

Cabergoline treatment at dry-off facilitated the remodeling and the lactoferrin immunoprotection of the mammary tissue in dairy cows

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Objectives

In ruminants, the early phase of drying-off is a period of intense mammary gland involution that is due, in part, to dramatic decline prolactin (PRL) release. The speed at which the bovine mammary gland involutes following the abrupt cessation of lactation is also directly related to the risk of new intramammary infections. Thus, strategies to hasten involution following dry-off could have implications in preventing mastitis and optimizing mammary tissue regenerative processes.

Materials and methods

To assess the effect of prolactin inhibition by cabergoline on mammary gland involution, 14 Holstein dairy cows were injected with a single i.m. administration of 5.6 mg cabergoline (n=7) or placebo (n=7) within 4 hours after the last milking before the drying off at the day of drying-off (D0). Mammary secretion samples were collected using a teat-cannula once during lactation (D-6) and at D1, D2, D3, D4, D8 and D14 after the drying-off. The mammary secretion samples were used for lactoferrin and zymography analyses to detect the activity of enzymes such as MMP, matrix metalloproteinases involved in the remodelling of mammary tissue during involution. Mammary epithelial cells (MEC) were also purified from mammary secretions after centrifugation and immunocytochemical binding in order to evaluate the MEC exfoliation. Mammary biopsy samples were collected one week before drying-off (D-6), at D1 and at D8 and used for lactoferrin immunochemistry and zymography analyses.

Results

The activity of MMP9 increased after drying-off in mammary secretions ($P < 0.001$). Cabergoline increased the activity of MMP9 (1.7 fold, $P < 0.05$) in mammary secretions and MMP-2 in mammary tissue after drying-off (1.4 fold, $P \leq 0.01$). MEC concentration progressively increased in mammary secretions after drying-off ($P < 0.01$). Cabergoline induced an increase in MEC concentration ($P = 0.04$). Lactoferrin content progressively increased in mammary secretions during involution. The rise of lactoferrin content in mammary secretions was significant starting at D4 in the cabergoline treated cows ($P \leq 0.05$) whereas it only happened at D8 in controls ($P < 0.05$). Overall, cabergoline treatment increased lactoferrin content of mammary secretions ($P = 0.10$). The total lactoferrin immunostaining in the mammary tissue increased after drying-off ($P < 0.05$). Compared with during lactation, this increase was observed at D1 and D8, respectively for cabergoline treated cows and control cows ($P < 0.05$).

Conclusions

Our results indicate that cabergoline treatment was efficient to enhance the extracellular matrix mammary remodeling, and the MEC exfoliation from the mammary epithelium and also hasten the udder immunoprotection by lactoferrin and therefore facilitates the drying-off.