SANITATION PROBLEMS IN THE MANUFACTURE OF COTTAGE CHEESE

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Cottage cheese is the result of a controlled bacteriological fermentation. Its successful manufacture and distribution is, therefore, largely a matter of controlling certain bacteriological and sanitation problems. These problems are discussed under three categories: namely, those that affect the manufacturing procedure; those that affect the shelf life or keeping quality of the finished product; and those that affect the spread of disease.

Cottage cheese is an easily digested, high-quality protein food which builds, repairs and maintains body tissue. It is economical and easily used by the housewife in the preparation of many attractive dishes. Thus, it is hard to understand why the per capita consumption of cottage cheese in the United States is only about 4.0 pounds per year, while in some areas, notably the Pacific Northwest, it is over 14 pounds per person per year, or 3.5 times as great as for the nation as a whole.

Sanitarians are not only interested in preventing the spread of disease through contaminated food, but are also interested in improving the public's health by promoting the use of those foods which build strong, healthy bodies. Cottage cheese, properly manufactured, is one of those foods. However, when improperly manufactured, it often lacks uniformity from day to day; it may be off flavored, or it may develop an unsightly appearance before being finally consumed. When these conditions exist, consumer acceptance is discouraged.

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Most of the sanitation procedures that are common in the processing of bottled milk, if applied to cottage cheese, would go a long way toward improving its quality and consumer acceptance. Sanitarians have a golden opportunity to help the dairy industry produce and sell a better cottage cheese, just as, over the years, they have helped produce and sell a better bottle of milk.

For the purpose of this discussion, the sanitation problems associated with the manufacture and distribution of cottage cheese have been divided into three categories; namely, those that affect the manufacturing processes, those that affect the shelf life and keeping quality of the finished product, and those that affect the spread of disease.

Sanitation Problems That Affect the Manufacture of Cottage Cheese

Cottage cheese is a fermented dairy product, which means that a controlled fermentation is necessary in its manufacture. This is accomplished by first pasteurizing the milk to destroy the undesirable types of bacteria, both pathogenic and non-pathogenic and then adding a pure culture of organisms known as starter.

This starter is of utmost importance, as it assists in the coagulation of milk, affects the characteristics of the coagulated milk, the flavor and other characteristics of the finished cheese. Thus, to be successful, adequate personnel and facilities must be available to carry on from day to day contamination-free starters. Poor sanitation and bacteriological techniques used in the handling of starters invariably results in a poor quality cheese.

As a great deal of cottage cheese is made in small plants where persons trained in bacteriology are not available, sanitarians, all of whom have had some bacteriological training, could aid materially by making suggestions and giving some instruction in the basic bacteriological procedures necessary to prevent the contamination of starters.

Aside from the problem of gross contamination of starters, a condition which can be temporarily corrected by discarding the contaminated starter and starting a new one, there are other problems which may be even more troublesome. It has been pointed out (2) for example, that milk from cows infected with mastitis will not support good starter growth. The control of mastitis, however, by the use of antibiotics, and the improper handling of the milk from animals treated with these drugs, may be even more damaging than the mastitis milk, as the residual antibiotics given off in the milk supply may completely destroy the starter organisms. In addition, the presence of certain sanitizing agents, as for example, quaternary ammonium compounds (10, 5) or the growth

of certain bacteria may result in the production of substances which inhibit the growth of starter organisms (1).

An analysis of over 2,000 milk samples gathered throughout the cheese producing areas of the state of Idaho (3) has shown that approximately 5 per cent of the samples analysed would not support the growth of lactic acid starters when added at the 1 per cent level. A breakdown of these samples showed that most of those which would not support bacterial growth came from small lots of milk. However, when 1,000 to 1,500 gallon lots of milk were sampled, practically none of these samples failed to support growth. This means that the presence of antibiotics or growth inhibiting substances in milk is a much greater problem for the small manufacturer than for the large one where the milk from a large number of cows is mixed together.

