Bactiguard® WOUND CARE

HYDROCYN AQUA® SOLUTION & GEL

Improved WOUND HEALING

WOUND HEALING CAN BE COMPLEX
THE TREATMENT DOESN'T HAVE TO BE



BACTIGUARD.COM

Wound care CHALLENGES

MULTI-RESISTANT BACTERIA

The prevalence of multi-resistant bacteria is escalating, and patients with chronic wounds receive more antibiotics than other patient groups.[1]



1 to 2% will experience a chronic wound during their lifetime.[2]

10-15% of people living with diabetes develop a diabetic foot ulcer.[2]

5-10% of diabetic foot ulcer patients risk losing a limb.[2]

1% of the global population aged 18–64 years suffer from venous leg ulcers.[2]

BIOFILM

Biofilm formation is also a major challenge and more than 65% of chronic wounds are affected by biofilm. Biofilm is a community of microorganisms that grow and organise in an extracellular matrix in multiple steps. It offers a physical and metabolic shelter for the microorganisms and make them harder to kill.[3]

THE PROPERTIES FOR AN *ideal* ANTIMICROBIAL SOLUTION

IN WOUNDS 2014, WOLCOTT ET AL CONCLUDED WHAT THE PROPERTIES FOR AN IDEAL ANTIMICROBIAL SOLUTION SHOULD BE:[4]

PROPERTIES OF AN IDEAL ANTIMICROBIAL SOLUTION[4]

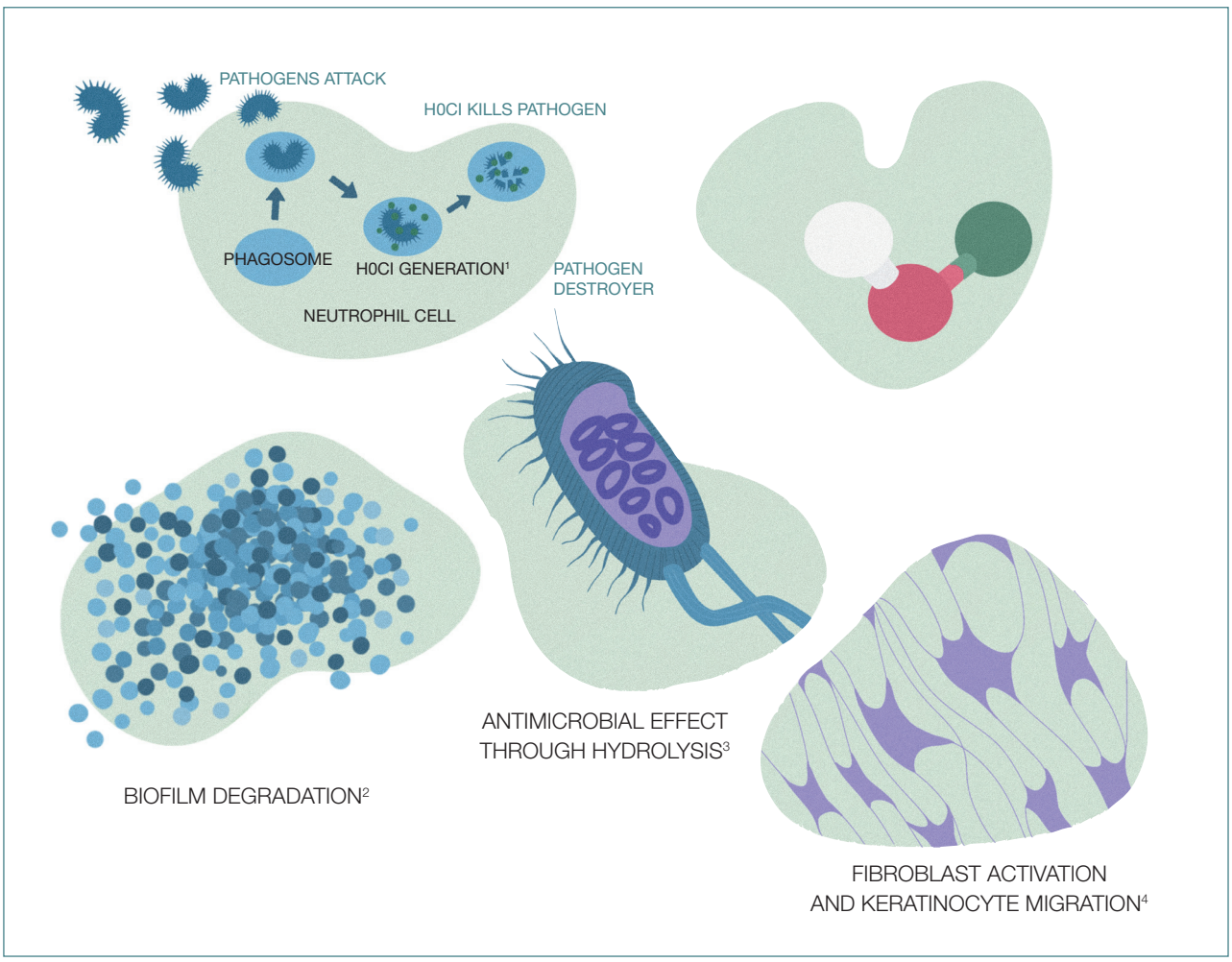
- Non-toxic to human cells
- Effective against a broad spectrum of microbes
- Safe in a variety of wounds
- Does not cause pain
- Does not require irrigation at high pressures
- Effectively removes loose tissue and debris from the wound bed.

