

## POSTER PRESENTATIONS

### INNOVATIVE SOLUTION IN MASTITIS PREVENTION THROUGH TEAT DIPPING

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#### ABSTRACT

The new teat dip formulation based on lactic acid has demonstrated bactericidal efficacy according to in-vitro European and AOAC norms against environmental and mastitis inducing germs. The action is powerful (25% dilution in EN test) and quick (1 minute contact time in AOAC). Field trials carried out in this study confirm the teat conditioning properties of the teat dip and ability to keep reduce the low level of cell count in milk. More than Iodine and Chlorhexidine products, the innovative solution for teat dipping is able to produce fly repellent and sun screen activity both suitable in summer.

**Keywords:** teat dip, lactic acid, fly repellent, bactericidal, European norms, AOAC norms

#### INTRODUCTION

Major products on the teat dipping market are based on Iodine, Chlorhexidine and Chlorine derivates. There always has been a dilemma in teat dip formulations between bactericidal activity and product toxicity in terms of cytotoxicity or environmental behaviour. Thus pushing formulators to develop low iodine technologies with high emollient contents. Lastly some Nordic countries with strategy environmental friendly policies have decided to classify biocidal products including teat dips according to Environmental behaviour, including biodegradation and bioaccumulation properties of the active substances.

Formulators therefore decided to develop alternative teat dips based on compounds such Nisin, Lactic acid, DDBSA,... The need of the farmer in additional features in teat dips makes the formulations more complex. Making the teat dip sun protective and fly repellent is challenging when the need is also to get enough the bactericidal activity. It has been notified therefore that alternative formulations such lactic acid demonstrates low efficacy in terms of mastitis prevention. Our works focused on activating the bactericidal power of lactic acid through synergistic combinations while increasing the features of the teat dip with demonstrated efficiency in terms of sun protection and fly repellent effect.

## EXPERIMENTAL

The innovative teat dip is based on a synergistic mixture of lactic acid, surfactant, fly repellent and sunscreen compounds.

The formulation has been investigated on top of the chemical and physical properties for the following experiments:

- In-Vitro testing according to European Norms on antiseptics and disinfectants EN 1656 (Determination of bactericidal activity according to standard EN 1656, chemical disinfectants and antiseptics used in veterinary field).
- In-Vitro Testing according to AOAC Official Method 960.09.
- Teat Conditioning trial and mastitis prevention, Belgian trial according to VICH GL9 guidelines for GCP and
- Fly repellence effect against *Musca domestica* (Test chambers according to AFNOR, BSI and CEB)
- Sunscreen effect expressed as absorbance versus wave length.

## RESULTS

1) In vitro testing according to European norms

**Table 1.** Results of *in vitro* testing according to EN 1656

Bactericidal tests	Effective Dilution	Reduction
<b><i>Pseudomonas aeruginosa</i></b>	25%	5 Log
<b><i>Staphylococcus aureus</i></b>	25%	5 Log
<i>Escherichia coli</i>	25%	5 Log
<i>Streptococcus agalactiae</i>	25%	5 Log
<i>Streptococcus dysgalactiae</i>	25%	5 Log
<i>Streptococcus uberis</i>	25%	5 Log

According to the results of the microbiology testing on EN norms 1656, presented in Table 1, the new teat dip formulation has a bactericidal action against mastitis causing bacteria as *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Escherichia coli*, *Streptococcus agalactiae*, *Streptococcus agalactiae*, *Streptococcus dysgalactiae*, and *Streptococcus uberis* at 25% against mastitis causing bacteria at 5 minutes of contact time. The formulation is therefore 4 times more efficient than the required level by EN testing. This efficacy is comparable to classical iodine or chlorhexidine products.

2) *In vitro* testing according to AOAC

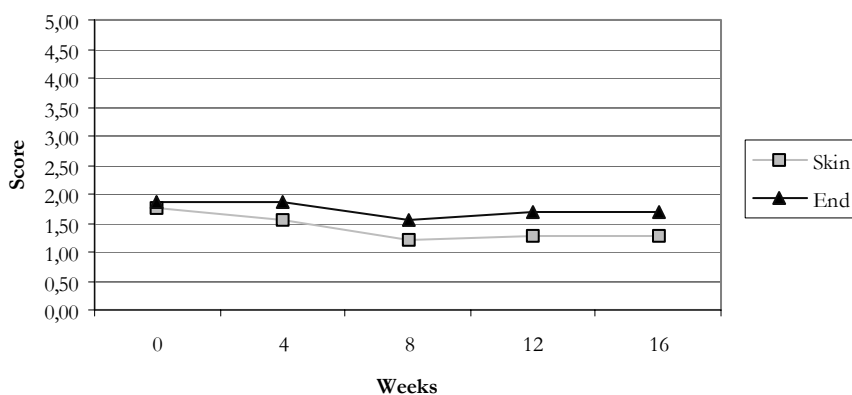
The lactic acid formulation was tested according to AOAC method 960.09, Germicidal and Detergent Sanitizing Action of Disinfectant, the efficacy was demonstrated against the following germs:

**Table 2.** Results of in-vitro testing according to AOAC 960.09 against 8 Log CFu/ml

Bactericidal tests	Contact time	Reduction
<i>Streptococcus uberis</i>	1 minute	99,99%
<i>Staphylococcus aureus</i>	1 minute	99,99%
<i>Escherichia coli</i>	1 minute	99,99%
<i>Streptococcus agalactiae</i>	1 minute	99,99%
<i>Streptococcus disgalactiae</i>	1 minute	99,99%

