

# Minnesota Dairy Products Processor

AGRICULTURAL EXTENSION SERVICE • INSTITUTE OF AGRICULTURE  
UNIVERSITY OF MINNESOTA • ST. PAUL 1, MINNESOTA

Editor - V. S. Packard

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## MILK FLAVOR CLINIC?

This coming year I will be glad to conduct raw milk flavor clinics for milk haulers, graders, and others interested in judging milk. Samples of milk prepared with various off-flavors will be available along with a discussion of the cause and control of milk off-flavors.

If you would like to hold a meeting or series of meetings on this subject please contact me at 136 Dairy Industries Building, University of Minnesota. Get requests in as soon as possible to be sure a convenient date will be open.

## CHEMICAL FLAVORS IN MILK

Recent research work by Chater Sen Gelda and E. L. Thomas of the Department of Dairy Industries has uncovered some interesting facts about chemical flavors in milk, particularly those caused by sanitizing agents:

1. A taste panel was able to detect iodine and chlorine in skim milk at a level of 6 to 8 parts per million (ppm). In whole milk detectable off-flavor was noted at a concentration of 10 to 14 ppm. Concentration is expressed in terms of available sanitizer as added to the products.

2. Mixtures of chlorine and iodine produced an off-flavor when the total mixture concentration was 6 to 8 ppm in skim milk and 10 to 14 ppm in whole milk. Whether present as an individual contaminant or in a mixture, the taste threshold level was the same. Chlorinated and iodinated samples were prepared from stock solutions containing 250 ppm available sanitizer (halogen).

3. Addition of highly concentrated solutions of iodophor to milk caused a decrease in levels at which the contaminant could be detected by taste. In other words, contamination of milk with a strong stock solution is potentially more serious than contamination with a solution at the strength used in sanitizing equipment. Consumers may raise objections at lower overall levels of iodophor in the former case. Here are the threshold taste values found by the panel:

<u>Concentration of iodopher as added to milk</u>	<u>Level of detection by panel*</u>
250 ppm	12 ppm
500 ppm	10 ppm
1,000 ppm	6 ppm
2,000 ppm	4 ppm

\* Note: In all cases concentration is expressed as parts per million available sanitizer as added.

4. Rate of loss of available iodine (the sanitizing agent in iodophors) from iodophors depends upon degree of exposure to air. Besides the resulting decrease in sanitizing power another practical problem exists. Vapors condensing on exposed equipment or within processing lines become sources of chemical flavor in milk. And the condensed material is a highly concentrated form of iodine which will cause off-flavors at very low concentrations in milk.

5. Presence of small amounts of phenol (.5 to 1.0 ppm) plus 15 to 20 ppm of iodine or chlorine in milk produces chemical compounds that are readily detectable by taste. Sources of phenol in milk are varied. Some ointments used on teats and udders for soreness or cuts contain phenols. Also water supplies and some plastics are potential sources. Flavor compounds formed when iodine or chlorine combines with phenol are technically referred to as iodophenols and chlorophenols respectively.

Recent work by Purdue scientists indicates that some chlorophenol compounds have such strong flavors that as little as 0.25 parts per billion (ppb) can be detected in milk. Range of detection of common chlorophenol compounds varies from 0.25 to 250 ppb.

#### EFFECT OF SEQUENCE OF CONTAMINATION

The phenol must be present in the milk prior to contamination with iodine or chlorine for this chemical combination to take place. Apparently the latter compounds are tied up by other milk constituents and made unavailable for reaction if they're added first. In fact, addition of iodine or chlorine only 2 minutes before phenol results in no off-flavors at nominal concentrations. Because the source of phenol varies widely, consideration must be given to the possibility that some may be present in milk prior to sanitizer contamination.

