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GO PEI MAGA

Farm Models for Efficient and Sustainable Dry Period Management in Dairy Cows

Information

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Operation 16.1.01 "Gruppi Operativi PEI" of Regione Lombardia Rural Development Programme 2014 - 2020.
The lead partner is Università degli Studi di Milano. The project is realized with the collaboration of: Associazione Regionale Allevatori della Lombardia, Società agricola Fratelli Monti ss, Baronchelli Società agricola ss Cascina Ca' dell'Acqua, Società agricola Cossa Fratelli e Cugini.
Managing authority of the programme: Regione Lombardia

THE PROJECT

MAGA Operational Group-Farm Models for Efficient and Sustainable Dry Period Management in Dairy Cows-funded by Lombardy Region Rural Development Programme 2014 – 2020. This programme promotes a competitive and sustainable agricultural and forestry sector to ‘obtain more with less’ in harmony with environment. The programme would convert the recent decreasing trend of productivity through the promotion of a sustainable and efficient agricultural sector (Communication 19 of European Commission, 2012).

The objective of MAGA Operational Group is to introduce new management livestock practices able to improve farm organisation with particular regard to not productive animals. These practices are able to prevent the onset of new diseases and to guarantee animal welfare without decrease the productivity. The second objective of innovation is an indirect goal, because these techniques are able to reduce use of antimicrobials, reducing antibiotic resistance in a ‘One-Health’ perspective.

INTRODUCTION

Dry period defines the period between one lactation and the next one of the commonly duration between 40 to 60 days. Cow doesn’t be milked to preserve energy for calf and for regeneration of mammary gland secreting cells. This period increases cow stress, because physiological changes are in act, such as milking stop, and different management practices are applied (changes of production group and feed ration modifications).

One of the main problems during dry period is intramammary infection that is influenced by multiple factors as described in figure 1.

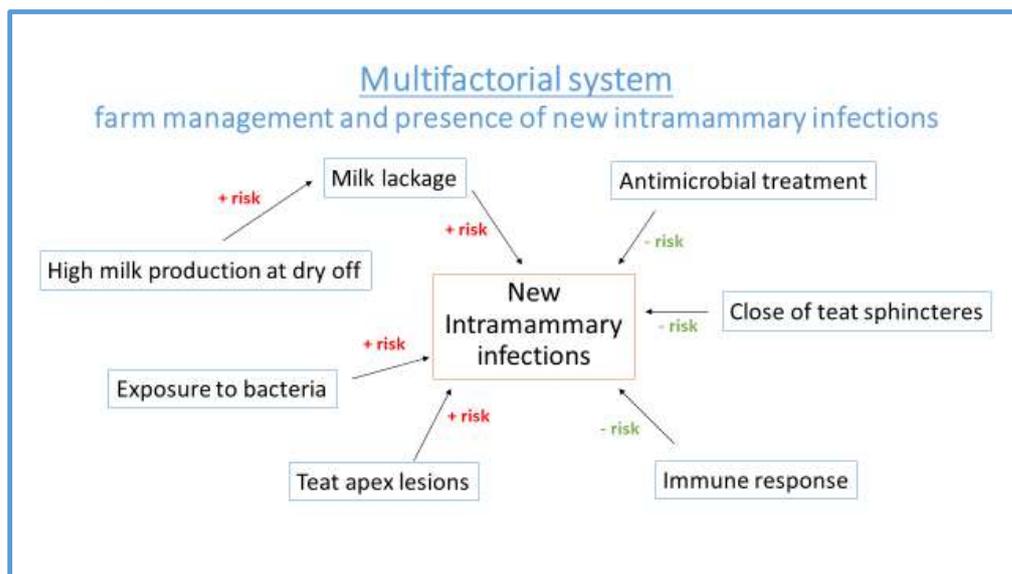


Figure 1: factor influencing intramammary infections during dry period

Usually farmers treated with intramammary antibiotics all cows at dry off to prevent future mastitis and to stop eventually ones in act (Blanket dry cow therapy). In 2022 this practice was abolished (Reg. (UE) 2019/6) to restrict problem linked to antibiotic resistance. In fact, an inoculated use of antimicrobials causes the selection of resistant bacteria. One solution may be Selective dry cow therapy, that consists in the treatment of cows that had udder health problems during lactation or that had a mastitis in act at dry off. This practice became mandatory in Netherlands in 2013 and actually no increase of udder health problems have been seen during the next lactations.

