

TECHNICAL PERFORMANCE REVIEW

Mastitis, or inflammation of the mammary gland, is widely considered the single-most profit robbing disease in the U.S. dairy industry. It is critical for preventative measures to be as effective as possible. When used as a pre / post milking teat dip, foam, scrub, or spray, EfferCept controls a broad spectrum of mastitis-causing organisms including:

Escherichia coli (E. coli)
Staphylococcus aureus
Streptococcus uberis
Streptococcus agalactiae
Salmonella choleraesuis

Salmonella typhimurium
Pseudomonas species
Mycoplasma species
Mycobacterium tuberculosis
Klebsiella species

Proteus vulgaris
Listeria monocytogenes
Candida species
Aspergillus species
Many viruses

TECHNICAL PERFORMANCE HIGHLIGHTS

Fast and powerful: Kills on contact, eliminating 99.99% of E. coli and Staph. aureus within 15 seconds of exposure.

Broad killing power: Outperforms bleach and 1% iodine in eliminating leading mastitis-causing organisms.

Trial proven: Reduced intra-mammary infections (IMI) and improved teat condition in a National Mastitis Council (NMC) Experimental Challenge. EfferCept decreased Staph. aureus based IMI by 69.0% and Strep. agalactiae based infections by 63.5% versus the control. In addition, teat skin and end condition scores at or near 1.0 for normal, smooth skin, free from scales, cracks, or chapping.

HOCI with continuous control: A higher concentration of hypochlorous acid (HOCl) for persistent efficacy in the presence of dirt, manure and other organic matter.

- Four times more resistant to neutralization by organic serum than bleach.
- Non-corrosive properties to maintain equipment and bedding.

Near-neutral pH: Protects, conditions, and softens skin, teats, and udders.

Easy handling and storage: Effervescent tablets offer 7-10 day shelf life and simple preparation with potable water.

EfferCept +  = **EfferCept** 

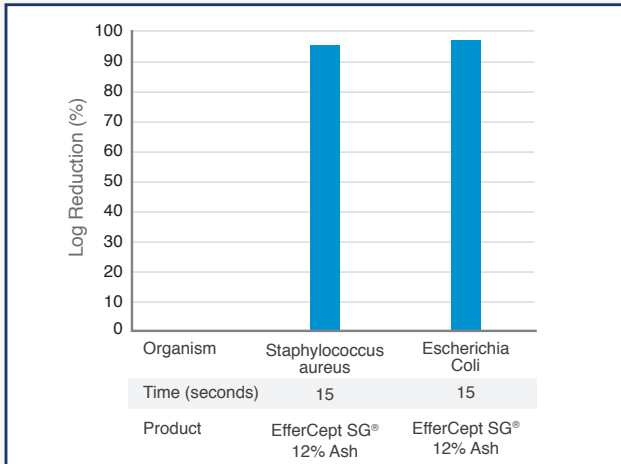


SG

Enriched with SoftGuard "SG" conditioner, EfferCept SG penetrates to help protect and soften teats, skin, and udders.

FAST AND POWERFUL

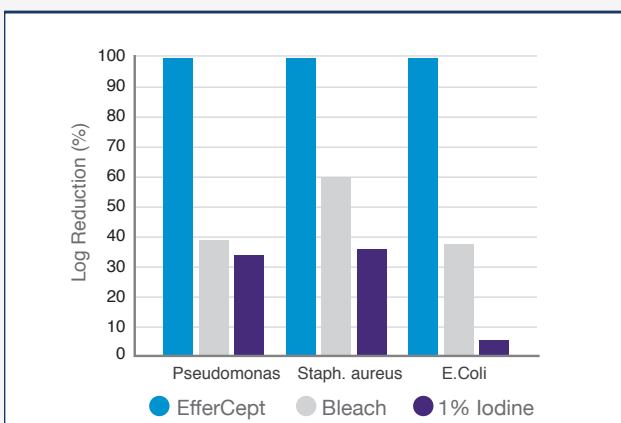
Independent laboratory results show EfferCept kills 99.99% of *E. coli* and *Staph. aureus* within 15 seconds of exposure time – half the industry standard of 30 seconds.



EfferCept® kills in 15 seconds with an organic soil challenge (10% sterile and 2% milk).

BROAD KILLING POWER

In a university study the active ingredient in EfferCept, at half the concentration of Clorox® bleach, demonstrated greater germicidal activity than bleach or 1% iodine.^{1,2}



EfferCept at a 2000 ppm solution, outperformed bleach and 1% iodine in eliminating three common mastitis-causing organisms.

