suddenly and rapidly progress to a fatal outcome, constant observation is essential. Signs of venous engorgement, especially in the veins of the neck, dyspnoea, tachycardia, or the appearance of cardiac arrhythmias are signals of danger. It should be noted that tachycardia is relative and a heart-rate of 80 beats a minute is real tachycardia in a patient whose heart-rate has been in the range of 50 or less.

Fortunately, it appears that the vast majority of patients suffering from starvation or severe malnutrition without other complications can be fed adequately by the oral route. Feeding by intravenous infusion should never be attempted unless fully acceptable facilities and personnel for its proper administration are assured. Supplementary nutrient provision by small parenteral injections, however, is a different matter. Adequate vitamin therapy usually can be provided by injections of 2 to 4 ml and these may be given subcutaneously or intramuscularly rather than intravenously. Parenteral therapy for the improvement of circulation rather than simple nutrition is, of course, sometimes desirable or even necessary in malnourished patients, but the unusual danger of pulmonary oedema and heart failure in such patients should be recognized.

2.6.2 *Calories*

By far the most useful item for providing calories parenterally is glucose. A major limitation is the amount of glucose that can be provided without flooding the body with an exorbitant volume of fluid. Glucose may be given in concentrations of 10% to 25% but concentrations of 20% or more frequently produce venous thrombosis. Glycosuria usually results with an administration-rate of more than 0.8 g per kg of body-weight per hour and may occur at lower rates in severely starved and debilitated persons. This means a maximum provision of the order of 200 Cal. per hour in the average adult. More rapid administration is possible if the body hydration is carefully controlled, since the major objection to glycosuria is the tendency to produce dehydration. The amount of glucose actually lost in glycosuria is not great so that a considerable gain in glucose retained can be achieved with rates of administration of 1.0 g to 1.5 g per kg per hour. The provision of the glucose in normal saline solution diminishes the dehydrating effect of the glucose alone.

Fat emulsions, now being developed in the USA, give promise of utility for intravenous feeding of man, but these preparations are not yet at the stage where they can be considered as adjuncts to the therapy of starvation in famine or similar situations involving many patients.

2.6.3 *Protein*

Protein nutrition may be aided by the parenteral route by the use of protein hydrolysates. A variety of these are now available for intravenous use. The better preparations are made from casein, animal-blood fibrin, or animal-blood plasma, by hydrolysis either with strong acid or with enzymes. The possibility of developing useful hydrolysates from vegetable proteins has been inadequately investigated. In general, the acid hydrolysates are more completely hydrolysed and produce fewer reactions. On the other hand, the acid hydrolysis destroys some of the amino-acids in which the resulting product is deficient unless the acids are replaced from some other source.

Besides the dangers of infection and of pyrogens which attend any intravenous therapy, the protein hydrolysates, when used in sufficient quantity to have a real effect on the nitrogen balance of the patient, also tend to produce other undesirable reactions, notably anorexia, nausea, vomiting, venous thrombosis, and, occasionally, antigenic phenomena. The incidence of anorexia, nausea, and vomiting is reduced with very slow rates of infusion and is reported to be much lower in preparations which are low in, or free from, glutamic and aspartic acids. Protein hydrolysates of the latter type are now commercially available in limited amounts in the USA ; they are even more expensive than the other hydrolysates.

The parenteral provision of whole blood, plasma, and gelatin for the purpose of protein nutrition is entirely unjustifiable. The proteins in whole blood and in plasma are only very slowly made available for metabolism and tissue replacement. Gelatin is likewise only very slowly metabolized from the blood and, moreover, it is an incomplete protein. None of these materials can be given in amounts which are nutritionally important. These materials have, of course, a very important use for blood replacement and for osmotic effects but their administration should be reserved strictly for these purposes.

