

The Chemistry of Microcyn® Technology

Robert Northey Ph.D

Oculus Director of Research and Development

The Microcyn® Technology on which Vetericyn® is based generates stable, highly efficacious pH-neutral products based on the science of hypochlorous acid (HOCl). This chemical is a highly efficient, but under most conditions, an unstable antimicrobial agent that is generated by human cells as a defensive agent.

Occasionally, through a lack of understanding of chlorine chemistry, the Microcyn Technology is erroneously described as dilute bleach. Bleach is an alkaline solution (pH>11) of sodium hypochlorite (NaOCl) which is the sodium salt of hypochlorous acid (HOCl), the active ingredient in the Microcyn Technology. These two chemicals exist in a pH-driven equilibrium. At pH 7.4, there are equal amounts of both chemicals in solution while at the alkaline pH of bleach the solution is greater than 99% sodium hypochlorite. The chemical properties of these two compounds, and thus Microcyn Technology and dilute bleach, are vastly different.

- **Antimicrobial Efficacy:** Hypochlorous acid, the active ingredient in Microcyn Technology, is 70 times more efficacious than the active ingredient in bleach, sodium hypochlorite. It has been long established that hypochlorous acid is a much stronger antimicrobial agent than sodium hypochlorite^{[1][2][3]}. In a comparison test against *Bacillus atrophaeus* spores, Microcyn Technology was able to achieve a 6-log reduction at a diluted concentration of 38 mg/L Free Available Chlorine (FAC) while it required over 3000 mg FAC to achieve the same reduction with diluted bleach at pH 11
- **Toxicity:** The high concentration of actives required for effectiveness with dilute bleach make this product toxic; Microcyn Technology has been shown to be non-toxic. There have been numerous toxicity studies undertaken on hypochlorous acid and sodium hypochlorite. While there are some minor procedural variations in the exact values, it is generally agreed that these compounds are not toxic in levels under 150-200 mg/L FAC^{[4][5][6]}. Microcyn Technology is very efficacious at levels of Free Available Chlorine below the point at which toxicity begins to become an issue. Alkaline dilute bleach, however, requires significantly higher levels of actives and therefore has major toxicity issues. This has been the issue with using sodium hypochlorite products such as Dakin's solution.
- **Stability:** Diluted bleach products such as Dakin's solution have limited stability requiring generation at the point of use while bottled Microcyn Technology is stable over long periods of time. Bleach is an alkaline product simply because the elevated pH gives the product stability^[7]. If

bleach pH is lowered below pH 11 the solution stability grows worse until a very unstable solution is obtained at pH 7^[8]. The U.S .Pharmacopeia ^[9] has set a shelf life for acidified, diluted sodium hypochlorite topical solution (pH 7.8-8.2) at 7 days. At neutral pH, Microcyn Technology products have shelf lives of eighteen months and beyond. The unique chemistry behind Microcyn Technology generates stable hypochlorous acid in a bottle.

There is no other stable bottled hypochlorous acid product available.

- Chemistry: The mechanisms by which Microcyn Technology functions are the result of tightly controlled chemistry. The science of chlorine in solution revolves around chemical equilibriums between compounds of varying reactivities. It is possible through minor modifications to solution chemistry to make major changes to product stability and efficacy. It has been demonstrated that products with the same pH and FAC can have vastly different properties^{[10],[11]}. The chemistry which provides Microcyn Technology with its unmatched stability also strongly influences the mechanisms by which the product activates function. Microcyn Technology is not just an antimicrobial; it has been shown to possess highly useful anti-inflammatory, anti-histamine and vasodilation properties. These are the result of tightly controlled chemistry and not something obtainable by simply diluting bleach.

As a final note, hydrogen peroxide was discovered in 1818, more than 190 years ago, and is widely used as a bleach agent and industrial cleanser. It is an efficient antimicrobial agent as a 3% solution; below this point certain microorganisms are resistant. Yet, hydrogen peroxide at concentrations above 0.003% is toxic to human and mammalian tissue and should be used with great caution. Peroxide inhibits healthy tissue growth and may impede the wound healing cycle when used on broken skin or wounds.

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