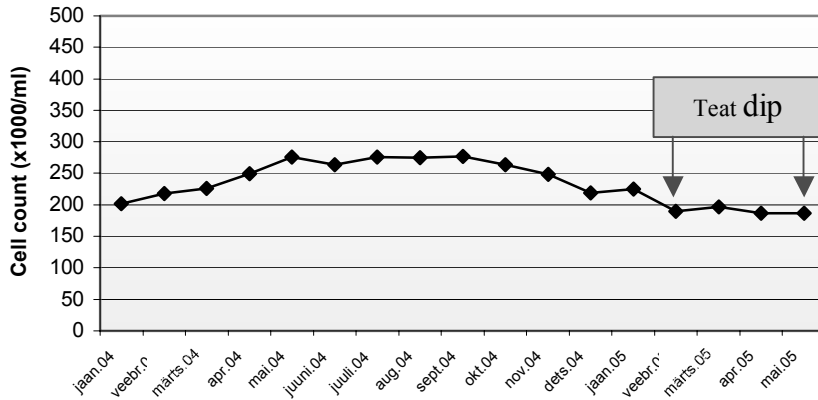
The contact time being 1 minute, the innovative teat dip is demonstrating a very quick action against the mastitis inducing bacteria and in presence of milk as a challenge substance.

### 3) Teat conditioning trial and mastitis prevention

**Figure 1.** Evolution of teat condition during application of teat dip

The trial carried out in Belgium from 02 of February of 2005 to 24 of May of 2005 in a herd of 40 cows, demonstrates the teat conditioning properties of the lactic acid teat dip.

The scores given in Figure 1 of the teats treated with the new formulation teat dip during 16 weeks have been statistically analysed. The statistical analysis of Variance (ANOVA) allows the comparison of the mean of teat skin and end scores. This analysis of variance revealed there is significant difference between the beginning and end of the trial, the scores remain between 1 and 1,5.

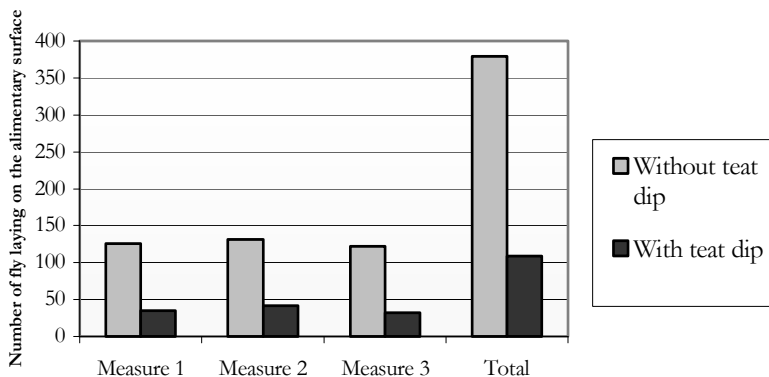


**Figure 2.** Evolution of cell count during application of teat dip

To appreciate better the evolution of the cell count during the trial and to allow statistical analysis with treatment period effect, the cell count from January 2004 to May 2005 have been recorded. Statistical comparison (ANOVA) between the results of the tested period and the same period the last year, proves that there is no significant difference between the two periods.

The new formulation teat dip is very well tolerated by cows and, on top of being strongly bactericidal, allows the improvement of a the skin condition and a low level of bulk milk cell count. These results presume the ability of the lactic acid teat dip to help prevent mastitis in dairy farms.

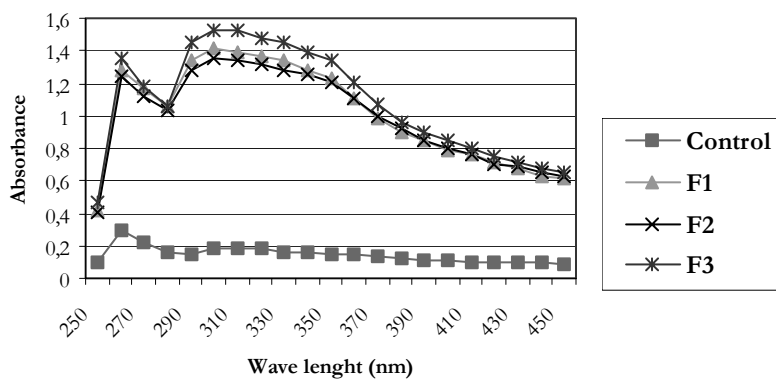
#### 4) Fly repellence



**Figure 3.** Measurement of flies laying on feeding surface treated or not with the teat dip

A laboratory validated test was carried out on *Musca domestica* to demonstrate the fly repellent activity of the lactic acid formulation. According to the results presented in figure 3, the intrinsic repellent activity of the teat dip is **71,2%**. The teat dip applied on surface demonstrates a significant repulsive effect towards *Musca domestica*. The objective of fly repellent activity of teat dip applicated on teats, is reached.

## 5) Sunscreen effect



**Figure 4.** UV absorbance graph for teat dip

The sun protection factor was studied using the absorbance/SPF analysis method. Three variations of the lactic acid teat dip were tested versus a control formulation without sunscreen ingredients. All lactic acid teat dip formulations included the sunscreen demonstrated ability of sun protection.

### CONCLUSION

The new teat dip formulation based on lactic acid has demonstrated bactericidal efficacy in-vitro according to European and AOAC norms against environmental and mastitis inducing germs. The action is powerful (25% dilution in EN test) and quick (1 minute contact time in AOAC). Field trials confirm the teat conditioning properties of the teat dip and ability to keep / reduce the low level of cell count in milk. More than Iodine and Chlorhexidine products, the innovative solution for teat dipping is able to produce fly repellent and sun screen activity both suitable in summer. We see a high potential application of this solution in countries with specific environmental friendly strategy in the use of chemicals on farm. More studies on the actual mastitis prevention are currently carried out to harmonise the formulation before the actual availability on the market.