Dairy Research Summary

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Effects of intravaginal lactic acid bacteria on immune response, incidence of uterine infections and uterine involution

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Why is this important?

Around calving, dairy cows undergo suppression of their immune system, resulting in a high incidence of bacterial infections in the uterus and mammary gland. In fact, almost 40% of dairy cows are affected by clinical metritis during the first 3 weeks after calving and another 15-20% by endometritis more than 3 weeks after calving. Furthermore, uterine infections predispose dairy cows to impaired reproductive performance (such as delayed return to cycling, lower conception rate, or more days open) and are the number one reason for culling of cows in Canadian dairy herds.

In the past, uterine infections have been treated with intrauterine or intravenous antibiotics with reasonable success. However, concerns about drug residues in milk and the rise of antimicrobial resistance have sparked a desire to find alternatives to antibiotics. The use of lactic acid bacteria (or probiotics) has been studied as a potential treatment in women with encouraging results and it stands that this treatment may work in dairy cattle as well. Probiotics are live microorganisms that benefit the host in various aspects (including immunity) when administered in adequate amounts.

The objectives of this study were to test whether treatment of cows with lactic acid bacteria could: 1) improve reproductive performance and uterine involution of postpartum cows, and 2) enhance immune response and lower the incidence of uterine infections and other post-calving diseases of transition cows.

What did we do?

One hundred pregnant Holstein cows were allocated to 1 of 3 experimental groups to receive intravaginal lactic acid bacteria (LAB) or carrier (sterile skim milk) during the transition period. The experimental groups included: 1) a dose of LAB at -2 and -1 weeks prior to calving and a carrier dose during the week after calving; 2) a dose of LAB at -2, -1 and +1 weeks of calving; and 3) a carrier dose at -2, -1, and +1 weeks of calving. Cows were monitored from -2 weeks before expected calving and up to +8 weeks after calving. Measurements taken included rectal temperature (to determine fever), uterine and ovarian ultrasound, blood samples, and vaginal mucus samples.

Ovarian structures were examined for presence and size of follicles and corpora lutea to determine whether ovarian cyclicity had resumed. Reproductive performance was measured by first-service conception rate, cumulative pregnancy rate, pregnancy rate at 150 DIM, services per conception, and number of days open.

Uterine infections were categorized into different classes:

- Metritis – cow having reddish brown vaginal discharge with odour, together with fever and an abnormally large uterus, decreased feed intake and milk production within 3 weeks of calving
- Clinical endometritis – cow with similar symptoms as metritis noted above but more than 3 weeks after calving
- Pyometra – a cow with accumulated material in the uterus along with a persistent corpus luteum

Retained placenta, displaced abomasum, lameness, and subclinical mastitis were also noted if present.

What did we find?

The data showed that LAB treated cows had a lower incidence rate of metritis compared to control cows (Table 1). There were no differences between treatments in terms of clinical endometritis, pyometra, retained placenta, displaced abomasum, subclinical mastitis, or lameness.

Table 1. Effect of LAB on diseases of transition dairy cows.[1]

	TRT1[2]	TRT2[3]	CTR[4]	*P*-value[5]
Metritis	15	6	38	0.007
Clinical endometritis	6	9	13	0.62
Pyometra	3	6	3	0.84
Retained placenta	3	6	13	0.29
Displaced abomasum	0	0	6	0.33
Subclinical mastitis[6]	40	50	55	0.90
Laminitis	9	9	6	1.00

[1] Values are the percentage of animals in each group

[2] TRT1: two doses of LAB prior to calving

[3] TRT2: two doses of LAB prior to and one dose of LAB after calving

[4] CTR: carrier only

[5] A p value of 0.05 means that there is a 5% chance that the results of the study occurred by chance alone. The lower the value the greater the degree of confidence in the findings.

[6] Subclinical mastitis = somatic cell count greater than 200,000 cells/mL

Treatment with LAB also sped up uterine involution in postpartum cows, with the involution process being completed within the first 21 days after calving compared to 28 days for control cows. Interestingly, treatment 1, but not treatment 2, decreased the number of days from calving to conception (days open) by 40 days (110 vs. 150 days in control cows). The researchers also found improved immune response in LAB-treated cows, as measured by the concentration of various immune factors in the blood.

What does it mean?

As concerns around antimicrobial resistance increase, it is essential that the dairy industry explore alternatives to antimicrobials. This study showed that intravaginal administration of probiotics (in this study, lactic acid bacteria) provided a health benefit to the reproductive tract against bacterial infections. Administering LAB lowered the incidence of metritis, sped up uterine involution, and improved immune response. Additionally, likely due to this reduction in illness, cows treated with LAB exhibited greater milk production and improved feed efficiency, warranting further research.

The availability of different types of probiotic products is increasing and knowledge around proper dosing and administration of these products continues to grow. Research has shown that they are capable of providing significant benefit to cows in a number of different areas. If your herd has significant issues with metritis, you may want to speak with your herd health veterinarian about incorporating probiotics.

Summary Points

- Concerns continue to build around the use of antimicrobials and the rise of antimicrobial resistance, leading to research on alternatives, such as probiotics.
- Intravaginally infused probiotics (lactic acid bacteria) used in this study were shown to speed up uterine involution, reduce the incidence of metritis, and improve immunity.

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