Continued efforts on the part of the dairy plants, sanitarians and fieldmen in preventing contamination of milk with these materials is necessary. Our study showed a marked difference between areas and between plants in the percentage of samples containing inhibiting substances. Our study also indicated that a routine testing program accompanied with field work was effective in keeping down, at least, the amount of such milk received.

As a result of this problem, we have recommended a routine testing program for our cheese plants and also recommended that a reconstituted, low-heat, non-fat milk powder, that had been previously tested for starter activity, be used in the preparation of the mother cultures as well as the bulk cultures for the manufacture of cheese. This eliminates the possibility of losing all of the starters in a plant because of the presence of growth inhibiting substances in the farmers' milk supply that may be used for starter preparation.

In addition to the problem of growth inhibiting substances in the milk supply, further investigations in Idaho have shown that bacteriophage infections could be detected in approximately 80 per cent of the vats of cheese showing poor starter activity.

Bacteriophages are viruses which destroy starter organisms. They are more or less specific in their activity (6). They are more resistant to heat than bacteria and may survive ordinary pasteurization temperatures (13). They survive drying (12), and being very small are easily carried on air currents.

The control of bacteriophage is strictly a sanitation and management problem. Once a plant becomes infected only the initiation and continued use of a complete cleaning and sterilizing program will correct the difficulty. This means washing and sterilizing with some bactericidal agent, such as chlorine, all equipment, walls, ceilings, floors, drains, etc. In addition, it is usually recommended that a starter preparation room be provided and located so as to be away from the making room and whey separation area in cases where American type cheese is also made and the whey separated. It is undesirable to have any air contact or any equipment moved from the cheese making room to the starter preparation room without it first being thoroughly sterilized.

Because of the fact that the virus is specific and requires the presence of a host organism susceptible to the bacteriophage, proper management of starters has been found to be helpful in controlling the infection. The carrying of 4 mother starters, each from a different source, and the use of a different one each day until each strain has been used has been found to be helpful. This allows an infection that may start against one strain to go through 3 additional clean-up and sanitizing processes before that strain, against which the bacteriophage can work, is again used. Some people recommend carrying several mother cultures from different sources and then mixing them in preparing the bulk culture. This often prevents a complete failure in case of infection as some, possibly one-half, of the cultures will probably not be affected by the particular virus and its activity will be more or less normal. Regardless of the method of starter management, however, the only permanent solution to the control of bacteriophage is continued strict sanitation.

Sanitation Problems that Affect the Shelf Life or Keeping Quality of Cottage Cheese

The spoilage of cottage cheese is for the most part the result of bacteriological decomposition. The organisms most commonly responsible are psychrophilic bacteria, yeasts and mold.

The growth of psychrophilic bacteria results in the development of fruity, or unclean flavors and odors. Also, it may result in the development of what is known as the tapioca or translucent curd, a condition which causes a shiny, translucent surface on each curd particle. The development of a pink or yellow pigment is also quite common. Yeast and mold growth result in the development of off flavors and often the presence of visible mold colonies on the surface of the cheese.

As all of these organisms are killed by proper pasteurization temperatures and as the temperatures of 120° to 135° F. reached in cooking cottage cheese, plus the acid condition of the cheese provides some further protection, their presence in the product is considered to be the result of post-pasteurization, and in many cases, post-cooking contamination.

These organisms are widely distributed throughout...
nature and they gain entrance to the product by un-
sanitary procedures. Aside from improperly washed
and sterilized equipment, the water used to wash the
cheese may be a source of psychrophilic bacteria.
Water which meets the requirements for drinking and
domestic use may still be unsuitable for use in wash-
ing cottage cheese. Thus, it is recommended that cot-
tage cheese wash water be treated by chlorination (4),
or pasteurized before it is used.

Because the wash water is also used for chilling or
cooling the freshly cooked cottage cheese curd, it is
recommended that the last wash water be chilled and
that sufficient amounts be used so that the finally
drained curd is cooled to 45°F. or less.