2.6.4 *Clinical use of intravenous feeding*

For clinical use it is recommended that intravenous alimentation, where this is needed, be applied with caution, starting with 10% glucose and allowing three hours or more for the intravenous infusion of one litre (providing 400 Cal.). If this is well tolerated, a more complete infusion can be attempted with a mixture of glucose and protein hydrolysate. With a 2-litre infusion flask, the following preparation of 1,700 ml may be given in two to four hours and would provide 1,000 Cal. and 50 g of protein hydrolysate : 1 litre of 10% glucose, 200 ml of 50% glucose, 500 ml of 10% protein hydrolysate which should be " salt-free " or very low in sodium. It is very rarely desirable to add salt, but if this is clearly required the total volume can be increased to 1,800 ml by the addition of 100 ml of 5% sodium chloride. It should be noted again that preparations containing salt should be given only under constant observation because of the danger of sudden pulmonary oedema.

For patients who appear able to tolerate and to benefit from such treatment, a schedule of two infusions a day may be attempted. This should provide a reasonably satisfactory rate of initial repletion for the very emaciated patient. It should be noted that the energy expenditure of an adult patient of this type is generally less than 1,500 Cal. a day, with a basic endogenous loss of protein of less than 30 g, so that an intake of 2,000 Cal. and 100 g of protein provides a very substantial allowance for repletion. Vitamins and minerals may be added to the infusion mixture but it is simple to give these separately by subcutaneous or intramuscular injection. With this type of feeding, a minimal vitamin provision per day might be considered to be 100 mg of ascorbic acid, 2 mg each of thiamine and riboflavine, and 20 mg of nicotinamide. In some situations many physicians may wish to double or triple these allowances ; where there is evidence of specific avitaminosis still larger dosages may be given.

Except in very rare situations it is to be expected that such intravenous feeding will not be continued more than a few days and that in the meantime oral feeding will be started and increased as rapidly as possible. As a rule, then, it is unnecessary to be concerned for this short period about the

provision of all supplementary nutrients in the infusions and injections. The temporary deficiency of calcium, phosphorus, potassium, iodine, iron, biotin, choline, pantothenic acid, pyridoxine, inositol, folic acid, and vitamin B_{12} may be accepted with equanimity unless there are definite indications that a specific deficiency exists ; these nutrients will be supplied in the oral feeding soon to be provided.

One advantage of the above arrangement is that the several materials are, or could be made, standard items in any hospital, dispensary, or field headquarters. The stock items, to repeat, are 10% and 50% glucose, 10% protein hydrolysate, and 5% sodium chloride, all in pyrogen-free distilled water, and ampoules of ascorbic acid and B-vitamin preparations. The intravenous apparatus should be as simple as possible in view of the fact that it will probably be used by inexperienced persons.

2.6.5 *Transfusions*

As has been noted, blood transfusions are not at all justifiable for purely nutritive purposes. For the most severely starved patients, however, transfusions are often of very great value for the maintenance and restoration of the failing circulation and as a generally supportive measure. The Swiss doctors who cared for some hundreds of victims from concentration camps believed that transfusion of fresh blood was the most effective therapeutic measure at their command. Blood transfusions, like all other intravenous infusions, must be given very slowly and cautiously to starved recipients.

Where there are good supplies of fresh blood or blood donors, it is possible that routine transfusion of all extremely emaciated patients, especially those who are comatose or in a state of actual or impending collapse, would be desirable. The usual precautions to ensure blood compatibility should be maintained, however, and even so it must be realized that there is some risk. With pooled blood, particularly, some cases of serum-borne hepatitis must be expected.

There is as yet little experience with the use of serum or human albumin in the treatment of severe but uncomplicated starvation. Where real shock, that is the equivalent of traumatic shock, is evident it would seem probable that whole serum or human albumin would be of much value.

2.7 Starvation Plus Trauma or Disease

2.7.1 *General remarks*

It is beyond the scope of the present report to go into details of the innumerable situations where starved or malnourished persons are also suffering from trauma or disease, or where the metabolic states of starvation or severe malnutrition are produced primarily from trauma or disease. The latter situations, where nutritional damage is secondary, are frequently

met in every large hospital in ordinary times and the problems of treatment should be familiar to competent physicians and surgeons. It goes without saying that treatment in such cases must combine attention to the primary cause of difficulty with effective measures to create a more satisfactory nutritional state. These latter measures must be selected according to the nutritional factors involved. These will be briefly noted below.

