

# Effects of Gestational Zinc Supplementation on Colostrum Quality in Ewes

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## Abstract

Sixteen ewes were divided into treatment and control groups to investigate the effects of gestational zinc supplementation on colostrum quality. The primary objective of this study was to assess the impact of zinc on colostrum immunoglobulin G (IgG) levels immediately following parturition. A secondary analysis compared total bacterial counts in the neonate, a factor that can influence its successful absorption by the neonate. Although the treatment group exhibited higher mean colostrum IgG levels compared to the control group, no significant difference was observed. For the bacterial analysis, zinc may have demonstrated a beneficial effect by reducing bacterial levels in the treatment group; however, further testing is required to confirm this potential impact.

## Introduction

Colostrum plays a critical role in the health and survival of newborn lambs. Quality of colostrum is dictated by an adequate concentration of Immunoglobulin G (IgG). Good quality colostrum is defined as a concentration of IgG of 22% or greater via Brix refractometer scoring [1]. Zinc is implicated in various physiological processes such as immune function [2], and is a direct nutritional component of colostrum. Additionally, zinc has an impact on maternal immunity, and assists in maintaining epithelial barriers to infection [3]. Zinc may have the potential to increase a ewe's colostrum quality not only through direct IgG levels, but also in the colostrum's ability to be absorbed with regards to the total bacterial count present (CFU/mL). A total bacterial count  $\geq 50,000$  CFU/mL is known to impact the neonate's ability to absorb and benefit from the IgG present [4].

## Methods

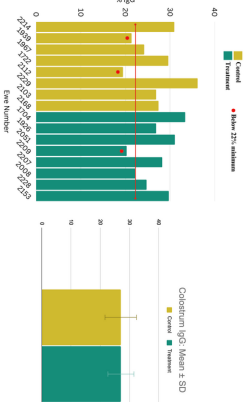
- **Subject Animals:** Pregnant ewes, (n=16, Hampshire/Dorsets/Crosses, 3-8 yrs. of age)
- **Treatment:** The 8 treatment ewes were started on Zimpro40 (1.0 gm/day = 40mg of zinc/day) at an average of 66.25 days prior to parturition, top dressed on feed along with ad libitum grass hay and a free choice sheep mineral.
- **Monitoring:** Ewes were monitored with hands-on checks 3x/day and camera surveying to ensure colostrum collection with 4 hrs. of parturition.
- **IgG Data Collection:** Udders and teats were cleaned and colostrum was expressed by hand in a sanitary fashion. A digital Brix refractometer was used to test the IgG %. Results were recorded in triplicate and averaged.

- Following this, the samples were frozen at 14-18°C.
- **Bacterial Counts:** Samples were thawed at 4°C, and either plated directly on TS agar or plated following serial dilution to ensure countable colonies. After incubation for 48hrs, colonies were counted to determine the total CFU/mL.

## Results

### IgG Testing:

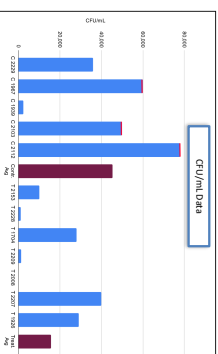
The treatment group had a mean IgG of 27.09%. Only 1 ewe of the treatment group fell below the 22% minimum. The control group had an IgG average of 27.02%, with 2 ewes falling below the 22% minimum as represented below in red. Overall IgG difference between the groups = 0.07%. The treatment group had a lower standard deviation value (4.45%) compared to the control group (5.39%).



### Bacterial Counts:

The average bacterial count for the control group (significant samples only) was 45,260 CFU/mL. The treatment group averaged 15,616 CFU/mL. In the control group, three ewes had bacterial counts  $\geq 50,000$  CFU/mL. No ewes in the treatment group exceeded the threshold. The following charts show individual CFUs/mL, control and treatment averages, and red lines denoting samples outside of the threshold ( $\geq 50,000$  CFU/mL).

Control	CFU/mL	Treatment	CFU/mL
2200	3000	2750	1000
960	6000	2200	1000
2000	700	1700	20000
1900	2300	2200	1200
2100	6000	2200	46000
2700	7000	2000	10
1220	500	3000	20000



## Discussion

Although the treatment group exhibited a slightly higher mean IgG level, the difference was minimal (<1%) and not statistically significant. The treatment group demonstrated a lower standard deviation (SD = 4.45%) compared to the control group (SD = 5.39%), suggesting reduced variability in IgG levels among treated ewes. This may indicate that while the treatment did not substantially elevate IgG concentrations, it could exert a stabilizing effect by minimizing extreme deviations.

Total bacterial counts (CFU/mL) were notably lower in the treatment group (mean = 15,616 CFU/mL) compared to the control group (mean = 45,260 CFU/mL). Means were calculated using only statistically significant samples ( $\geq 10$  countable colonies). The threshold for an unacceptable bacterial load is defined as  $\geq 50,000$  CFU/mL. While several individuals in the control group exceeded this threshold, none of the ewes in the treatment group had bacterial counts  $\geq 50,000$  CFU/mL. This suggests that the treatment may be effective in reducing overall bacterial load and in preventing excessive microbial proliferation. Further research is warranted to determine whether these findings can be replicated with statistical significance. With various factors impacting statistical reliability such as small sample size, variable zinc consumption, and appreciable differences between bacterial culture counts, this pilot study should be viewed as a preliminary step toward more comprehensive research. Incorporating measurements of zinc concentrations in both blood serum and milk would provide valuable insights and enhance the depth of future investigations on this topic.

## Conclusion

The data from this study suggests that zinc may not have an appreciable impact on colostrum IgG, but could have promising potential in reducing high bacterial counts in colostrum. Overall, further large-scale research with precise, individualized zinc supplementation is needed to conclusively determine whether increasing a ewe's zinc intake above typical levels during critical gestational periods offers a significant benefit in enhancing colostrum quality.

## References

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