SURVEY

In 2020 about 100 dairy farmers filled a survey about management techniques applied during dry period. The most of respondent came from North of Italy and managed intensive farms of medium-big herd size with high daily milk production (on average of 30 kg per day per capita).

The main problem encountered was the high milk production at dry off (>20 kg/day capita) with consequent milk dripping and mastitis problems.

The reports of survey underlined that 53% of farmers used blanket dry cow therapy, 38% selective dry cow therapy and 9% no dry therapy (figure2).

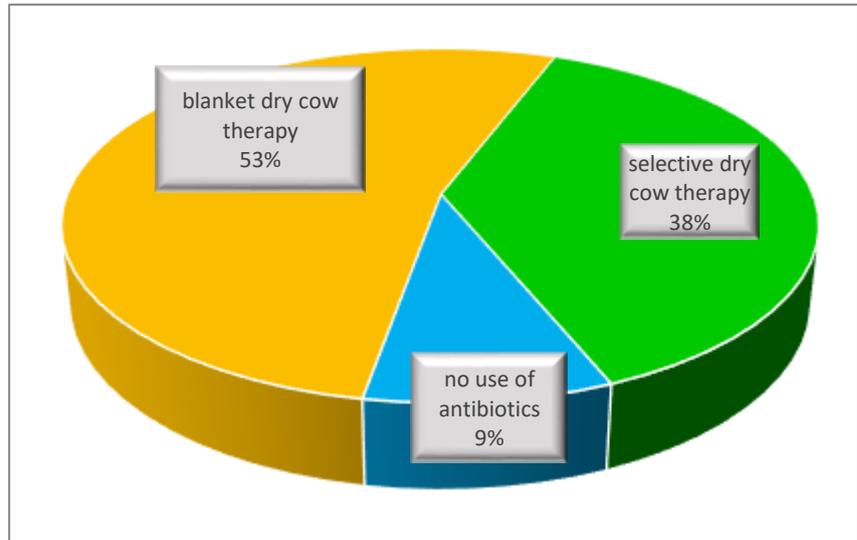


Figure 2: Different dry off strategies applied in 100 Italian dairy farm

INNOVATION PHASE



MAGA Operative Group included three farms of dairy cattle located in Lombardy (North of Italy) with 120-500 lactating cows, representative of local farm type. During 2020-2021 monthly inspections were performed to evaluate environmental and sanitary conditions of cows.

Especially some evaluations were effected: hygiene score of cows at the end and at the beginning of lactation and during dry period, bacterial count and pathogen mastitis agents at teat level of dry cows. Moreover, in dry cows' areas temperature and humidity were monitored with environmental sensors and bacterial count of litter material were analysed with sterile footwear.

During the two years of research selective dry cow therapy protocol have been proposed and applied. Moreover, udder health conditions were monitored at the end of lactation and at the beginning of the next one.

For this reason, 700 milk samples were collected by university team and analysed, evaluating bacterial count, lacto acid bacteria concentration and total and differential cell count, by ARAL (regional association of Lombardy breeder) laboratory.

Milk somatic cells consist of leukocytes, which, in turn, consist of three fractions (differential somatic cells):

1. Lymphocytes = regulate the immune response since the start of infection
2. Macrophages = ingest cell debris and bacteria and detect eventually pathogens present in organism
3. Neutrophils = main actors of immune response

During a mammary infection there is an increase of neutrophils versus a decrease of macrophages, which act in a second moment. For this reason, neutrophils are pointers of mammary health status.

However, total end differential somatic cell count was performed by an instrument of new generation: Vetscan.

RESULTS

LITTER MANAGEMENT AND BACTERIAL COUNTS OF TEATS

An appropriate management of cows during dry period is a crucial point to prevent new mastitis in the first days of next lactation. In fact, when there are not a properly cleaned environments are, manure is accumulate in the walking and resting areas. Cows lie down and bacteria agents of mastitis may stick teats and penetrate inside udder.