#### EFFECT OF SANITIZER CONCENTRATION

As the concentration of contaminating chlorine increases, the amount necessary to detect a chlorophenol off-flavor decreases. For example, milk that contains 0.1 ppm phenol requires 200 ppm of chlorine to cause a detectable flavor if the concentration of added chlorine is 500 ppm. Only 5 ppm of chlorine in milk will result in chlorophenol off-flavor if the concentration of added chlorine is 2,000 ppm.

## EFFECT OF CHLOROPHENOLS IN WATER ON MILK FLAVOR

Industrial wastes have resulted in phenol contamination of many water supplies. Addition of chlorine to such water causes formation of chlorophenols. Contamination of milk with water containing chlorophenols may yield off-flavors at very low concentrations.

Chlorophenol flavor may be detected when homogenized milk is adulterated to 2.5 percent with water containing 0.1 ppm phenol and 1 ppm chlorine. The calculated amounts of phenol and chlorine in the milk are only 2.5 and 25 ppb, respectively.

## EFFECT OF FAT CONTENT ON CHLOROPHENOL FLAVOR DETECTION

To some extent, fluid dairy products of high fat content may mask the chlorophenol flavor. A given amount of contaminant in half-and-half is not so detrimental to flavor as an equal amount in whole milk.

## EFFECT OF CHLOROPHENOLS ON COTTAGE CHEESE FLAVOR

Off-flavors may develop if wash water containing chlorophenols is used during cottage cheese manufacture. However, flavor development is dependent upon the proportion of chlorine to phenol in the wash water. An off-flavor will be detected when wash water contains 0.1 ppm phenol and 1.0 to 1.1 ppm chlorine. Flavor intensity increases as chlorine content increases up to about 6 ppm. But flavor can be eliminated by addition of larger amounts of chlorine -- in this case about 10 ppm. Excess chlorine oxidizes the phenol and no off-flavor develops.

## EFFECT OF CHLOROPHENOL ON BUTTER FLAVOR

When whole milk containing chlorophenols is separated most of the flavor compound goes with the cream. Butter manufactured from such cream will have a definite off-flavor. An intense off-flavor in the whole milk will result in an intense off-flavor in the butter.

Skim milk separated from whole milk containing chlorophenols may be acceptable for cottage cheese manufacture. Laboratory trials indicate no off-flavor in cottage cheese or cottage cheese whey even though the original whole milk had a pronounced chlorophenol flavor.

## AVOID CHEMICAL FLAVORS IN MILK:

1. Use all sanitizing chemicals at concentrations recommended on the label. Twice as much will not necessarily be twice as effective.

2. Always drain lines and equipment before processing.

3. Always discard first milk or cream processed. Most residual sanitizer will be found in it. Don't risk a customer's good will for the profit from 1 or 2 quarts of milk.

4. Keep sanitizer containers tightly capped. Don't allow vapors to penetrate the processing area.

5. Avoid contamination of milk with ointments or salves containing phenols. Label information lists active ingredients. Presence of chemical names containing the word phenol should be taken as evidence of the need for strict precautions to prevent milk contamination.

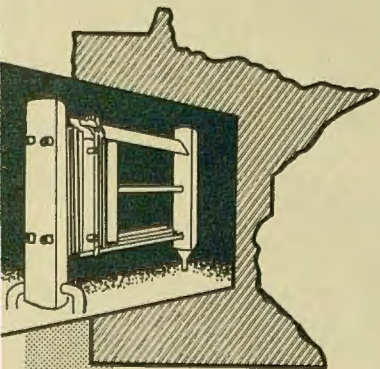
6. Oxidize phenols in cottage cheese wash water by adding excess chlorine. One-tenth ppm phenol in water can be oxidized by 10 to 15 ppm chlorine.

### MILKHOUSE LAW

Iowa and Missouri now can be added to the long list of states having passed some form of legislation concerning milkhouse or milkroom requirements for manufacturing grade milk. How long can we wait?

### DAIRY PRODUCTS INSTITUTE

The annual Dairy Products Institute is scheduled for September 10, 11, and 12. We're planning a program which should help bring latest problems and research findings into focus. We hope to see you there.



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