

## Chlorine Dioxide FAQs

### What is Chlorine dioxide?

Chlorine dioxide (ClO<sub>2</sub>), the primary germicide in ABS udder care products, is an incredibly effective broad-spectrum, anti-inflammatory, bactericidal, fungicidal and virucidal agent. It has been recognized for its disinfectant properties since the early 1900's.

ClO<sub>2</sub> kills microorganisms by disrupting transport of nutrients across the cell wall. It can be generated in a gas or liquid form. ClO<sub>2</sub> should not be confused with chlorine gas.

### What are the advantages of a chlorine dioxide udder care product versus an iodine?

Chlorine dioxide products are more effective under organic load. When milk, mud or manure are present on teats, these organic materials increases the pH on the skin. Iodine is negatively affected by these pH increases and loses killing ability with the organic material present. Chlorine dioxide is not affected by this high pH level when organic materials are present and is able to maintain killing ability.

Also, ClO<sub>2</sub> products have proven to have a quick kill – a 15 second kill as proven in standardized tests developed by the Association of Analytical Chemists (AOAC). With these AOAC testing methods, germicides must achieve a 5-log reduction in 15 seconds to be considered effective. The ABS Valiant products have provided a completed kill in 15 seconds – with and without a 10% milk load.

### Where else has chlorine dioxide been used for disinfection?

Although ClO<sub>2</sub> has been used in udder disinfection for the past 15 years, it has been used commercially for over 60 years. It is used for disinfection and odor control and has been known for broad-spectrum killing ability.

Some examples of industrial chlorine dioxide use include:

- washing fruit and vegetables
- disinfecting meat and poultry
- disinfecting food processing equipment
- sanitizing water
- controlling odors
- medical disinfection - instrument disinfection, sterilization of contact lenses
- treating municipal water
- bleaching pulp and paper
- electronics - circuit board cleaning
- bleaching textiles

In November 2001, the EPA began to use liquid chlorine dioxide in the clean-up of government buildings against Anthrax.

### Is chlorine dioxide the same as bleach?

No. While ClO<sub>2</sub> has chlorine in its name, chlorine dioxide's chemistry is radically different than that of chlorine. Bleach is a hypochlorite/hypochlorous acid, which is a more corrosive oxidizing system. Chlorine dioxide is gentler on hands and teat skin and has less tendency to become inactivated by organic matter (mud, manure, milk) than bleach.

### Is chlorine dioxide non-toxic? What about residues?

Chlorine dioxide is residue safe, the active ingredients break down to products naturally found in the environment - **organic acids and salt**. It is environmentally friendly and not harsh on teat skin. In fact, all of the ABS formulations are fast, safe and effective.

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## The Full Story of Chlorine Dioxide and Teat Conditioning



For more information call **1-800-ABS-STUD** and ask for the Technical Services department.



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# Why Chlorine Dioxide Conditions Teats

It's been clear for years: the chlorine dioxide (ClO<sub>2</sub>) class of teat dips effectively prevents mastitis. Numerous studies following NMC protocols prove it.<sup>1</sup> Satisfied customers around the globe applaud it. And somewhere along the way, while these dips were working hard to protect cows from mastitis, a welcome upshot became apparent: bad teat ends improved with ClO<sub>2</sub> usage.

Though no formal study unveiled this discovery, positive field reports have poured in and continue to do so. **The effect on bad teats has been so predictable, even foremost milk quality consultants have taken note, recommending ClO<sub>2</sub> teat dips to help heal teats with hyperkeratosis, or rough teat ends.**<sup>2,3</sup> Their observations indicate the ClO<sub>2</sub> class of teat dips are very effective in softening keratin, allowing keratin removal with aggressive action during udder prep.

## Softening is Key

The question has been posed that if chlorine dioxide “dissolves hyperkeratotic tissue, wouldn't it also dissolve skin?”