Litter material and skin teats surface bacterial count of were evaluated. Hygiene score scale, from 1 to 4, was used to describe the udder cleanness of cows. The major percentage of cows with dirty udder was observed in fam B (figure 3). Moreover, farm B was the farm with the highest litter and teats bacterial count among the three farms (figure 4). This result underlines the importance of using appropriate cleanness practices to prevent mastitis.

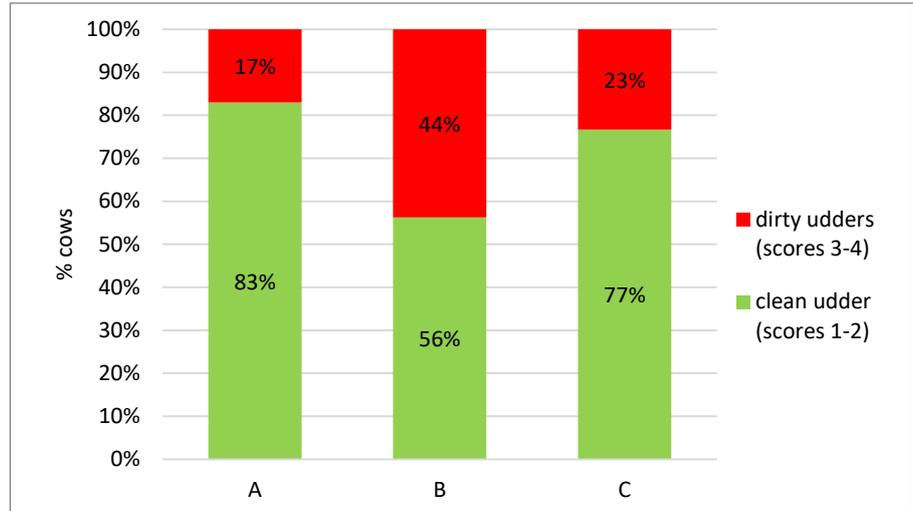


Figure 4: percentage of cows with clean and dirty udder of dry cows in the three farms of the project

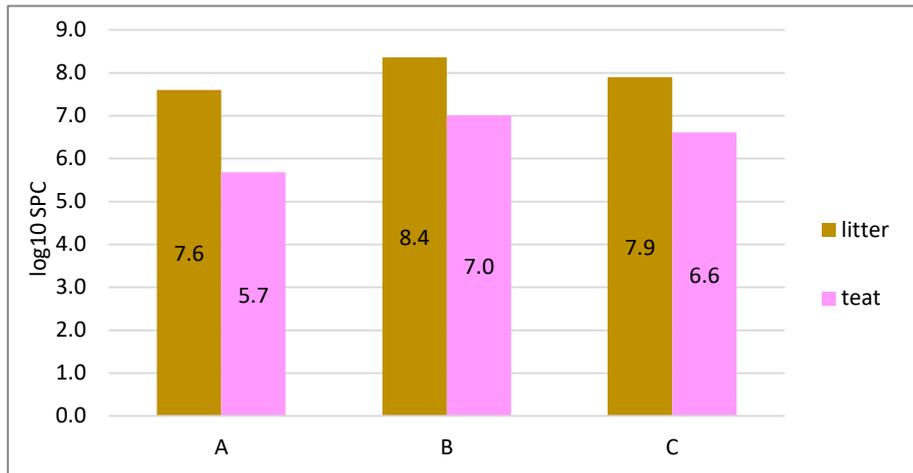


Figure 3: bacterial counts of litter material (\log_{10} SPC/g) and teats of dry cows (\log_{10} SPC/swab)

The presence on teats of bacteria agents of mastitis was evaluated. Staphilococcus aureus was found in 26% of samples analysed (figure 5), underling the high spreading of this bacterium among animals.