Whereas, it is true the psychrophilic bacteria grow
at low temperatures, 45°F. or less, they also grow
much faster at 50°F and 60°F. Thus, the colder the
cheese curd is kept, the better will be its shelf life.

Generally speaking, the lower the pH of the cheese,
the more slowly the psychrophilic organisms will grow.
Thus, a finished, creamed cottage cheese, that has a
pH of 5.0 or less, is desirable. Various methods have
been used to obtain this condition, such as manufacture
of the so-called acid type cheese, keeping the number
of washings to a minimum, and either acidifying
the wash water by the addition of acid (8), or the
cottage cheese dressing (9) by adding starter to the
dressing before pasteurizing. When it is desirable to
store cottage cheese, storage in a brine solution
(3.2 lbs. of salt in 80 lbs. of water) acidified with 84
ml. of a 50% citric acid solution (7) is desirable. Acidifi-
ying the wash water is particularly important if the
water supply is alkaline in reaction. Successive wash-
ings in such water will raise the pH of the curd and
tend to make the curd slick due to the casein dissolv-
ing power of the alkaline salts. Chlorine is also more
effective in an acid reaction (4).

The creaming mixture used on cottage cheese can
be another source of contamination. Here again the
contamination that affects keeping quality is post-
pasteurization; consequently, it is a plant sanitation
problem. If the cream used to cream cottage cheese
were handled under the same condition as milk or
bottled cream, an important source of contamination
would be eliminated and an improvement in keeping
quality would no doubt result in a large number of
plants.

Good sanitation, proper pH control and good re-
frigeration are essential for a good shelf life for cottage
cheese.

Sanitation Problems Which Affect the
Spread of Disease

As most cottage cheese is manufactured from pas-
teurized milk or milk products, inspection of the pas-
teurizing procedures to insure adequate pasteurization
is important.

It should be pointed out, however, that cottage
cheese is a product which maybe subjected to a great
deal more post-pasteurization contamination possi-
bilities than bottled milk. The milk for cottage cheese
is held in open vats for a number of hours; it is often
subjected to varying amounts of handling by the hands
of the workers; it is often stored in containers, such
as metal cans, which would not be considered suitable
for pasteurized milk; and it may be creamed and
packaged by hand or in packaging machines which
lack many of the sanitary safeguards commonly in-
sisted upon in packaging milk.

There is need for improvement in the manufacturing
and packaging equipment used in processing cottage
cheese. Some progress has been made but until further
improvements are forthcoming, the health of the
workers engaged in handling this product should be
carefully checked. A recent (7) report indicates
that if coliform counts are an indication of sanitation
and safety, then much of the cottage cheese on the
market today is certainly on the border line. That
cottage cheese can be manufactured with a low col-
iform count is evident, however, from a report from
the Spokane Health Department (11) where one
company has had only one sample with a positive col-
form count, and that was one per gram. In contrast to
this, 22 per cent of the samples analysed in the same
market had over 1,000 coliform per gram.

The result of a Michigan survey (7) on the sanitary
qualities of cottage cheese concluded, “judging
from the data presented, an unsatisfactory condition
exists in the field of cottage cheese manufacture and
packaging.” There is nothing mysterious about the
manufacture of good cottage cheese, and the major
shortcomings are simply poor bacteriological pro-
cedures and poor sanitation.

Many health departments might well follow the pro-
cedure of the city of Spokane which now requires
Grade A milk to be used in the manufacture of cottage
cheese; prohibits the use of canvas covers for cheese
vats; prohibits copper pipes and hand filling of car-
tons; and requires a more sanitary lip protected cart-
on.

Sanitarians could do a great service to the dairy in-
dustry and to the consuming public by working for
the same conditions of sanitation in the manufacture
of cottage cheese as are now insisted upon in the pro-
cessing of bottled milk.

References

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