

Scientific data show that by saturating gauze with stabilized Hypochlorous acid-based cleanser*, a perfect delivery system is achieved, for soaking and packing wounds. How much to soak into gauze for effectiveness?

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AIM

Stabilized pure Hypochlorous Acid-based wound cleanser*(pHA/HOCL) is well described in the literature and shows a 5–10-minute soaking may be indicated for optimal cleansing. Thus, the means to deliver such exposure times is critical. Sterile gauze has been generally used for this. We rigorously examined whether using gauze to deliver pHA cleanser to the wound is sound practice based on pHA dissipation in gauze, and via a typical polyurethane foam dressing material. We attempted to determine the ideal level of saturation of the dressings for clinical use. Additionally, we studied the rate of dissipation of pHA in ex vivo porcine tissue.

METHODS

We poured pHA (HOCL preserved cleanser) into gauze dressings in measured quantities, using HOCL measuring strips to monitor HOCL degradation in these dressings over time. The gauze dressing tested is a common one chosen by clinicians currently using gauze for applying HOCL cleanser. A polyurethane foam was also tested for such soaking as a potential, more expensive alternative to gauze, but one that may be preferred as a more advanced material than gauze. We similarly poured variable quantities of the pHA/HOCL cleanser into the chosen common 4 X 4 gauze, to observe HOCL levels over time compared to the HOCL concentration in the packaging (bottle). We also poured HOCL solution on ex vivo porcine tissue and monitored HOCL dissipation over time on tissue.

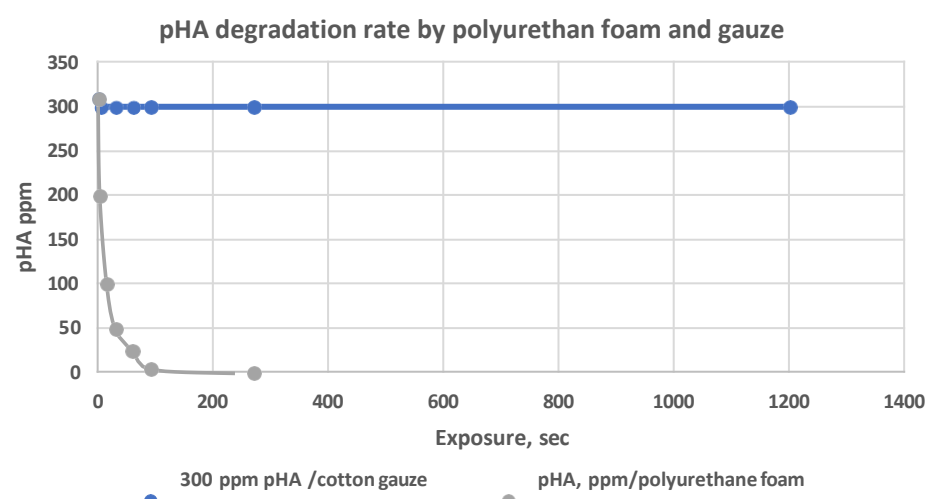


Figure 1: Hypochlorous Acid degradation rate in gauze and polyurethane foam dressing material.

DISCLOSURES
This work was produced with support from Urgo Medical North America.

