

# Immunoglobulin-G Content In Bovine Colostrum Preserved By Freezing, Fermentation and Chemical Preservatives

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The bovine fetus normally receives no antibody or disease resistance through the placenta as is the case for humans (29, 31, 32). To receive disease resistance the newborn calf must consume and absorb colostrum (18, 19, 20, 33, 36).

Recently, efforts have been directed to increasing the protection from enteric disease in colostrum by prepartum vaccination (1, 2, 4, 8, 22, 25, 30). To fully utilize colostrum as a disease preventative for calves, certain objectives must be obtained.

First, cows must be vaccinated sufficiently in advance of calving to obtain a maximum antibody in the colostrum (3, 15, 16, 34). Antibodies to disease are produced in the body and pass from the blood into the colostrum. Little antibody formation occurs within the mammary gland. Antibody passage from the blood into the colostrum begins when colostrum formation is initiated, which is four to five weeks prepartum, and reaches its peak absorption into the mammary gland about three to five days prepartum (3, 15, 35, 37). It requires at least three weeks for any vaccine to produce maximum immunity; cattle should be vaccinated at least seven to eight weeks prepartum to obtain the maximum antibody in the colostrum.

Second, the colostrum must contain specific antibodies to protect against specific diseases; vaccinating the cow for brucellosis will provide the calf with no protection from enteric diseases or diarrhea.

Third, the calf must nurse or be force-fed sufficient colostrum within four hours of birth to obtain the maximum absorption from the gut and passage into the body.

Under optimum conditions the dam will supply more than sufficient colostrum for her calf, but when sufficient colostrum is not available other sources must be utilized. When more colostrum is produced than needed it can be stored in various methods for future use. One source of colostrum for emergency use in beef cattle is surplus colostrum from a neighboring dairy.

Storage and preservation of colostrum has been done through freezing, fermentation at ambient temperatures and the use of preservatives (5). Freezing requires freezing equipment, except in winter climates, and provides a means of long storage. Fermentation at ambient temperature is economical and applicable during temperatures of less than 27°C. Preservatives are recommended and used to prevent losses of colostrum during warm weather.

Extensive investigations have dealt with the nutritional value of colostrum stored by various methods (7, 10, 11, 24, 26, 27, 28). Little data is available relating to the effects of storage on immunoglobulins (antibodies).

It has been established that less immunoglobulins are absorbed from fermented colostrum than from fresh or frozen colostrum, and availability for absorption is apparently affected by pH and other undetermined factors (12, 13, 14, 17). There is a minimal destruction of immunoglobulins when colostrum is fermented at ambient temperatures. This investigation was initiated to determine the levels of immunoglobulins in colostrum following freezing, fermentation at ambient temperature and when preserved with propionic acid, acetic acid or formic acid.

## Experimental Procedure

Fresh colostrum was collected from the first two postpartum milkings and IgG, IgM and IgA determinations made using the agar gel single radial immunodiffusion method (9, 21). Tests were made on whey obtained by rennet coagulation and centrifugation. Plates for this procedure were obtained commercially.\* Following immunoglobulin determination, the fresh colostrum was divided into aliquots and either frozen at -4°C in plastic

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containers, fermented in glass containers at ambient temperatures (at 27°C or less) or placed in glass containers with the preservatives of either proprionic acid (1.0%), formic acid (0.3%) or acetic acid (0.7%). Fermented and preservative treated colostrum was stirred each day. Aliquots were analyzed periodically for immunoglobulin content.

### Results and Discussion

Based on the data as presented in Fig. 1, the levels of immunoglobulin-G in the first two post-partum milkings were slightly greater than 6,000 mg per 100 ml of colostrum. These levels were maintained well for the first four weeks of holding with all treatments except acetic acid and proprionic acid. The level of immunoglobulin was maintained for up to six weeks by fermentation and freezing. An increase in immunoglobulin was detected in fermented colostrum and colostrum preserved with acetic acid between six and eight weeks. Immunoglobulin levels decreased in colostrum preserved with either formic or proprionic acid from six to eight weeks of storage.

The immunoglobulin levels in colostrum were preserved by freezing and maintained at a higher level for the first eight weeks than any other method of preservation.

Based on the above observations, it would be apparent that bovine colostrum preserved by fermentation, formic acid or freezing would provide immunoglobulin levels at near normal for at least four weeks. Preservation by fermentation would provide normal levels of immunoglobulin colostrum for at least eight weeks. It is obvious that the choice means of preserving immunoglobulins in stored colostrum is by freezing.