2.7.2 *Inadequate nutrient intake*

Neoplasms, traumatic lesions, and strictures in the gastro-intestinal tract, as well as anorexia nervosa and Simmonds (pituitary) cachexia, may produce simple starvation which is very similar in many respects to that resulting from famine. The problem is to increase the exogenous nutrient supply and to correct the primary cause. However, until the primary defect is remedied it is frequently necessary to make extensive use of tube-feeding or intravenous alimentation, neither of which can be safely and effectively used without careful supervision. Full advantage should be taken of all the ordinary oral feeding that the patient's condition will allow. The combined oral, tube, and parenteral feeding should aim at nutritional rehabilitation beyond mere maintenance of balance because such patients are almost invariably nutritionally depleted by the time a vigorous feeding schedule can be instituted. Ideally, an intake of at least 3,000 Cal. and 150 g of protein should be the target for the average adult patient in this category, but this level should be approached in stages. If the pre-treatment intake is estimated to have been less than 1,000 Cal. a day for some weeks, or if the body-weight is down to 70% or less of normal, an increase of 50% for the first few days may be as ambitious as it is wise to attempt, and a goal of 2,000 to 2,500 Cal. a day by the end of a week is not too conservative. The problem is fully comparable to that of refeeding famine victims which is discussed elsewhere in this report.

2.7.3 *Unusual nutrient losses—dysentery, diarrhoea, and colitis*

Undernutrition may be exacerbated or even produced primarily by severe dysentery, diarrhoea, or colitis. It should be noted that these conditions are very common in populations subjected to severe food shortages in the chaos of war or other catastrophe. The nature of the nutritional defect may be gauged from the character of the substances lost in the stool. Water and electrolyte loss are commonly excessive so that dehydration may cause a superficial appearance of more severe cachexia and undernutrition than actually obtains. But actual loss of nutrient may be great through failure of digestion and assimilation, through unusual and excessive intestinal secretions, and through bleeding and escape of plasma proteins. Frequent feedings of soft, easily assimilated foods are indicated and parenteral therapy may be used both as a nutrient supplement and as a means of correcting dehydration and the tendency to circulatory

collapse and shock. In any case a high protein intake is advisable because the nitrogen losses in the faeces may be large. The presence of dehydration may conceal the state of protein depletion because the small total amount of haemoglobin and plasma proteins is concentrated in a constricted blood volume; effective rehydration may produce a prompt and large fall in plasma protein and haemoglobin concentrations and sudden oedema. In most such patients, frequent small feedings by mouth of milk, egg nog, farina, scraped meat, strong consommé, crushed ripe bananas, rice gruel, mashed potatoes, and similar foods are well tolerated and efficacious. As with all starved patients, milk preparations are almost universally useful and dried skim milk should be considered a staple food to be fed either as such in water or mixed with other foods in soup or porridge consistency. Protein concentrates, such as casein or hydrolysates, may be useful but are not often necessary; the hydrolysates are frequently troublesome because they may induce anorexia or nausea and vomiting.

2.7.4 *Unusual nutrient losses—burns*

Superficial burns cause a large outpouring of protein-containing fluid through the injured skin and into the skin and subcutaneous tissues. With deeper burns there is steady loss of protein until healing is almost complete. If the burned surface is large, or if there is infection in deeper burns, the total loss of protein may be enough to cause a serious depletion of protein. Besides these losses from the burned surfaces, which begin shortly after the burn is suffered, there is increased urinary loss of nitrogen from patients with severe burns. This excessive nitrogen elimination begins several days after the burn and may persist for three or four weeks. Persons previously severely undernourished may not exhibit any excess urinary nitrogen loss even after severe burns. In any case, however, all burned patients should be considered to be either actually or potentially protein-depleted and should be treated as such.

Besides protein depletion, there is evidence of great losses, or destruction, of some vitamins in the bodies of burned patients, and the best current practice in the USA is to administer large quantities of vitamins as well as of proteins. Some current recommendations may be unrealistic, particularly for mass application. It should be emphasized that heroic dietary prescriptions are by no means proved to be essential or even desirable, but there is no doubt that nutrient requirements are considerably elevated in burned patients. For badly burned patients and those who have been exposed to toxic levels of irradiation, it would seem desirable to make all possible efforts to ensure a high calorie, high protein diet fortified with very liberal amounts of ascorbic acid and the B vitamins. Except for the vitamins, the very fact of the elevated nutrient requirements makes it imperative to promote oral feeding simply because intravenous feeding at

best would fall far short of the needs. The appetite must be catered for and this means avoidance of unfamiliar or exotic flavours as well as providing as much variety as possible within the preference spectrum of the individual.