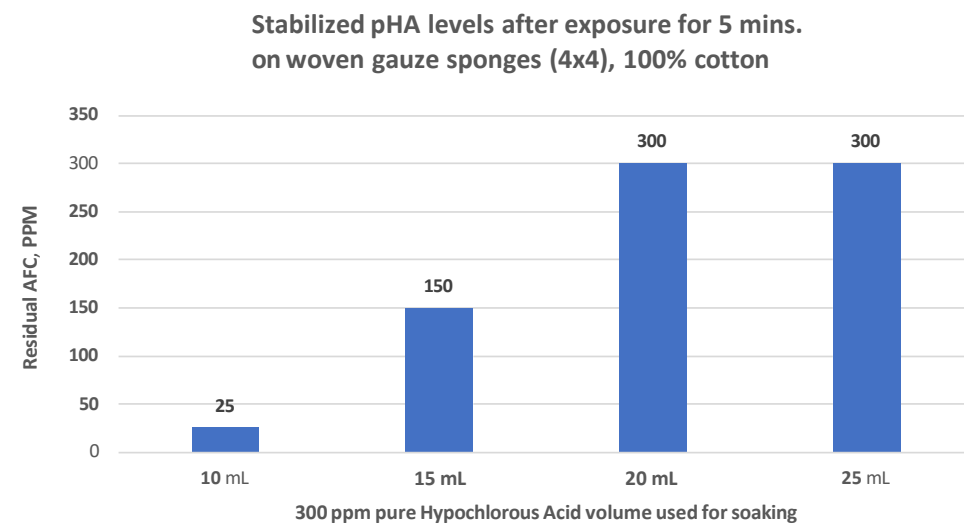


Figure 2: Shows soaking the gauze delivery system must be done with an adequate quantity of the pHA cleanser. After five minutes of exposure to various volumes of the pHA wound cleanser, the 300 ppm originally dosed onto the 4x4 cotton gauze was lower when delivered at less than 20 ml..

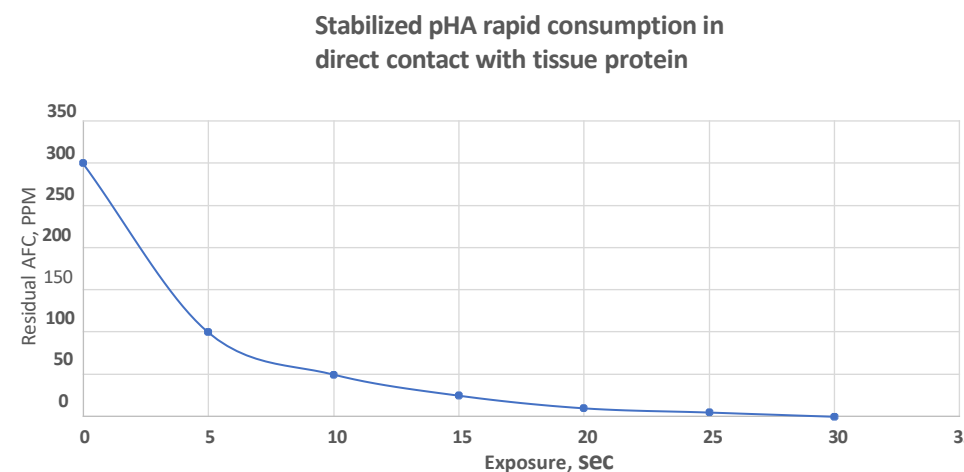


Figure 3: Degradation of hypochlorous acid is rapid in the presence of ex vivo porcine tissue, this likely reduces cytotoxicity due to elimination of the HOCL in tissue via well known, tissue safe pathways.

Organism	Time to kill	% Reduction
MRSA	15 seconds	99.999%
VRE	15 seconds	99.999%
Escherichia coli	15 seconds	99.999%
Acinetobacter baumannii	15 seconds	99.999%
Bacteroides fragilis	15 seconds	99.999%
Candida albicans	15 seconds	99.999%
Enterobacter aerogenes	15 seconds	99.999%
Enterococcus faecium	15 seconds	99.999%
Haemophilus influenzae	15 seconds	99.999%
Klebsiella oxytoca	15 seconds	99.999%
Klebsiella pneumoniae	15 seconds	99.999%
Micrococcus luteus	15 seconds	99.999%
Proteus mirabilis	15 seconds	99.999%
Pseudomonas aeruginosa	15 seconds	99.999%
Serratia marcescens	15 seconds	99.999%
Staphylococcus epidermidis	15 seconds	99.999%
Staphylococcus haemolyticus	15 seconds	99.999%
Staphylococcus hominis	15 seconds	99.999%
Staphylococcus saprophyticus	15 seconds	99.999%
Streptococcus pyogenes	15 seconds	99.999%
Staphylococcus aureus	15 seconds	99.995%
C. difficile endospores	15 seconds	99.93%

Figure 4: Planktonic germs are eliminated rapidly by stabilized pure hypochlorous acid preserved wound cleanser (300 ppm).