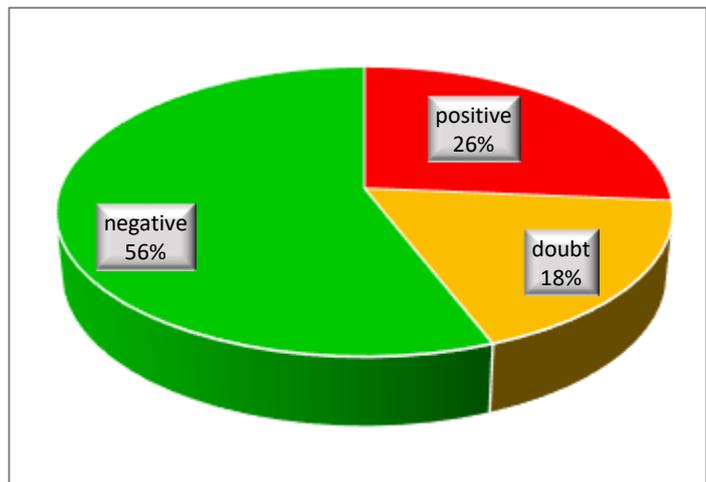


Figure 5: percentage of teat swabs with positive, negative or doubt response at Staphilococcus aureus

COW BEHAVIOR DURING DRY PERIOD

Health animal status, environmental factors and areas management are only three of the multiple factors that influence cow physical activity.

During dry period high temperature, slippery walking areas, uncomfortable cubicles or litters may reduce lying cow time. Short rest time increases herd stress and lameness risk with negative effect on quantity and quality of milk production of next lactation.

Usually, lactating cows have a rest time 1 hour and half shorter than dry cows, because these animals don't spent time in milking parlor or in waiting room.

In the three farms of the project cows spent on average 12 hours lying down.

TEMPERATURE AND HUMIDITY CONDITIONS IN DRY COWS AREAS

Usually heat stress during dry period is undervalued, because no direct consequences on milk quantity or quality (high somatic cell count) are reported. However, heat stress in dry cows could have long-term effects. Previous studies reported a decrease in milk production in the next lactation and compromise future career of the next cattle generations as a consequence of high temperature in the barn. As underlined in figure 6, cows in the three farms were subjected at high *Temperature Humidity Index* (THI), (that is combined index of temperature and humidity), during summer, especially between 11 A.M. and 9 P.M. THI values > 72 indicate possible heat stress, so it is essential to use cooling techniques, such as fans. However, warm and humid environments promote bacteria proliferation. In fact, an increase in bacterial count of teats was found in summer (figure 7).

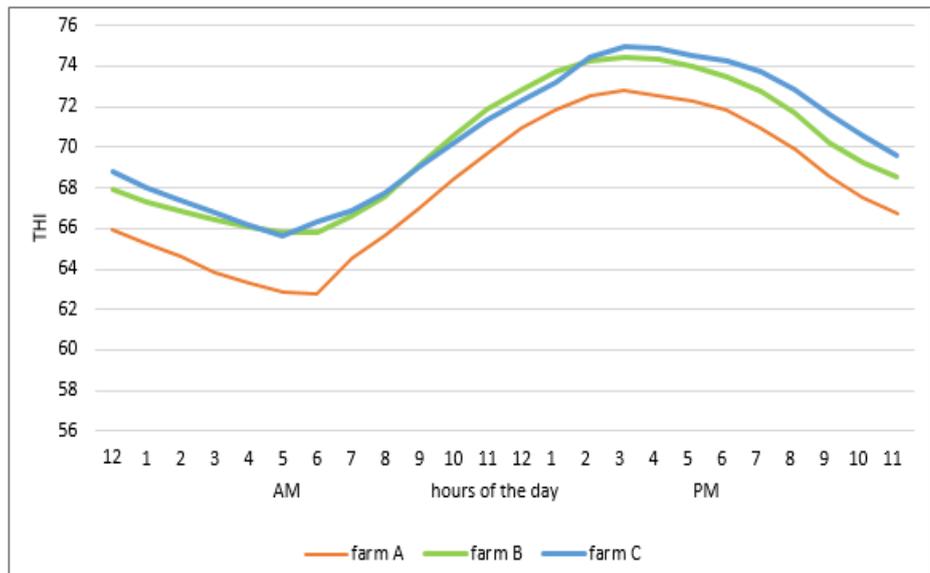


Figure 6: THI of dry cows areas during summer (May-September)