2.7.5 *Unusual nutrient losses—catabolic phase after trauma*

It is now widely believed that severe trauma or other great " stress " may induce a catabolic state in which the nitrogen balance of the body becomes negative in the presence of an intake which would normally maintain equilibrium or even promote storage. This effect is seen most prominently in persons who were well nourished before the injury or stress and is difficult or impossible to demonstrate in a patient who is nutritionally debilitated. In a well-nourished individual, in fact, a distinct tendency toward a negative nitrogen balance is easily produced by simple bed-rest. Presumably, these persons have ample protein or nitrogen stores which are readily reduced by muscular inaction or the processes incident to the repair of injury. On the other hand, there are the debilitated persons with extensive chronic infections in whom it is extremely difficult to induce positive nitrogen balance.

In any event, it must be agreed that the size of the protein stores and the prevalence of the direction of protein metabolism may be influenced by other factors besides the diet. This control or regulation or influence is believed to be in or at least closely related to the endocrine glands, notably the adrenal cortex, the pituitary, and the gonads. Experimentally, injections of adrenal cortical extract, and of adrenal steroids which have an oxygen at carbon number 11, produce a negative nitrogen balance, and it is presumed on the basis of animal experiments that the same general effect results from any stimulus which results in a discharge of such hormones from the adrenal cortex. Effective stimuli for such discharge may be any severe physical trauma, prolonged and intense emotional trauma, thermal (including cold) insult, and, in fact, any great " stress." Eventually, " exhaustion " of the gland may result so that the tendency toward catabolism is removed or reduced.

In the contrary direction is the action of testosterone and other androgenic hormones which tend to produce a diminished nitrogen excretion without azotaemia. This anabolic effect is sought to an increasing extent in medical practice in the use of these hormones in debilitated patients in whom there is difficulty in obtaining a positive nitrogen balance by dietary means alone. The question thus arises as to the possible utility of testosterone and similar substances in the treatment of ordinary starvation. At the present time, at least, it is not recommended to use these adjuvants except, perhaps, in the occasional starved patient with chronic infection who is not responsive to dietary protein. The great majority of

starved patients can be rehabilitated without the complications, expense, and possible dangers of hormone therapy. It should be observed, however, that this is an important field for research.

In addition to the negative recommendation that hormone therapy should not be used on any large scale in starvation at present, a more positive conclusion emerges from consideration of the so-called catabolic state. The protein needs of the starved patient are in all likelihood increased by injury, not only by the amount of protein required for direct repair but also because of the tendency toward catabolism. With this in mind it is recommended that extra dietary protein be provided for such patients. A goal of about 150 g of protein daily is suggested or a schedule of perhaps 50% more protein for the starved and injured patient than for the patient who is only starved.

2.7.6 *Special problems of infants and children*

2.7.6.1 *General remarks.* The problems of infants and children have been mentioned in several places in this report. More specific consideration is provided in this section.

Obviously, the nutritional requirements for growth—and the formation of milk by the lactating woman—are additional to ordinary needs. Both growth and lactation are sensitive to undernutrition and a reduction in these processes is an early adjustment to undernutrition. The economy thus effected tends to preserve life, but the biological potential of growth is so great that total suppression does not occur without serious depletion of the body.

The protein requirement for growth is high. In the face of calorie shortage the dietary proteins tend to be used for simple energy purposes. In the young child the result may be a serious protein deficiency on a calorie-poor diet, even though the protein intake is, by itself, reasonably high. Moreover, the formation of new tissues requires incorporation into them of appropriate vitamins and minerals, so the amounts of these nutrients needed are directly related to the rate of growth.

In the treatment of starved or undernourished children it is essential to remember that the " normal " state includes a " normal " rate of growth. Rehabilitation should include not only restoration of the normal growth-rate but also compensation, as far as possible, for previously subnormal growth.

