Applying heat makes it possible to direct attention to how the casein can be removed. Casein and its properties make for demonstrations that are of interest to any group in the plant. These and other points are covered and enlarged upon as the demonstration is made.

Present Simple Facts

In closing this discussion, the writer wishes to emphasize one very important point. Dairy Science subject matter can be made too technical for beginners. Too frequently the lecturer overestimates the understanding of the subject by the listener. It will probably surprise many readers, if they have not already learned by experience, that simple facts about dairy science are not understood by the layman, college students in the beginning class, and creamerymen. Such simple items as "whey," "butter-milk," how butter forms on churning, the action of heat on milk, and cream rising, can be made fascinating when properly explained. Simple facts about milk and its products make a story—a good story, and to make a good story better—demonstrate.

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FLY AND RODENT CONTROL IN DAIRY PROCESSING PLANTS

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The Federal Food, Drug and Cosmetic Act requires not only that food products must be free of filth but also that the plant in which the food is processed, stored, or held must be clean. The courts have defined filth as objectionable material repugnant to the general public. Manure fragments, finger nail polish, insect fragments, and rodent hairs, are examples of such filth.

Where the dairy plant, itself, or its products have been found to be in violation of this law, penalties in the form of seizures, fines, and injunctions have been meted out. The damaging effect of bad publicity resulting from such court actions is inevitable. As a result, the dairy industry has become acutely aware of the necessity for cleaner plants and for filth-free products, and this, in turn, has spearheaded a drive for better insect and rodent control.

During the last 5 years there have been major advancements in the methods and materials designed for combating flies, rats, and mice in dairy processing plants. Today, any dairy plant wishing to keep these pests under control must be conversant with these new developments in this field.

Some of the new chemicals developed in the warfare against insects and rodents have been found to be toxic to humans and other warm-bloods, so extreme care must be exercised in their use.

Fly Control

It is now commonly recognized that subsequent generations of flies are able to build up resistance or immunity to certain sprays, such as the chlorinated hydrocarbon insecticides. As mankind has developed better methods for controlling flies, the flies themselves have been able to develop better defenses against such attacks.

In controlling houseflies in and around dairy plants, certain basic factors are involved, such as: (1) elimination of fly breeding areas outside the plant where fly eggs may be deposited and matured into adults, (2) prevention of ingress into the building, (3) elimination of those that are able to gain access to processing areas.

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FIG. 1. Garbage made inaccessible to flies and rodents.

Flies lay their eggs in damp, nutritive material, such as milk and whey spillage around loading docks and driveways. Between rains, it should be the plant's established practice to sprinkle such breeding areas with an insecticide specifically designed to readily mix with the damp
material and to kill the eggs and larvae. Such a product would have to be water miscible, such as Lindane, with perhaps additives of methoxychlor.

An entirely new and very promising development is an organic phosphate compound, known as Malathion, which is particularly effective against strains of flies that are resistant to such materials as DDT. This material in a water base mixed with sugar is ideal for residual application to roosting areas of flies outside the plant, such as conveyor portals, and around constantly opened doors. Flies will usually crawl over or roost on certain outside surfaces before attempting to go through a doorway. The organic phosphate, applied to such surfaces, will continue to kill flies for as long as 10 days after application. Dairy plants that buy this material in concentrated form and mix a ready-to-use formulation themselves should proceed with caution. This practice embodies the dangers of incorrect mixing. It is an organic phosphate compound, known as Malathion in a water base with sugar impregnated. The sugar not only acts as a synergist to the formula but also retains the flies on the treated surface long enough to effect a good kill.

There are many means of preventing flies from entering the dairy. Suffice to say, that all openings should be well screened but conveyor portals and heavy traffic doors that cannot be screened at all times present a problem.

Doorways should have self-closing devices and should be reduced in size to the very minimum. Similarly, conveyor portals should be provided with steam jets, or tunnels with their interiors painted black to discourage fly entrance. Moreover, the openings into the building that are completely unprotected at certain periods should be provided with a strong curtain of air through which the flies cannot penetrate. Such a curtain can be provided by a fly fan, which will be 95% effective if the right model is chosen and if it is installed correctly.

There is probably more misuse of fly fans than any other means of fly control in the dairy industry. It must be remembered that the fans with specially built-in deflectors will spread the air over a wider area but in so doing will reduce the velocity so that flies can easily gain entrance at floor level. It is better to use fans without deflectors but more of them if the doorway is wider than 48 in. A lighted cigarette can be used for testing a fan's efficacy at various points around the door to see whether or not there are any back currents of air which would, of course, bring flies from the outside.

Despite these precautions, many flies still will be able to gain entrance to the building on employees' clothing and on the underlips of cans. In nonprocessing areas and in rooms far removed from exposed foods, it is safe to use a residual insecticide on the walls and perhaps even on the ceilings for fly control, since there would be no danger of the wounded fly dropping into the food or equipment. For such treatments, a 3% methoxychlor and 1½% Lindane insecticide in an oil base is effective.

