

and pumping units, hose lines, and tank trucks. Pre-disaster preparations should comprise an inventory of available trucks, including water sprinkling, milk, and petroleum products trucks, as well as plans for cleaning them.

### Conclusion

In the event of enemy attack upon a community, its public water works system may be seriously damaged and the water supply subjected to gross contamination by sewage or special warfare agents. Also, in the immediate period following disaster, huge drafts may be placed upon the system to supply water for fire fighting. This, too, introduces additional hazards to the safety of the supply. Under these circumstances there may be a shortage of water over a considerable period, and water that is available may require special treatment. These effects can be minimized, however, by proper planning and preparation.

### REFERENCES

- (1) Kehr, R. W., and Butterfield, C. T.: Notes on relation between coliforms and enteric pathogens. Pub. Health Rep. 58: 589-607 (1943).
- (2) Clark, Harold F., Geldreich, Edwin E., Jeter, Harold L., and Kabler, Paul W.: The membrane filter in sanitary bacteriology. Pub. Health Rep. 66: 951-977 (1951).

## Milk Control Planning For Civil Disaster

By **GORDON E. McCALLUM, C.E.,**  
**JOHN D. FAULKNER, M.S.P.H.E.**

In event of attack on major population centers, milk pasteurization plants and cold storage facilities, as well as transportation and utility services, are likely to be destroyed or their operations disrupted. Following such disaster, immediate measures must be taken to conserve and protect the target city's milk supply; to provide for its adequate processing for the

health protection of consumers; and to insure milk distribution to those immediately requiring it.

Considerable attention has been paid in the United States in recent months to the development of plans by Federal (1, 2), State, and municipal governments, and by industry (3) for dealing with milk supply problems likely to arise in event of large-scale civil disaster.

In the United States, the milk production and processing industries are decentralized over a vast geographic area, and all of our major cities have developed their own milksheds from which they obtain a large proportion of their fluid milk supply. Sanitary control of milk production and processing, as a preventive measure against transmission of milk-borne disease, is extensive. This control is exercised chiefly by State and local authorities, and not by the Federal Government. Practically all market milk sold in the United States is pasteurized, using a time-temperature combination of either 143° F. for 30 minutes or 161° F. for 15 seconds. Raw milk for pasteurization is usually transported from the dairy farm to country receiving stations, and thence to the pasteurization or processing plant, or to the plant direct, by automotive equipment. Although some milk for pasteurization is shipped to distant markets by rail, refrigerated or insulated automotive tank trucks are customarily used to haul raw milk great distances.

### Diversion of Fluid Milk Supply

As most dairy farm producers of milk for pasteurization are not located in the immediate vicinity of our large urban centers, it is unlikely that many would be damaged or seriously affected by enemy air attack on a given target city. Conversely, many milk processing plants of an attacked city might be destroyed, seriously damaged, or otherwise made inoperative. Therefore, it is necessary to plan for emergency

---

*Mr. McCallum is chief of health emergency planning of the Office of the Surgeon General, and Mr. Faulkner is chief of the milk and food branch of the Division of Sanitation, Public Health Service.*

---

diversion of the city's raw milk supply to previously designated pasteurization plants, other milk processing plants, or to cold storage facilities in outlying areas and nearby communities. Routine automotive transportation of milk from dairy farms to receiving stations and processing plants affords a high degree of flexibility in developing diversion plans.

### **Emergency Milk Processing Facilities**

Civil defense authorities of each potential target city must develop plans in conjunction with the local milk industry for the use of specific facilities in outlying areas which can receive and pasteurize portions of the diverted supply. These facilities should be earmarked according to their maximum operative capacity on an emergency basis, and agreements obtained for their use in civil disaster. Each milk receiving station should be assigned at least three alternate emergency processing plants and, where considered necessary, each milk producer should be assigned at least three alternate receiving stations or emergency processing plants, listed in a predetermined sequence to be followed for delivery of milk if it becomes necessary to divert the supply.