2.7.6.2 *Body-size.* With increasing undernutrition of women during pregnancy, the birth-weight of the infant tends to decrease progressively and there is an increase in the premature-birth-rate. These two trends represent, to some extent, the same phenomenon since the designation of premature birth is largely based on birth-weight. However, undernutrition

of marked degree during pregnancy apparently has a tendency to result in premature onset of labour as well as to reduce the growth-rate of the foetus in late pregnancy. In any case, both the incidence of prematurity and data on birth-weights are useful for evaluating the nutritional status of the pregnant women in the community and even of the community as a whole.

Other things being equal, nutritional requirements are directly related to body-size, but calculations for children based on this principle can lead to serious errors. With chronic underfeeding the growth of children is retarded and they become small in respect to age. They then require additional calorie and protein allowances for recovery of lost ground.

The differentiation between genetic and nutritional factors in the determination of body-size is difficult particularly when there are no signs of specific nutritional deficiency, but this does not mean it must be ignored. During a period of food shortage the body-sizes of children may be compared with standards recorded for the same community in periods of food abundance. Such comparisons are of limited value when applied to individuals but they afford a valuable measure of the prevailing state of nutrition. Unfortunately, there are complications. In the first place, in many parts of the world malnutrition is prevalent even in " good " times. And, in the second place, reliable height-weight-age standards are not available for more than a few population groups.

It is probable that the subcutaneous fat of the body reflects the calorie adequacy of the diet in both children and adults. Estimation of the thickness of the skin plus tela subcutanea is not difficult but reliable standards must be established. Work toward this end is now proceeding in several laboratories and such work should be continued and extended.

In any case, it seems proper to estimate food allowances for children according to age without reduction in case the body-size is small. This provision may be satisfactory for all stages of development until the mature body-size is being approached. In late adolescence, however, the remaining growth potential is small and a compromise is necessary. The recommendations in the FAO Report on Calorie Requirements [21] offer practical guidance for this stage.

2.7.6.3 *Other characteristics.* Besides reduced body-size, children suffering from starvation or general malnutrition characteristically exhibit small flabby muscles and an accompanying " fatigue " posture. This reflects three processes. In children, as in adults, physical activity decreases progressively in undernutrition and disuse atrophy of muscles results. Secondly, in default of adequate exogenous nutrients, muscle substance is consumed to support the essential life processes. Lastly, there is failure of the normal growth of new muscle.

Normal, well-fed children are highly active and energetic. The change to the apathy and inactivity characteristic of severe undernutrition is, therefore, even more striking than in adults. However, in comparing population groups allowance must be made for differences in social customs, particularly with older children. For example, in some areas custom dictates that girls beyond the age of nine or ten do not engage in vigorous play or sports.

Starved infants and children exhibit many of the characteristics of starved adults—pallor, cold and dry skin, winged scapulae, deep suprasternal notch, dry and lifeless hair. Like adults, they may have a wide variety of specific deficiencies superimposed on general undernutrition. In areas of famine and food shortage perhaps the most common and serious specific deficiencies of infants and children are those of proteins and the particular amino-acids which are well represented in milk. The characteristics of kwashiorkor should be studied with care by all nutritionists and physicians who have to deal with infants and small children where there are food shortages.

2.7.6.4 *Care and treatment.* Wherever possible infants and young children should be cared for by their mothers or other relatives. In large camps or hospitals efforts should be made to provide separate quarters for family groups or for women with young children. Emergency feeding-stations for infants and young children, as well as for pregnant and nursing women, are invaluable for providing direct nutritional aid to those vulnerable members of the community. In addition, such stations provide excellent opportunities for other medical help, for health education, and for instruction in the feeding of infants with limited food supplies.

For the school-age children special feeding is often most conveniently done at the schools. However, there should be consideration for those schoolchildren who fail to attend school; in many cases these children are those most in need of food and special care. Someone, preferably a visiting nurse or social worker, should be assigned to attempt to discover the circumstances of continual non-attendance.

Supplementary food and feedings will be provided to infants and children according to the available supplies. In a real food emergency it is unlikely that the most useful single food, milk, will be in adequate supply and an order of priority must be established for it. Other things being equal, the following priority is recommended: infants, pregnant and nursing mothers, pre-school children, adolescents, and children of school age.