In processing areas, the application of residual insecticide is not recommended because of the danger of dropping insects. Instead, the plant should depend on space-spraying methods using a pyrethrin or allethrin insecticide in an oil base with such additives as sulphoxide, Octicide 264, or piperonyl butoxide as synergists. Such a product should be fogged or space-sprayed so that an entire coverage of the room is made.

It is important to use a high flash-point solvent in space-spraying, as low flash-point solvents can create a definite fire hazard. It is well to be sure that the insecticide used carries the rating of Fire Underwriters' Laboratories in this respect.

In insect control, the method of application and equipment utilized are of equal importance with the insecticide chosen. The insecticide must effect not only a quick knockdown and kill but, in the case of residual materials, a long-lasting one also.

For space-spraying for control of flying insects, a spraying unit should be chosen that will break the insecticide down into particles of 15 to 30 microns.

Many insecticide sprayers, particularly those employing the Venturi principle, will produce extremely large droplets of insecticide, which precipitate and wastefully settle to the floor. For average-sized dairy processing plants, there are several electric powered sprayers that are ideal. These sprayers are equipped with timers and will produce very fine particles of spray which remain suspended in the air for long periods of time.

To apply a good residual insecticide to a surface so that the material will crystallize and continue to kill insects for long periods of time, the sprayer chosen is also very important. Of utmost significance is the nozzle, which, instead of misting or providing a cone-shaped spray, should project the insecticide onto the surface in a fan-pattern so that the treated surface can be made glistening-wet and yet not run with the liquid.

Enough cannot be said about insecticide toxicity. Management should be concerned not only about the danger of contaminating the food product but also about the danger to the worker who applies the material. Insecticides have a tendency to be readily absorbed through the skin; therefore, precautions such as washing the hands after application and the wearing of rubber gloves should be very strongly stressed. For plant use, an insecticide should be chosen which minimizes danger of food contamination.
or human toxicity. Chlordane, for example, although an unusually fine residual insecticide against crawling insects, is rated more toxic, generally, than DDT.

**Rodent Control**

In the control of rats and mice in a dairy plant it is important first to eliminate rodent harborages outside the building; second, to remove the rodent feeding media both outside and inside; third, to develop good rodent proofing barriers for all entrances into the plant, and, fourth, to utilize both trapping and poisoning materials and equipment inside and outside the premises.

Some of the habits and characteristics of rats are much different from those of mice, but, generally speaking, the dairy plant's rodent control program should be overhauled and ready for action at the first advent of cold weather, when these pests will attempt to seek food and shelter inside the warm building. Old lumber and scrap equipment should never be piled on the ground against the outside walls of the plant, and no food should be available in alleyways, such as unprotected garbage containers and discarded butter wrappers. All rodent harborages should be eliminated, such as false walls and double ceilings.

The plant should be considered as a fortress with all means brought into play to keep rats and mice from gaining access. Doors should be tight fitting with self-closing devices so that no light can be seen under them at floor level. Pipe and electrical conduit passageways to the building should be securely screened or sealed so that no open space remains around them. A very careful examination should be made of every square foot of the plant's perimeter up to several feet above the ground to make sure all openings are sealed. Rodents cannot live unless they are well fed, so any source of food should be dispersed in bait boxes. These are available in either cardboard, wood, or metal. The bait boxes embrace the safety angle, provide a hidden place to feed, and supply an adequate amount of material through the feeding hoppers in the boxes. A sufficient supply is important because either Warfarin or Pival must be eaten by the rodent for 5 to 14 days consecutively.

**FIG. 2.** Sugar, dried milk, and other foods should be stored on pallets high enough that rodent control measures can be properly exercised.

**FIG. 3.** A poor method of storage.
Fig. 4. Unsealed pipe holes serve as rodent inlet to plant.

The bait boxes should be put in places which rodents frequent. This can be determined by their footprints (in flour sprinkled for that purpose), rodent excreta droppings, or gnawing. The boxes should be placed at the wall-floor juncture.

Trapping, rather than poisoning, should be resorted to around exposed food and food handling surfaces, and the extended trigger principle is particularly applicable. This merely involves placing on the trigger of the trap an extended piece of cardboard or screen to enlarge the surface of the springing mechanism so that the rodent in touching the trap will spring it immediately. These extended trigger traps should be placed at right angles to the wall, preferably with a box or obstacle behind, so that the rodent traversing the wall-floor juncture almost has to contact the extended trigger and hence spring the trap.

For rats, there are specially-made metal traps that can be baited with liquids. For mice, there is a wind-up, box-like trap that is particularly effective, as it will catch as many as twenty mice in one setting without baiting.

It Is Important to Proceed Cautiously

Again it should be emphasized that caution must be taken in using insecticides and rodenticides in any type of food processing plant. It is important that the plant operator know what is being used in his plant and whether it is safe from both the food contamination and human toxicity standpoints.