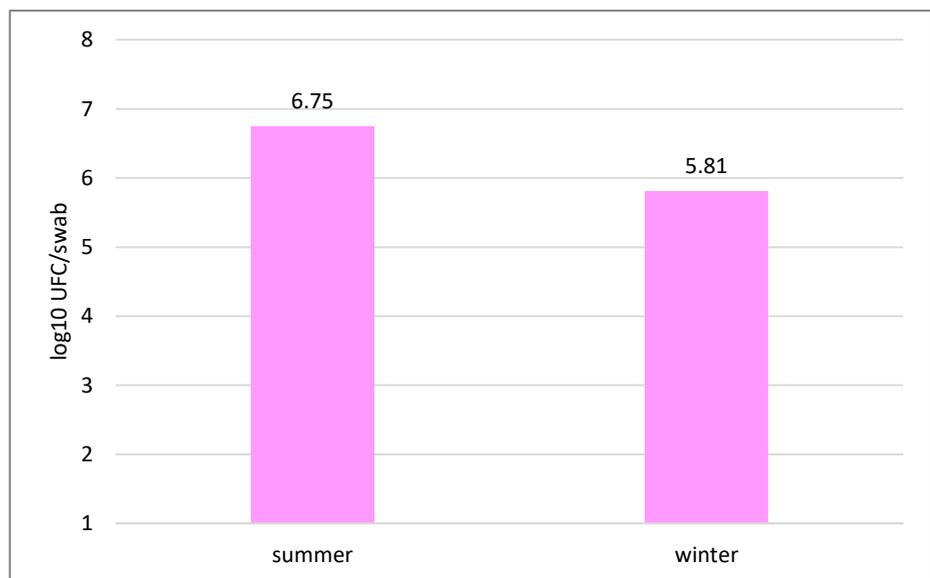


Figure 7: bacterial count of dry cows' teats in summer and winter



APPLICATION OF SELECTIVE DRY COW THERAPY PROTOCOL

A total of 243 cows were monitored in the period between the end of lactation and the beginning of next one. In this group some cows were selected to not be treated with antibiotics at dry off. The choice criteria were based on the healthy condition of milk collected during the last 30 days of lactation:

- Total somatic cell count <100,000 cells/ml for primiparous cows and <200,000 cells/ml for multiparous ones
- Percentage of the sum of neutrophils and lymphocytes on somatic cell count <69.3%
- Negative response of Vetscan, an instrument that counts total somatic cells and single fraction of differential somatic cells

After selection 40% of cows monitored were eligible to not be treated with antibiotics, but for previous healthy problems during career only 89 (37%) really were enrolled in no treated group. After dry period a single or double milk samples in the first 60 days of the next lactation were taken from all 243 cows. .

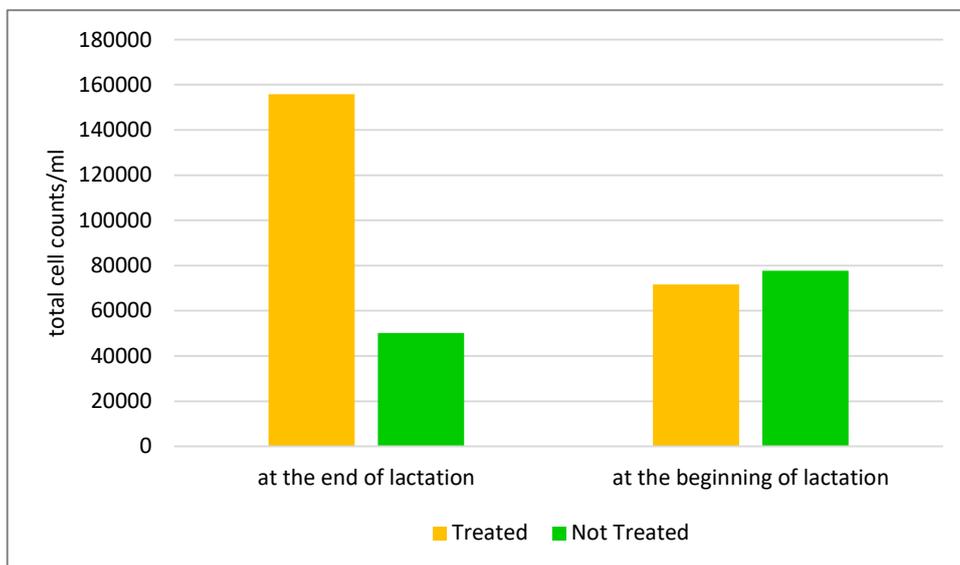


Figure 8: average value of somatic cell count in the two different groups at the end of lactation and at the beginning of the next lactation

As showed in figure 8 the somatic cell count of cows at the end of lactation were different for the two groups. The somatic cell count was higher in treated group than no treated one. At the beginning of lactation, on the contrary side, there was an increase in no treated cows, as expected, and a decrease in treated one (figure 9). Moreover, no significant difference is showed between the values of somatic cell count of the two groups and values <100,000 cells/ml are indexes of good udder health status.