Among milk and milk products, pasteurized fresh whole milk is usually a very scarce or non-existent commodity in periods of real food shortage. But good quality dried skim milk or evaporated milk are excellent substitutes, particularly if fortified with vitamin D by a concentrate or by

irradiation. " Condensed " milk ordinarily refers to a product containing added sugar and is less desirable for most purposes.

The problems of the care and treatment of severely malnourished infants are generally familiar to experienced paediatricians because these problems are not uncommon in their ordinary practice. If possible, therefore, every relief mission or medical team dealing with a starved population should include a competent paediatrician.

2.7.6.5 *Management of diarrhoeal disease.* Diarrhoeal disease is a major direct cause of death among infants in all situations which involve a threat to the health of the community. Famine is such a condition and the prevalence of diarrhoea in famine areas is always such that its management, especially among infants, is a large problem.

Special consideration must be given to the infant affected by diarrhoeal disease. The rapidity with which severe electrolyte imbalance and dehydration may occur at this age is well known. Therefore, the primary therapeutic concern is the prompt correction of dehydration and acid-base equilibrium before the advent of irreversible tissue-damage. Only thereafter is one primarily concerned with the replacement of other nutrients. The therapeutic regimen to be chosen depends upon the facilities available. The response of the infant's electrolytes to diarrhoeal disease may be paradoxical (i.e., with hyperelectrolytaemia rather than hypoelectrolytaemia). For this reason the use of parenteral fluids other than physiological saline, 5% glucose, and distilled water is best withheld in the absence of adequate laboratory facilities for determination of the state of electrolyte balance in each individual. For initial treatment alone, a hypodermoclysis of one-sixth molar solution sodium of lactate may be used safely without blood chemical analysis. The amount of fluid to be given is in the range of 150 to 200 ml per kg of body-weight per 24 hours. Two or three grams of calcium chloride in 10% solution given orally for one or two days may be necessary to correct the frequent hypocalcaemia (usually seen when rehydration is completed). Transfusions of whole blood are indicated to combat anaemia. Suggested amounts of fluids to be given at any one time by the available routes are as follows : hypodermoclysis—40 ml per kg body-weight ; infusion—20 ml per kg body-weight ; transfusion—10-20 ml per kg body-weight. When electrolyte derangement and dehydration are much improved, cautious feeding may be instituted with substances such as breast, half-skim, skim, dilute evaporated, or other low-caloric, easily tolerated, milks. Feeding of scraped apple or banana powder may be beneficial. Large amounts of vitamins should be given with special care to assure adequate amounts of C, K, and B complex. The use of sulfonamides or (preferably) antibiotics prophylactically in therapeutic dosage is advisable.

2.8 References on Starvation and Mass Malnutrition

The selected list of references given on page 54 is intended as a guide to recent works which afford details about the biological characteristics of starved and malnourished people and the problems to be anticipated in their treatment. It must be noted that some of these references are far more valuable for the factual data provided than for the conclusions drawn.

A complete discussion of simple starvation is given by Keys et al.[35] who also provide a very extensive bibliography. Mass relief operations in a famine affecting 4 million people in the Netherlands are discussed in a Netherlands government publication.[41] Neurological manifestations are covered well by Spillane [50] and by Denny-Brown.[13] The clinical picture in persons starved in concentration camps in Europe is portrayed in the Netherlands government publication,[41] and by Lamy et al.,[37] Hottinger et al.,[26] Debray et al.,[12] and Leyton.[38] The corresponding situation in the Far East is discussed by the Netherlands Red Cross Feeding Team [42] and by Morgan et al.[40] The presentation of findings in the ghetto of Warsaw in the work edited by Apfelbaum [3] is a unique documentation of starvation as seen from the inside of a large urban community which starved to death. A particularly useful symposium on European starvation is that edited by Bigwood.[7] Other symposia on findings in Europe in the second World War are those edited by Brull [9] and Boerema.[8] Analyses of food intakes in periods of food shortages are provided by Fleisch,[17] Valaoras,[61] Dols & van Arcken,[15] Drummond,[16] US Strategic Bombing Survey,[60] Strøm,[51] Trémolières & Péquignot,[55] India Famine Inquiry Commission.[27] Famine oedema is discussed by Keys et al.,[36] Gounelle,[22, 23] Denz,[14] Beattie, Herbert & Bell,[6] and Sinclair.[48] Valuable studies on starving persons observed under controlled conditions have been reported by Bachet,[4] Simonart,[47] and by Beattie & Herbert.[5] The general problem of calorie requirements is presented by Keys,[31, 32] Taylor & Keys,[53] and FAO.[20] Two of the most recent and authoritative works on all aspects of human nutrition are those edited by Jolliffe, Tisdall & Cannon [28] and the American Medical Association handbook.[1] The special problems of starvation in children are discussed by Kerpel-Fronius,[30] Antonov,[2] Trémolières,[54] De Haas & Posthuma,[11] and Stuart.[52] The problems of pregnancy are examined by Smith.[49] The evaluation of nutritional status in periods of food shortage is discussed by Trémolières et al.[56]