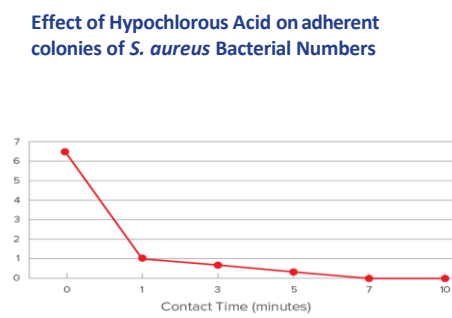


Figure 5: Previously published data shows that soaking with pHA cleanser is indicated to remove microbes, but some complex microbial colonies in invitro testing, S. aureus for example, require more time for maximum efficacy.

RESULTS

We found that when completely saturated (i.e the liquid drips when the dressing is held up by the edge), the 300 ppm level of HOCL present in the packaging remains at 300 ppm within the gauze dressing up to 20 minutes (Figure 1). This requires about 25 ml of the cleansing fluid. Polyurethane foam dressings turned yellow, and rapidly degraded the HOCL from 300 to near zero within minutes and are clearly not suitable as delivery systems for the pHA cleanser (Figure 1). Volume of the cleanser used matters. For flat gauze pad (4 X 4) of the most common brand, about 25ml is ideal for HOCL level to remain at 300 ppm (same as in the bottle packaging) for up to 20 minutes (Figure 1). Significantly less volume than that leads to lower than the desired 300 ppm HOCL within the gauze when tested after just 5 minutes of introduction of the liquid to the gauze.

For example, a 10 ml pour (instead of 25 ml) into the 4 X 4 gauze, shows a level of only 25 ppm after 5 minutes post soaking (Figure 2), while as previously stated the level remains at 12 X more (300 ppm) after 20 minutes, when 25 ml was poured. A 4 yard packaging gauze (referred to generally as a large bandage roll) takes about 100 ml of liquid to fully soak so that there are no dry spots in the roll, and this also ensures that the HOCL concentration is at 300 ppm post soaking. HOCL poured on ex vivo tissue was rapidly consumed, showing a half life of less than 15 seconds (Figure 3)

DISCUSSION

The advice provided previously to soak wounds with a gauze that has been soaked to dripping with the pHA/ HOCL cleanser is sound and in line with published results on clinical efficacy. We know that 300 ppm HOCL based cleanser, can rapidly eliminate planktonic germs (Figure 4).

A gauze soak of up to 20 minutes is viable at full strength of 300 ppm, while the use of foam is to be avoided as the HOCL quickly dissipates in the foam. It is recommended that gauze, in whatever format is used, be fully saturated or soaked to an approximate level that it begins to drip when lifted. The recommendation is also that the soaked gauze should not be squeezed dry. The rapid dissipation of HOCL in tissue is consistent with previous findings in research literature and indicates that it does not likely linger at the wound site, unlike other antimicrobial preservative agents, and this may be responsible for the reported lack of tissue toxicity in the pure hypochlorous acid cleanser. The soaking over time is recommended as many germs are rapidly eliminated (within 30 seconds) via HOCL exposure when in the planktonic state, complex microbial colonies lead to a situation where both the germs take more than a few minutes to be effectively eliminated (Figure 5). Therefore, the fact that the soaked gauze should retain the HOCL preservative potency over time, is critical. This research has implications for practice.

* Vashe® Wound Solution, Urgo Medical North America

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