The requirements of each emergency processing plant for auxiliary equipment and supplies should be carefully noted to enable the plant to pasteurize and handle a portion of the diverted supply. Arrangements for the procurement of such equipment and supplies must be included in over-all civil defense plans.

Following large-scale civil disasters in the United States, in some instances the supply of fluid milk available to the stricken area is likely to far exceed the immediate need. The disposition of this surplus milk must be anticipated and plans made for its conversion if possible into concentrated milk products. If such arrangements cannot be made, other disposition must be planned so that emergency processing and cold storage facilities will not be overtaxed.

### **Public Health Protection**

The sanitary control of fluid milk and milk products in times of civil disaster is of the utmost importance. The possibilities for disease

transmission are multiplied many times, while routine control tends to break down or is overtaxed. From the standpoint of protection against milk-borne disease, it would be desirable to maintain existing sanitary standards for the production, processing, and handling of milk, and to intensify control procedures. However, this will not be possible in the immediate postdisaster period, and emergency standards and control procedures must be developed. In developing such emergency standards, departures from existing standards should be made only when clearly required. Every effort should be made to re-establish existing standards as soon as possible in the postdisaster period.

Immediately following the disaster, the efforts of the health department, or other milk control authorities, should be directed toward control of the pasteurized supply. All emergency milk processing facilities should be inspected as soon as possible after the disaster, and at frequent intervals thereafter, to determine compliance with minimum standards for proper operation. Inspection of producer dairies and receiving stations should be discontinued during this period, but producers should be forewarned that they must continue to comply with existing standards insofar as possible.

Bacterial examination and phosphatase tests of samples of pasteurized milk from each emergency processing plant should be made daily until operations have been stabilized, and at frequent intervals thereafter. Because of the laboratory workload involved, the assistance of industry laboratory technicians and facilities will be required. Plans should also provide for the use of laboratory facilities outside the target area. The bacterial examination of samples of raw milk from producer dairies should be discontinued during this period in order that laboratory efforts can be directed to the control of the pasteurized supply.

As a result of an attack, the emergency milk pasteurization facilities for a stricken area may be inadequate to meet immediate needs. Therefore, advance planning should provide for the issuance of instructions to emergency feeding centers, restaurants, and to the public on emergency methods for the pasteurization or steri-

lization of raw milk in the event that raw milk must be distributed.

### **Distribution of Emergency Milk Supplies**

In civil defense planning for the distribution of foodstuffs in a disaster area, the nutritional need of special groups for milk must be given special attention. Infants, children, pregnant women, special dietary cases, and the injured will require milk in some form. Food supply plans should provide for the distribution of pasteurized milk direct from emergency processing plants to mass feeding centers, other communal kitchens, evacuation points, medical facilities, and stores. In the immediate post-disaster period it is likely that the establishment of emergency milk distribution centers will also be required. As soon as possible, however, distribution through regular retail outlets should be re-established.

Plans should provide for the use of existing milk industry automotive equipment for distribution purposes. If sufficient milk trucks are not available, other vehicles should be requisitioned and used solely for this purpose. During delivery, milk should be iced or otherwise maintained at a temperature of 50° F. or below.

In the immediate postdisaster period, pasteurized milk may have to be delivered in bulk rather than in individual containers. Special attention must be paid to the storage, handling, and serving of bulk milk to prevent contamination. Milk stored at mass feeding centers, other feeding establishments, and at emergency milk distribution stations must also be kept refrigerated.

### **Substitution of Concentrated Milk Products**

A portion of the raw milk supply of a number of our likely target area cities is produced on distant milksheds which extend into several States. This milk is shipped both by rail and automotive tank truck to the cities concerned for pasteurization. An attack on a major transportation center, or simultaneous attacks on several large cities, could disrupt the Nation's transportation system to such an extent that a large portion of the raw milk supply of

some of these population centers would be cut off temporarily. Where this probability exists, advance planning should provide for the substitution of milk powder and canned milk until the fluid supply is restored.