3. ORGANIZATIONAL ASPECTS [25, 41, 57, 58, 59]

(*e*) The organization of general relief activities in relation to nutrition when famine conditions prevail.

In the immediate postwar period much experience of organized relief feeding was gained. Relief on a large scale involving whole countries was often needed. The task of relief was undertaken largely by allied, neutral, and international teams and under the aegis of international organizations. Of these, the United Nations Relief and Rehabilitation Administration (UNRRA) and the United Nations International Children's Emergency Fund (UNICEF) may be mentioned, as well as organizations such as the International Red Cross, the League of Red Cross Societies, and the Society of Friends. The work of these organizations has been fully documented and is readily available for reference.

The organization of relief activities usually implies serious emergency and acute need. The normal life of the community is disrupted and the situation calls for the direct provision of meals and food through distribution centres, rather than through a system of rationing. If the emergency is confined to a limited area within a country, relief may be organized by the country itself by the transport of food from other parts of its territory. In some instances where there is a scattered population faced with a catastrophe seriously disrupting the supply of food, it may be more satisfactory to withdraw the people from the affected area than to take relief supplies in.

But when the emergency is formidable and needs are great, national action alone will be insufficient. The modern tendency is to regard the relief of large-scale and severe food shortages as an international or world responsibility.

Much preparatory work is needed to carry out a relief programme successfully. Food supplies must be provided and suitable personnel and equipment obtained. The agencies concerned with relief must be ready to move in supplies and personnel as soon as the appropriate moment arrives. Although during the first World War some relief supplies from neutral sources were delivered to the people of some occupied territories, it is to be feared that the bringing of relief to a hungry population usually cannot start before its liberation. Distribution centres, mobile canteens, field kitchens, etc., must be set up without delay in the affected area. Equipment that will provide some means of cooking within the homes may be necessary. It is important to consider also supply of water and fuel needed for cooking. In arranging the provision of food the local dietary habits and patterns of the people to be relieved should be taken into account, as far as this is possible.

An immediate necessary task is to make quick surveys of small samples of the population to be relieved to discover the level of feeding during the famine period and the current state of nutrition. These will show whether the people are suffering from specific food-deficiency states as well as from generalized undernutrition and will indicate the level of relief required and also the need for foods rich in particular nutrients to make good specific food deficiencies. Personnel qualified to make such dietary and nutritional surveys and organize special feeding measures should be recruited and put to work at the earliest possible moment.

Experience has shown that under western European conditions, where famine conditions are not superimposed on chronic undernutrition, relief may be needed by three broad categories: (*a*) the "normal" underfed population, (*b*) ambulant "near" starvation cases (those with 25% body-weight loss), and (*c*) acute starvation cases (cachexia, pronounced oedema, etc.). To deal with this situation three types of feeding teams are necessary: medical selection teams, distribution teams, and clinical teams. The work to be done by these teams consists of selection of the people to be cared for in categories (*a*) and (*b*), the distribution of food to the three categories, and the clinical care of the serious cases. The types of personnel required are physicians, nurses, dietitians, distribution officers, cooks, and kitchen staff.

Relief agencies and workers from outside a country should always work in co-operation with whatever authorities and experts are available in the area under relief. The latter will have detailed knowledge of the local situation and the normal habits and manner of life of the people. Their full participation in relief measures will increase their efficiency and have a good effect on morale.

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