Chlorine dioxide does not dissolve hyperkeratotic tissue. It softens it for easier removal. Lactic acid, the activator in the system, is an alpha-hydroxy acid (AHA). The functional benefits provided by AHAs are skin softening and exfoliating.<sup>4</sup>

## What about the pH?

There are industry claims that low pH is bad while products with moderate pH (pH about 5 or 6) are more desirable for skin. **These generalizations about pH are not accurate. It is recognized that a strong acid can be corrosive to skin; however, not all acidic products are bad for skin. Chlorine dioxide products, with pH levels ranging from 2.7 to 3.2, are proof. Lab testing of these products shows improved skin hydration. Field experience echoes the lab results. Furthermore, one can design a pH 5 iodine teat dip that can be very harsh to skin.** Therefore, it is difficult to make cause-and-effect generalizations about pH.

“We have measured the skin surface pH of cows' teats and they are essentially neutral,” notes Dr. Joseph Morelli, Ecolab Senior Scientist. “This has been corroborated by researchers in Germany. Prolonged application of a ClO<sub>2</sub> teat dip vs. a nil treatment control had no significant impact on the skin pH.<sup>5</sup> What does this tell us? There is no basis, physiological or otherwise, to say one pH is better than another. In addition, use of a low pH formula does not significantly alter the skin's inherent pH.”

As you consider your teat dip selection, be mindful of what has been proven to work in scientific studies as well as what works in the field. An extensive list of studies supports the effectiveness of the ClO<sub>2</sub> class of dips in mastitis prevention. User feedback further suggests these dips help minimize teat end roughness, as seen in the actual herd results included at right.



Teat exfoliation in progress



Exfoliation end result, healthy teat condition from ABS Udder Care Products

<sup>1</sup> Summary of Peer-Reviewed Publications On Efficacy Of Premilking and Postmilking Teat Disinfectants Published Since 1980. [www.nmconline.org/docs/Teatbibl.pdf](http://www.nmconline.org/docs/Teatbibl.pdf)

<sup>2</sup> Johnson, A. 2003. We can avoid bad teat ends. *Hoard's Dairyman*, May 10, p. 341.

<sup>3</sup> Reid, D.A. and A. P. Johnson. 2003. Trouble Shooting Herds With Poor Teat Condition. 42nd Annual National Mastitis Council Meeting Proceedings, pp. 124-127.

<sup>4</sup> FDA Draft Guidance. Labeling for Topically Applied Cosmetic Products Containing Alpha Hydroxy Acids as Ingredients. 2002. [www.cfsan.fda.gov/~dms/ahaguide.html](http://www.cfsan.fda.gov/~dms/ahaguide.html)

<sup>5</sup> Fox, L.K., L.Y. Oura, and C.R. Ames. 2003 Teat Skin pH. *J Dairy Sci.* 86 (12):3951-2.

# Actual Teat Condition Results with ABS Udder Care Products

Improvements in teat end and teat skin condition have been found through the use of ABS udder care products in many commercial dairies throughout the U.S. Three examples follow.

The first example (see Figure 1) is taken from a 3,400 cow Midwestern dairy. This herd saw improvements in teat end scores after the initiation of Valiant™ Pre-Post as a post dip, when it converted from an iodine-based teat dip. The average teat end scores on the iodine products are seen in orange, the Valiant Pre-Post scores are seen in green. The herd initiated use of Valiant Pre-Post on October 12, 2004 and improvements in teat end condition can be seen on the November 11, 2004 teat scores, **where the average teat end scores dropped to 1.9.**

The next example (see figure 2) are the teat scoring results of a 2,900-cow Michigan dairy. The ABS personnel had collected teat end scores on May 10, 2004, before the initiation of ABS udder care products. After 1 month of Valiant Pre-Post use as a post dip the teat end scores were collected again. The results show **a drop of over 10 percent abnormal teat scores, or a reduction of teats that are scoring 3, 4, or 5.** After six months of Valiant Pre-Post use the teat end scores were collected again on October 18th and the results can be seen in figure two.

## Teat condition improvements – Team Success:

The interest in improving milk quality and lowering herd somatic cell count (SCC) prompted the initiation of a team approach on an 850 cow California dairy in July 2004. The dairy management and ABS teams implemented a strategic plan to improve milk quality at a time when the herd was averaging a SCC of 240-260,000.