EFFECTIVE AGAINST MYCOPLASMA

A study comparing germicidal activity against three bovine *Mycoplasma* species found that EfferCept was “effective” when tested against *Mycoplasma californicum*, *Mycoplasma bovigenitalium* and *Mycoplasma bovis*.³

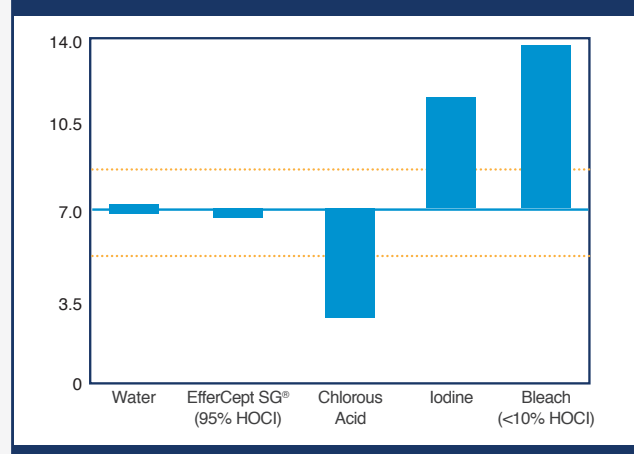
The active ingredient and benefits of EfferCept continue in the combination EfferCept SG tablet.

A DIFFERENT KIND OF CHLORINE

The active ingredient of EfferCept is sodium dichloroisocyanurate (NaDCC), in effervescent tablet form for simplified preparation. While the active ingredient in EfferCept is a member of the chlorine family, it differs from other chlorine-based treatments that operate at a pH favoring the prevalence of the OCl⁻ ion.

The product is pH-buffered—formulated specifically to prevent major shifts in pH—so that it exhibits a near-neutral pH of 6.3–6.7 regardless of the concentration level. With a pH comparable to water, EfferCept is set apart from bleach and other chlorine products in its odorless smell and absence of corrosive properties, maintaining the integrity of any equipment or bedding it encounters as it sanitizes.

PH COMPARISON OF TEAT DIP PRODUCTS



EfferCept® solution is unique among disinfectants for its near-neutral pH.

WHY A NEUTRAL PH IS IMPORTANT:

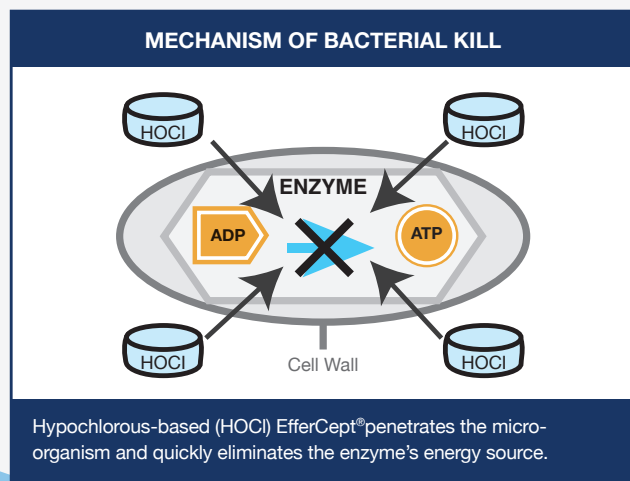
1. The prepared solution is non-caustic with minimal irritation to skin and animal tissue.

2. This neutral pH is created by a high concentration (95%) of hypochlorous acid, HOCl, and a minimum concentration (5%) of the hypochlorite ion, OCl⁻. Both HOCl and OCl⁻ are relatively strong disinfectants. However, HOCl, as in EfferCept, offers several efficacy advantages:

- Increased control of mastitis-causing organisms
- Continued performance in the presence of organic matter
- Fast kill

DISTINCT MOLECULAR PERFORMANCE

Hypochlorous acid (HOCl) provides exceptional killing power with virtually no irritation. The HOCl molecule is key to the product's demonstrated performance against a wide range of harmful organisms. This molecule bears no positive or negative charge and, unlike the negatively charged OCl⁻ ions produced by chlorous acid/chlorine dioxide treatments or OI⁻ ions produced by iodine treatments, it is not repelled by the negatively charged bacterial cell wall. It penetrates the cell wall to deactivate the cell's primary energy-producing source, resulting in rapid cell death.



The molecule easily penetrates microorganisms but does **not** easily penetrate animal and human skin cells. The HOCl contained in the product formulation reacts with soil and fat substances, converting them to soluble salts that rinse away.

PERSISTS AGAINST ORGANIC MATTER

The inert effervescent base provides immediate dispersion of the active ingredient. However, as HOCl is consumed during germicidal activity, additional HOCl is released from the NaDCC molecule to maintain an equilibrium concentration of approximately 95% HOCl. In this manner, the product provides continued germicidal action.

The HOCl molecule allows the product to be effective in the presence of high concentrations of dirt, manure and other organic matter. Organic substances quickly neutralize negatively charged OCl⁻ and OI⁻ ions that are the active components of other antimicrobial treatments. While these other treatments work well under "clean" conditions, they can be deactivated by organic matter that is often present.

Tests show the EfferCept solution is four times more resistant to neutralization by organic serum than bleach.