These results demonstrate that this protocol of selective dry cow therapy is relevant without changes in welfare and health status of cows. Thanks to the application of this protocol the reduction of antimicrobial usage at dry off was 37% in the three partner farms. Moreover, no major mastitis cases were found in the first 60 days of lactation.

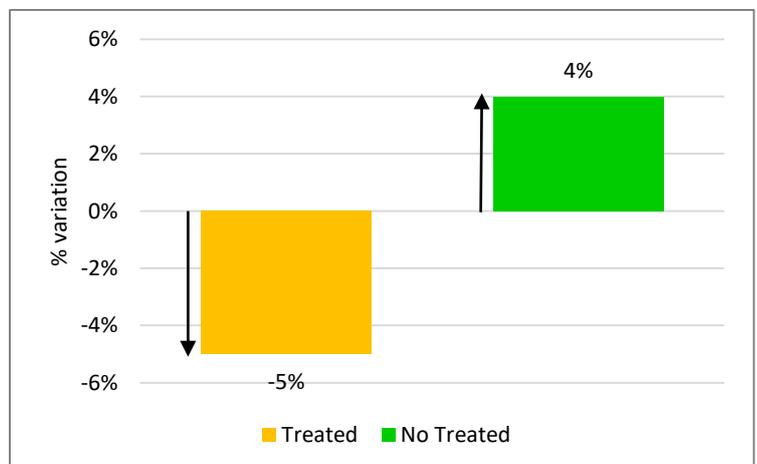


Figure 9: percentage variation of somatic cell count before and after dry period in the two different groups

SOMATIC CELL COUNT

Total somatic cell count is influenced by management factors. Milk of cows with no clean udder (score 3-4) showed high somatic cell count. Moreover, during summer with high humidity and temperature, heat stress compromised animals health increasing milk somatic cell count (figure 10).

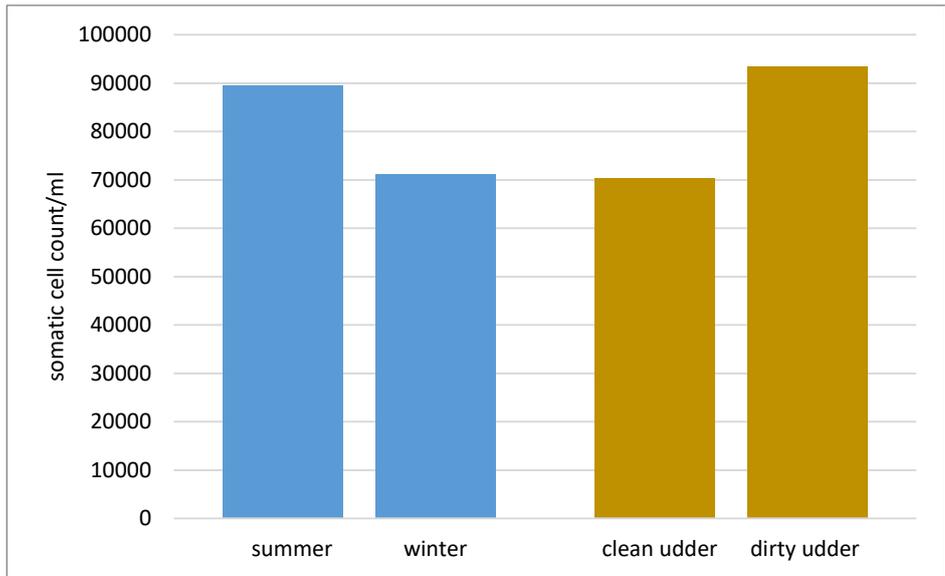


Figure 10: somatic cell count of summer and winter milk and milk coming from clean and dirty cows' udder



LACTO ACID BACTERIA

Lacto acid bacteria are essential for cheese making and they were present in different concentrations in the milk of treated and not treated with antimicrobial cows at the beginning of lactation. Protocol of selective dry cow therapy seems to preserve lacto acid bacteria in milk, because antimicrobials reduces all bacterial flora without distinctions (figure 11).