Some forms of concentrated milk would also be more adaptable to utilization during the immediate postdisaster period than fluid milk, for example, canned milk required for the preparation of infant formulas. Civil defense planning should provide for the procurement and distribution of concentrated milk products to meet special needs.

### **Rationing**

In view of the large supply of milk available for fluid consumption in the United States and the decentralized nature of our fluid milk production, it does not appear that rationing will become necessary on other than a temporary basis in the immediate postdisaster period. However, restricted distribution of concentrated milk products may be needed because of shortages resulting from transportation difficulties.

### **Training of Auxiliary Personnel**

The training of auxiliary personnel, both for key positions of milk processing plants and for emergency milk sanitation duties, is of the utmost importance. Auxiliary personnel will be needed to supplement the staffs of emergency milk processing plants and milk control agencies and as replacements for regular employees who become disaster casualties. Milk plants should select from among their own employees alternate personnel for each key position. Such personnel should be thoroughly trained in their alternate duties so that they may take over operations if necessary. Auxiliary milk sanitation personnel and laboratory personnel should be recruited and trained by the health department or other proper milk control authority.

### **Auxiliary Utilities, Equipment, Supplies**

The various utility services in the fringe and outlying areas of major population centers are likely to be disrupted in case of enemy attack.

For those plants located in outlying districts and dependent upon the target area for power, consideration should be given to the need for standby or auxiliary power equipment in order to maintain operations and refrigeration in emergency processing plants in case of the destruction or serious disruption of the main power supply. Alternate methods for the operation of boiler units must also be considered. In addition, if the plants selected for emergency milk processing do not have auxiliary water supplies and are dependent upon the target city supply, consideration must be given to obtaining an alternate source of water. Auxiliary water supplies should be properly protected against contamination, and should be subjected to inspection and bacteriological examination as a pre-attack readiness measure.

Additional supplies of milk bottles, other containers, chemical detergents and bactericides, spare parts, and miscellaneous materials will be required by the emergency processing plants in event of a disaster. Advance planning must provide for the procurement and distribution of such emergency supplies. Consideration should be given to the storage of normal industry stocks in warehouses outside the area of probable destruction. It will also be necessary to plan for the emergency needs of dairy farm producers and milk receiving stations, including maintenance or feedstuffs for dairy cattle.

#### **Rehabilitation of Damaged Facilities**

It is possible that only a few of the plants supplying a disaster area may be destroyed or badly damaged by an attack, and if power and water are available, only a limited portion of the supply need be diverted. In case atomic weapons were used in the attack, all undamaged and partially damaged plants should be monitored for radioactive contamination prior to resumption of operations. Advance planning should provide for rapid monitoring and decontamination of milk processing facilities.

As soon as practicable after an attack, a survey should be made of complete and partial damage to, and contamination of, milk processing plant and cold storage plant facilities in the stricken area. Civil defense aid should be provided to restore operations where it is fea-

sible to do so. Where immediate resumption of operations is not advisable, undamaged equipment and supplies should be salvaged for use in other plants.

#### **Hazards of Warfare Agents**

In general, we believe it can be assumed that if a milk plant is close enough to an atomic blast to be seriously contaminated with radioactive materials, it will have been destroyed or severely damaged by the blast or thermal radiation effect. Undestroyed milk and milk products in the central area of the explosion which have been exposed to heavy neutron-induced contamination should be disposed of. Milk products in undisturbed sealed containers which were exposed only to "fall-out" or "surge mists" will probably be safe for consumption; however, the outside surfaces of the containers must be washed to remove adhering contamination (4).

