The most misunderstood and inadequately supervised item of sanitation on the dairy farm is the water supply. Even in some areas supervised by well organized milk inspection programs, water supplies frequently are found to be improperly located, constructed and protected. It is only necessary to review the facts presented in the Sanitary Milk Control Study (1) made by the National Research Council several years ago to see that this statement has a basis in fact. In four of the eight cities studied, the percentage of improperly constructed and protected water supplies varied from 36 to 86 per cent of the farms inspected. No other item received such low scores.

This failure on the part of sanitation workers to insist on properly located and constructed water supplies may be due to several things. In the first place it is possible that some sanitarians do not consider the water supply important in preventing disease transmission. After all, they may reason, any disease organisms getting into a milk supply through this source will be eliminated in the pasteurization process. This viewpoint, of course, overlooks the generally accepted concept that control should not be based on one line of defense but on many. One of our leading textbooks (4), however, appears to take the former position: "The water supply on a dairy farm should be potable. Extensive tests have shown that often this is not the case. Inasmuch as little can be done to remedy such a condition, food officials insist that all water for washing purposes be boiled, and they are increasingly requiring that chlorine be used in a final rinse as a factor of safety."

A sound philosophy of health protection in the field of milk control would be that one should strive for a solid foundation of protection at several points from the source whether it is a cow or a well, through the steps of pumping, handling and storing to the final processing of the product. If the total effort depends on one thin protective crust such as cooking, pasteurization, or chlorination then any sudden or temporary breakdowns at any one step would not be covered by a supplementary protective measure.

A second possible reason for neglect of the water supply item in dairy farm inspection might be hesitancy, on the part of sanitarians who have not had much contact or experience in water supply sanitation, to give advice and to criticize the farm water supply. If this is a reason for carelessness on the part of sanitarians in stressing the importance of a protected water supply, then special emphasis should be directed to the training of personnel in this important item of sanitation.

WATER SUPPLY IMPORTANT TO THE DAIRY FARM

A three year study (2) of nine dairy farms in the St. Louis milkshed by the Agricultural Research Service of the U. S. Department of Agriculture and published in May of 1954 concluded that good practice in dairy farming was hampered when the water supply was inadequate or when conditions were not conducive to habits of cleanliness. This study emphasized the importance of good sanitation practice as a require-
ment for the most economical method of producing high quality milk. Water supply is an important consideration in any attempt to develop the most economical investment in building, equipment and labor consistent with the production of quality milk. Economy in the production and processing of milk is tremendously important in this time of high costs.

**Water Supply Necessary for Reasons Other Than Just Milk Production**

The water supply is important not only because of the danger of contaminating the milk supply through an unsafe water supply but because of the importance of an adequate supply conveniently available, for the proper cleaning of dairy plant facilities, equipment and personal cleanliness.

Just as an adequate and safe water supply for municipal, industrial and business use is recognized as being of fundamental importance in the development of our national economy, so it is recognized as equally important on our farms for the many household tasks, for fire protection, for personal cleanliness, for stock to drink, and for the cleaning of facilities and equipment used in the production of quality milk. Not only is it important to have a source of water available but it is important to have it under pressure and conveniently available for the washing and sterilizing of utensils and other clean-up uses if the operation of the dairy is to be efficient and economical.

Although assistance in the development of a water supply is frequently given by agricultural departments, in bulletins and through Extension Agents, progressive and up-to-date milk sanitarians should know some of the fundamental factors that are important. Such factors include location in relation to sources of pollution, capacity of available sources of supply including short time and total daily pumping capacity of the source of supply, and the desirable storage capacity to meet peak as well as total demands.

**Technical Information Available**

Technical information as to the proper location, design and construction of water supplies is available in a number of publications. Several such publications are listed and commented on in order to assist inspectors in dealing properly with this problem of water supply on a dairy farm. The U. S. Public Health Service issues a pamphlet entitled "Individual Water Supply Systems" (5), which outlines recommendations of a Joint Committee appointed to study the problems involved and to develop a set of uniform recommendations for the use of agencies responsible for the supervision of individual water supply systems.

This publication not only outlines basic requirements but gives details regarding location, protection, treatment, distribution and storage. Procedures are recommended for the disinfection of water supplies and a very excellent bibliography on the subject is included. Another publication which gives considerable detail on the same problem is the 1953 Milk Ordinance and Code (6) recommended by the U. S. Public Health Service. As an appendix to the Ordinance and Code there is a complete outline of minimum standards for location, construction and protection of water supplies for dairies. This appendix is liberally illustrated with construction details for the various types of wells and springs together with typical pump mountings, man-hole covers and piping installations. A third publication entitled "Safe Water for the Farm" is issued by the U.S. Department of Agriculture (3). This publication includes a number of tables regarding farm uses of water, friction losses in various sizes of pipes, data on wind-mills, capacity of tanks and cisterns, and characteristics of various types of pumps.

**Two Misconceptions Which Seem to Have Quite Wide Acceptance**

It is not possible to present in this paper a treatise on the design, construction and maintenance of the various types of water supplies which would be found on dairy farms throughout the country. Nor would it be possible or wise to outline in detail all of the hydrological, geological and bacteriological factors which affect the quantity and quality of water supplies. This information as indicated above is available elsewhere; however, two apparent misconceptions as to the proper construction of wells deserve comment.

The following statement often is heard: "This well is OK because it is a drilled well". Regardless of how a hole is opened from the ground surface to the water bearing strata, the same two general ways of contaminating the well exist. It may be constructed so as to permit water to enter from the ground surface and run into the well or it may be so located as to permit seepage or a contaminated underground source to enter the hole below the ground surface and run down the hole to contaminate the supply. Unless the well is located away from sources of pollution such as cesspools or sewers, contamination may reach the water. Such contamination can be prevented by proper location and by proper filling between the casing and well hole and by sealing the bottom of the casing into an impervious strata. Surface water, in so far as possible, should be prevented from flooding over the top of the well. This is diffi-
cult to do if well pits and sumps are used and for this reason some health departments prohibit such pits. These simple principles of protection apply to bored wells, drilled wells, and to dug wells.

Another misconception often expressed is — “This well is protected at the surface because it has a concrete top”. Here again there is no magic in the concrete per se. The top must be sealed to prevent surface water from running into the well through any opening at the top of the well. First the hole is opened from the ground surface to the water strata; then a casing is installed to support the wall of the hole. A strainer is attached at the bottom to keep the sand strata back and permit the water to enter the well hole. Inside the casing a flow line is installed to house the pump impellers. Factors which are important in properly covering the top of the well include sealing the flow line to the pump base, sealing the annular space between the casing and flow line, filling the annular space between the casing and well hole at least to a depth of ten feet, and providing a top to shed surface water and support the motor and pump. The casing usually is brought up several inches above the ground surface and recessed into the pump base. The basic principles outlined above apply in protecting the top of dug as well as drilled wells. Milk control officials should reappraise their efforts relative to this item of sanitation as there is ample evidence to indicate that proper well construction often is neglected.

**Summary**

The most misunderstood and inadequately supervised item of sanitation on the dairy farm is the water supply. It is, however, important from an economy standpoint as well as a secondary line of defense against contamination of a milk supply. Technical information on the location, design and construction of farm water supplies is readily available. Several misconceptions which seem to be quite prevalent in the minds of the general public and some milk control sanitarians are described.

**References**