### Summary

Preservation of immunoglobulin levels in stored bovine colostrum is best achieved by freezing for at least eight weeks. Fermentation at ambient temperatures was nearly as effective in maintaining immunoglobulins as by freezing for the first six weeks of storage.

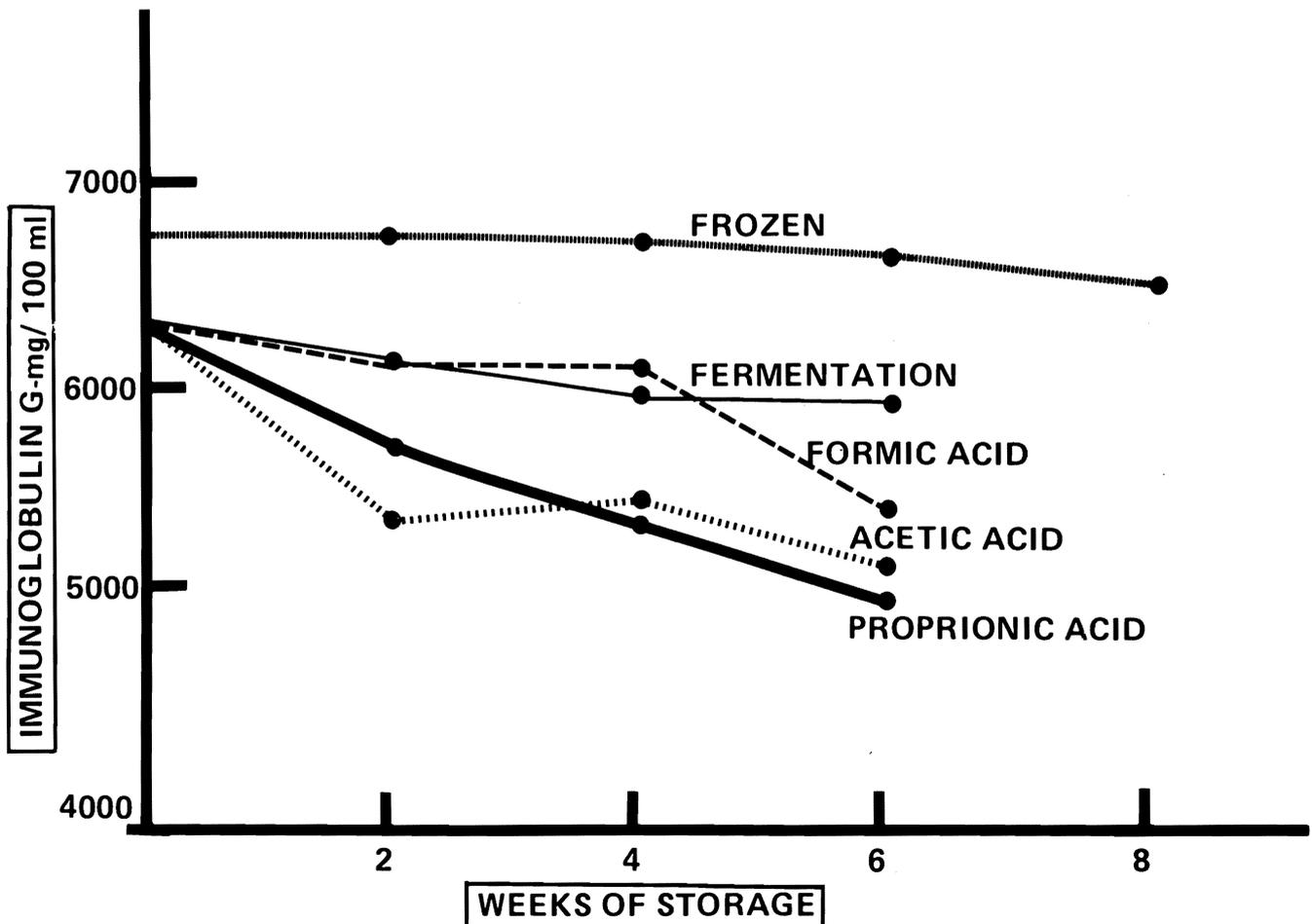


Fig. 1. Immunoglobulin levels in bovine colostrum stored by freezing, fermentation at ambient temperatures and with the chemical preservatives acetic, propionic and formic acid.

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