According to currently accepted principles, milk plants and their equipment exposed to "fall-out" or radioactive mists can be decontaminated by washing and scrubbing down exposed surfaces followed, if required, by the use of citric or muriatic acid. Since radioactive decay is entirely unaffected by chemical reactions the removal of induced radioisotopes, fission products, and unfissioned particles is necessary (4).

Milk and milk products directly exposed to chemical warfare agents must be destroyed. After an attack, facilities and products in sealed containers must be decontaminated before use in accordance with the instructions applicable to the agent or agents used.

The use of various biological agents by the enemy presents special problems which are now being studied by our military establishment and others. Procedures for rapid detection of the use of such agents have been initiated in the United States based on an epidemiological intelligence system for prompt reporting and study of disease outbreaks. Milk and milk products provide an excellent medium for the conveyance of some of the possible biological warfare agents that might be used; however, the processing of milk at high temperatures does provide a high degree of protection against

some of these organisms. It can be anticipated that the enemy will develop heat-resistant strains of pathogens and will also use toxins. Therefore, plans must be developed for the protection of milk plant operations against the possible introduction of biological agents through sabotage activity of enemy agents.

#### Research and Development Needs

Some of the problems related to milk supply in times of civil disaster, on which we believe further research to be required, are:

1. The use of chemical preservatives and sterilizing agents as a substitute for the heat treatment of milk.
2. Field screening tests for the rapid detection of radioactive and chemical contamination of milk, as well as improved laboratory procedures for the rapid detection of various biological agents and toxins that might be added to milk.

#### Coordination of Plans and Organization

Plans for milk control services in civil defense must be worked out in detail to fit the specific problems and probable disaster conditions for each likely target area, and must be integrated with the plans of communities designated to provide assistance and support in case of wartime civil disaster. They should then be carefully integrated into, and coordinated with, other civil defense plans at local, State, regional, and Federal levels. It is, of course, of paramount importance that the milk industry and its organizations participate in the development of all plans.

#### REFERENCES

- (1) Federal Civil Defense Administration: Manual of milk and food sanitation in civil defense. To be published.
- (2) U. S. Public Health Service: Milk control services in the civil defense program. Outline prepared by the Milk and Food Branch of the Division of Sanitation. Washington, D. C., 1951.
- (3) Milk Industry Foundation: The dairy industry in civil defense. Washington, D. C., 1951.
- (4) Goldman, Morton I., and Nelson, Donald J., Jr.: Contamination, decontamination, and waste disposition. Environmental Health Center, Public Health Service, Cincinnati, Ohio.

## Food Sanitation Problems In Emergency Feeding

By GORDON E. McCALLUM, B.S.  
JOHN D. FAULKNER, M.S.  
STEPHEN E. KOELZ, M.P.H.

Emergency food sanitation problems are extremely complex. In solving these problems many of the specific procedures and techniques generally considered to be fundamental in food sanitation will have to be altered.

Factors which normally take precedence in the development of plans concerning administrative and scientific problems related to food supply and emergency feeding in civil defense operations include: (a) adequacy of sufficient amounts of principal food items required for the feeding of casualties, refugees, evacuees, and other homeless persons; (b) a consideration of the need for possible rationing and distribution of food and supplies; (c) the availability of emergency facilities and equipment for adequate storage, preparation, and service of food; and (d) food sanitation. We will deal only with food sanitation problems as they affect the operation and administration of emergency feeding programs.

The possibilities of disease dissemination will be greatly increased at times of emergency mass feeding so that adequate control measures will be essential. Therefore, the specific measures directed toward the protection of food assume added significance over those normally practiced.

The principal problems in the establishment of safe food service under emergency conditions relate to: (a) the use of equipment and the selection of foods in menu planning for varying degrees of emergency conditions; (b) the train-

---

*Mr. McCallum is chief of health emergency planning of the Office of the Surgeon General, Public Health Service. Mr. Faulkner is chief and Mr. Koelz is food sanitation consultant of the milk and food branch, Division of Sanitation, Public Health Service.*

---