PRODUCT DESCRIPTION

EfferCept [®] Pre / Post Teat Dip	
Active Ingredient	Sodium dichloroisocyanurate (NaDCC)
Technology Name	Activon Technology
Composition Before Dilution	50% NaDCC, 50% Inert Ingredients
Composition After Dilution	95% HOCl, 5% OCl ⁻
Appearance	Light blue tablet
pH	6.3 – 6.7 (near neutral)
Available Active	Recommended 2000 ppm
EfferCept Recommended Dilution Rates	Regular Strength: 4 tablets/gallon of water Max. Strength: 6 tablets/gallon of water
EfferCept SG Recommended Dilution Rates	Regular Strength: 2 tablets/gallon of water Max. Strength: 3 tablets/gallon of water
Shelf Life After Dilution	Lasts up to 10 days

PREVENTS IMI IN NMC CHALLENGE

In a controlled-infection clinical trial, Dr. Stephen Nickerson at Louisiana State University examined the efficacy of EfferCept as a post-milking preventative against intramammary infection (IMI).⁴

The trial measured two types of bacteria that can spread from infected cows to uninfected cows during the milking process and inhibit the cow's ability to produce milk.

Following the National Mastitis Council (NMC) Experimental Challenge guidelines (formerly known as Protocol B), animals were exposed to a challenge suspension of *Staphylococcus aureus* and *Streptococcus agalactiae* daily, following the afternoon milking.

After exposure, two teats of each animal were treated with EfferCept, at the label-indicated concentration of 2000 ppm (the recommended rate for regular strength), with optional SoftGuard™ conditioner added at a rate of one ounce/gallon. The remaining two quarters remained undipped as controls.

Milk samples were collected pre-trial and weekly for culturing to determine the presence of infection. EfferCept reduced the infection rate for *S. aureus* by 69.0% ($p < 0.001$) and 63.5% for *S. agalactiae* ($p < 0.01$).

Soft, healthy teat skin and ends are vital to good overall udder health. A healthy teat end allows the sphincter to close tightly, keeping mastitis-causing bacteria from

SUMMARY OF EFFICACY DATA IN CLINICAL TRIAL

Organism and treatment	Quarters eligible for new IMI	% Quarters with new IMI	% Reduction compared to control
<i>S. aureus</i> Dipped Control	137 140	7.3 21.4	69.0% ($p < 0.001$)
<i>S. agalactiae</i> Dipped Control	147 148	5.4 14.2	63.5% ($p < 0.01$)

entering the teat canal. Characteristics of teat skin surfaces and teat ends were scored before and after the trial to determine effects of treatment on teat skin condition, according to criteria established by Goldberg et al.⁵

In the NMC-based clinical trial, mean herd score before and after the trial for dipped and untreated (control) quarters was approximately 1.00, reflecting normal, smooth skin, free from scabs, cracks or chapping. Teat end condition scores showed similar results with no evidence of irritation.

Dr. Nickerson concluded the product was "highly effective in preventing new IMI" and was as efficacious as other products. (The complete study report is available on request.)

SUMMARY

EfferCept SG Sanitizing Teat Dip when dissolved in water combines the mild, non-irritating, yet powerful killing of EfferCept with cleaning and conditioning to soothe and protect skin, teats, and udders. The product uses hypochlorous acid to penetrate cell walls and deactivate the detrimental organism's primary energy-producing function. Other disinfectants apply an extra-cellular oxidation-reduction reaction that burns or erodes the cell wall.

EfferCept stands apart from other chlorine products by maintaining its germicidal effectiveness in the presence of organic substances such as dirt, manure, and other organic matter.

EfferCept demonstrates a better log reduction of a wide variety of harmful bacteria compared with bleach and iodine solutions to exponentially decrease microorganisms during the milking process.

The addition of conditioners in EfferCept SG enhances EfferCept, which has been proven highly effective in preventing new IMI in trials conducted according to the NMC standards. Objective teat end and skin condition scoring in the clinical trial substantiates its mildness to skin.

¹ Murdough, P.A. and J.W. Pankey, Dept. of Animal and Food Science, University of Vermont, J. Dairy Sci, Vol. 76, No. 7, 1993.

² Saeed, A.M., Department of Veterinary Pathology, School of Veterinary Medicine, Purdue University, 1997.

³ R.L. Boddie, W.E. Owens, C.H. Ray, S.C. Nickerson, N.T. Boddie, J. Dairy Sci. 85:1909-1912, 2002.

⁴ Nickerson, Stephen C., Hill Farm Research Station, Louisiana State University, "Efficacy of an Experimental Teat Dip Against *Staphylococcus aureus* and *Streptococcus agalactiae*"

⁵ Goldberg, J.J., P.A. Murdough, A.B. Howard, P.A. Dreschsler, J.W. Pankey, G.A. Ledbetter, L.L. Day, and J.D. Day, J. Dairy Sci. Vol. 77, 1994.