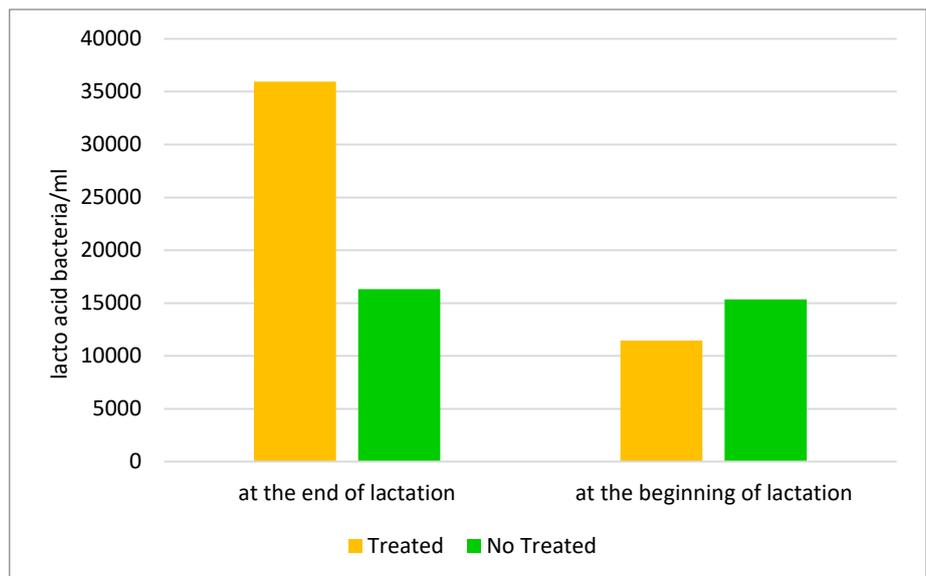


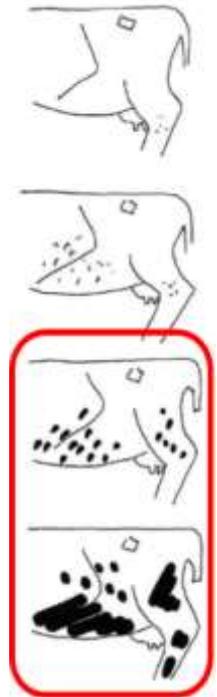
Figura 11: lacto acid bacteria of milk from treated and no treated cows at the end and at beginning of lactation

RISK FACTORS

Thanks to the results achieved risk factors at dry off, that predispose to high somatic cells count at the beginning of the next lactation (<100,000 cells/ml), have been identified (table 1).

Table 1: Risk factors at dry off, that predispose to high somatic cells count at the beginning of the next lactation (>100,000 cells/ml)

RISK CONDITIONS AT DRY OFF	RISK RATE
High somatic cell count at the end of lactation (>100,000 cells/ml)	++++
Dry off without antibiotics	+++
Dry period > 55 days	++
Protein milk content <=3,6%	++
Dirty upper legs and flanks	+ _____



Dry off without antibiotics is one of the risk factor, because, as previous described, could increase somatic cell count. Moreover, animal with high somatic cell count at the end of lactation risks to have high somatic cell count at the beginning of the next one. For this reason, is useful to pay attention at the other factors that can be monitored and changed:

- Avoid long dry period, because teat sealant could lose its effectiveness
- Ensure clean bedding and equipment to reduce the risk of pathogen contamination between environment and animals
- Monitor nutritive milk quality, especially protein percentage

CONCLUSIONS

Selective dry cow therapy protocols could be applied without changes in health and welfare of cows, moreover the reduction of antibiotics at dry off is about 37%. It's essential to monitor cows during dry period and guarantee well ventilated and clean places for a successful application of these protocols.

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