



BANGICID IN TEAT DIP FORMULATION

Introduction

Mastitis is one of the costliest diseases of the dairy industry caused by pathogenic microorganisms that enter the udder through the teat end and streak canal. Herds suffering mastitis will have losses in milk production and income in the range of 20-30%.

As one of the most effective methods to control mastitis, disinfect teat with teat dips is widely used in dairy industry. A teat dip is used either as a pre-dip or a post-dip to inhibit and kill mastitis bacteria. Pre-dipping helps eliminate bacteria from environment, while post-dipping targets contagious pathogens.



Contagious Organisms

- *Staphylococcus aureus*,
- *Streptococcus agalactiae*,
- *Streptococcus dysgalactiae*,
- *Klebsiella pneumoniae*
- *Mycoplasma species*

Environmental organisms

- *Streptococcus uberis*
- Coliform bacteria

The teat dips can be categorized by their active ingredients including iodine, chlorhexidine, hydrogen peroxide, lactic acid and fatty acids and their derivatives. Emollients, skin conditioners, barriers, skin dyes and surfactants are also added to keep skin moisture and enhance the performance. Chlorine, iodine, and chlorhexidine compounds are effective chemical germicides but they can become inactivated over time and they can also be inactivated by reacting with organic materials. Additionally, the concerns about the presence of germicide residues in milk products further limit their application in teat dips. The substitutes for these germicides are short to medium-chain fatty acids (C₆ to C₁₄) and their derivatives. To remain the fatty acids in their active forms in both the concentrated and the diluted teat dips, acids must be added to maintain the pH below 4.0.

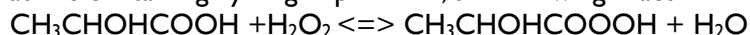
Lactic acid in teat dips

- Act as bacteriostatic agent itself

Except for adjusting pH to maintain the fatty acids in their active forms, lactic acid itself is an efficient bacteriostatic agent. The undissociated (protonized) lactic acid is a lipophilic acid which can penetrate the cell membrane (lipid) of bacteria. The hydrogen ions release by lactic acid will inhibit the growth of bacteria by disturbing the cell metabolic functions such as deactivate ATPase. Moreover, the elimination of proton H⁺ from the inner cell consumes energy and decreases the cell metabolism, thus the bacteria growth.

- Form perlactic acid

In the teat dip formulations containing hydrogen peroxide, the following reaction exists:



Perlactic acid (CH₃CHOHCOOOH) has effective germicidal and sterilizing capabilities. It has the attributes of hydrogen peroxide but possesses greater lipid solubility and excellent fastness against catalase and peroxidases.



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- Increase killing speed

To be considered as effective, as proved in standardized tests conducted by the Association of Analytical Chemists (AOAC), a teat dip should achieve a 5-log reduction in 15 seconds which is also known as the quick kill. As the mildest and most effective AHA available, L (+) lactic acid is capable of increasing the killing speed by softening and exfoliating hyperkeratotic tissues.

- Reduce skin irritation

Lactic acid and sodium lactate can rejuvenate skin and increase cellular water content. This can reduce skin irritation resulted by surfactant and germicides contained in the teat dip formulation.

- Stable and safe

Comparing with acetic acid, lactic acid has less evaporation rate and more stable. For example, at 20 °C, the vapor pressure of lactic acid is 0 (mmHg) but 11.88 (mmHg) for acetic acid. The benefits of low evaporation rate include more accurate production and more constant quality.

Thanks to the following characteristics, lactic acid is safe to be used in teat dip formulations

- **ADI:** No limitations should be made against the use of L-Lactic Acid. (FAO/WHO, 1994)
- **LD50:** 3730mg/kg bw (Rat, oral)
- **GRAS:** (FDA-21CFR, §184.1061, 2000)
- **Metabolism:** L-Lactic Acid is an existing compound of food and can be metabolized by mammalian.

The blend of lactic acid and sodium lactate has excellent buffering property which is useful for maintaining the pH stability of teat dips.

Recommended Dosage

In both hydrogen peroxide and fatty acid based teat dips, the following amounts of lactic acid can be added (Table 1).

Table 1. Recommended dosage of lactic acid in teat dips

Type of teat dip	Content of lactic acid (%)
Concentrated	4.5 – 5.0
Ready to use	1.5 – 1.7

Benefit Analysis

For example, in a 200-cow dairy, averaging 50 pounds of milk per cow per day for 365 days a year, with the milk price of \$20 per hundred pounds, eliminate mastitis can save considerable profit loss for farmers (Table 2).

Table 2. Profit loss caused by mastitis

Herd Condition	Milk loss (%)	Milk loss (pound)	Profit loss (USD)
Healthy	0	0	0
Suffering Mastitis	20	730,000	146,000
	30	1,095,000	219,000