In September of 2004, the ABS team made a series of recommendations including:

- Equipment maintenance and updates (detachers, pulsators and wiring)
- Implementation and maintenance of a good milking routine with pre and post dipping (not spraying)
- Use of an NMC protocol tested teat dip that kills quickly and improves skin condition
- Consider milker incentives to improve procedure compliance and milk quality
- Year-round clean, dry and comfortable conditions for all cows, milking, close up and dry

Following ABS recommendations, equipment updates were made and ABS hosted a milker's school for the dairy's parlor staff. The use of milker's gloves was also encouraged to decrease transmission of bacteria.

The next step (mid September 2004) in the team process was the implementation of ABS udder care product Encore™ Pre-Post dip as their pre and post dips.

**ABS team members collected teat scoring data to monitor efficacy of the milking procedure, equipment and udder care product changes. The results indicate dramatic improvements with decreased abnormal skin condition and teat end scores of 38% and 11% respectively (see Figure 3).**

Follow-up visits by the ABS team confirmed compliance of proper milking procedures. The dairy's milk quality performance has improved with lower SCC (250,000 to current 190,000) and reduced culling for mastitis.

Figure 1 AVERAGE TEAT END SCORES

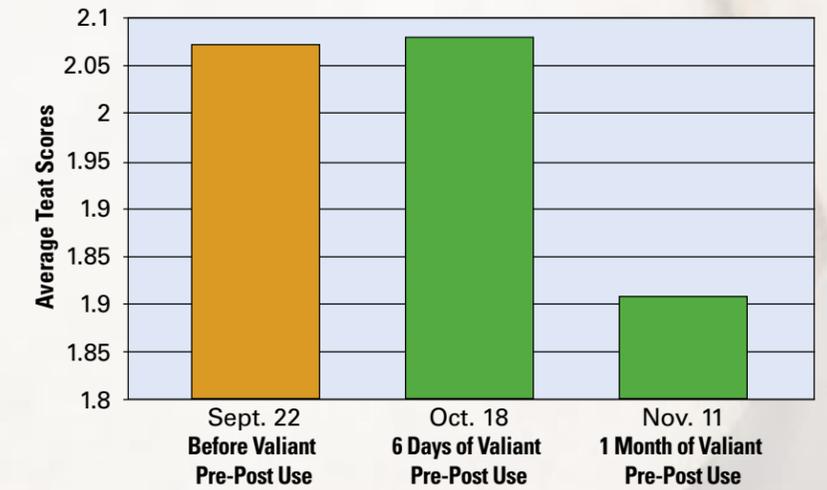


Figure 2 TEAT END SCORES WITH USE OF VALIANT PRE-POST

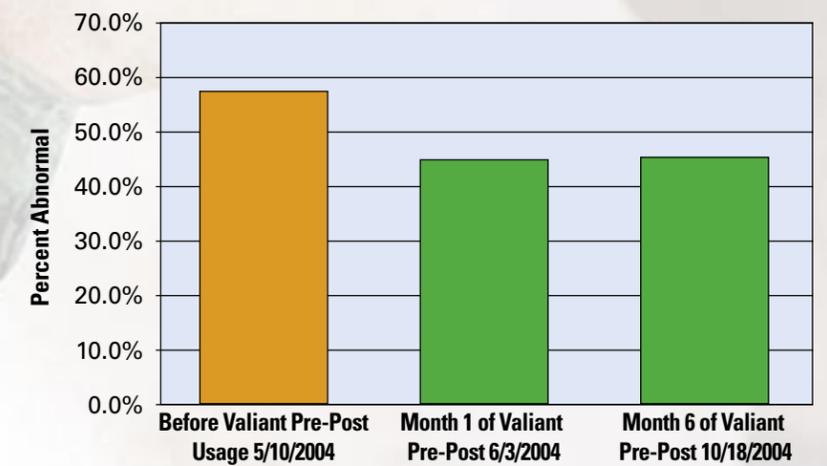


Figure 3 DAIRY TEAT END AND SKIN CONDITION SCORES