They also concluded HOCl meets the requirements of a good wound cleanser.

”Effective wound cleansing should remove all pro-inflammatory material and foreign bodies for optimal wound healing”[5]

HYDROCYN AQUA® *mimic* BODY'S OWN IMMUNE SYSTEM[6]

Hypochlorous acid (HOCl) is a component in our own immune system. It is naturally produced by neutrophils in the steps of phagocytosis of bacteria and other microorganisms.



An ideal wound treatment should be effective as well as harmless to human cells. But what if it could also improve healing by accelerating the healing process itself?

In a 2014 study Sakarya et al concluded that HOCl has favourable effects on fibroblasts and keratinocytes migration compared to Iodine.

Fibroblasts and keratinocytes are crucial in creation of granulation tissue in wound healing. They are closely related through different cytokines released in the process of wound healing. HOCl is thought to upregulate crucial proinflammatory mediators and in this way improve the proliferation of both fibroblasts and keratinocytes.

TO CONCLUDE: Sakarya states HOCl is an ideal wound care agent for improved wound healing.

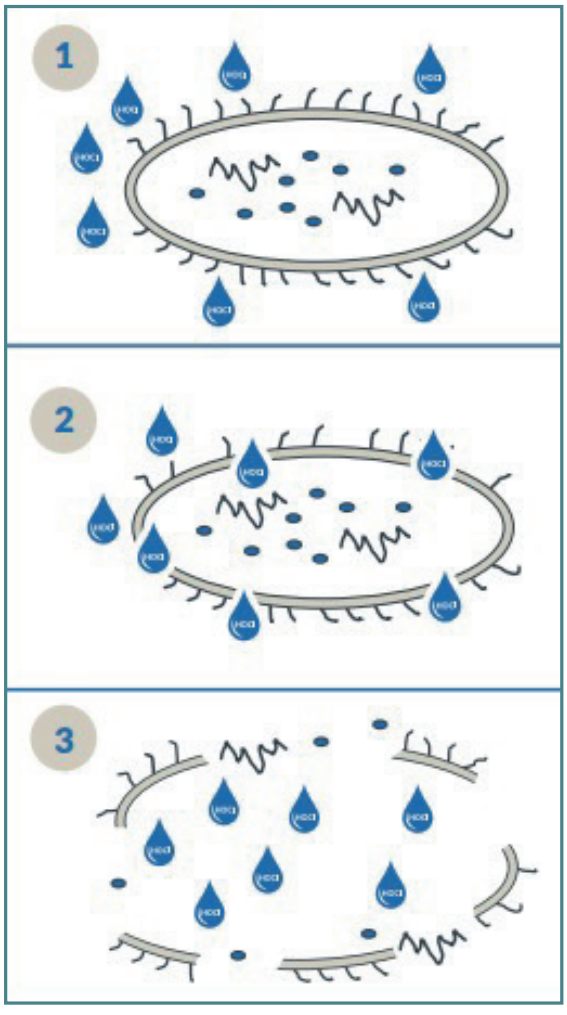
HYDROCYN AQUA®: *mode of action*

Hypochlorous acid (HOCl) is the active ingredient in the HYDROCYN Aqua® product range. HYDROCYN Aqua® has a broad mode of action; first and foremost, it effectively reduces biofilm built up by microbes in the wound. It also quickly kills bacteria, virus and fungi through hydrolysis. Last but not least there is a positive effect on fibroblast and keratinocyte migration which is a crucial step for wounds to close and heal.

With HYDROCYN Aqua®, you use the strength of our own immune system without compromising on the safety and at the same time improve wound healing.

HYDROCYN AQUA® KILLS MICROBES BY OSMOTIC SHOCK

- The cells of microorganism are negatively charges while hypochlorous acid (HOCl) is electrically neutral. When HYDROCYN Aqua® is applied, HOCl can penetrate the pathogens cell wall and slime layer.[7]
- The hypotonic effect of HYDROCYN Aqua® ensures water increasingly flows into the cells to equalize the osmotic gradient. The increased internal pressure causes bacteria to burst in a process called osmotic shock.[8]



Rapid ANTIMICROBIAL EFFECT – WITHIN 60 SECONDS

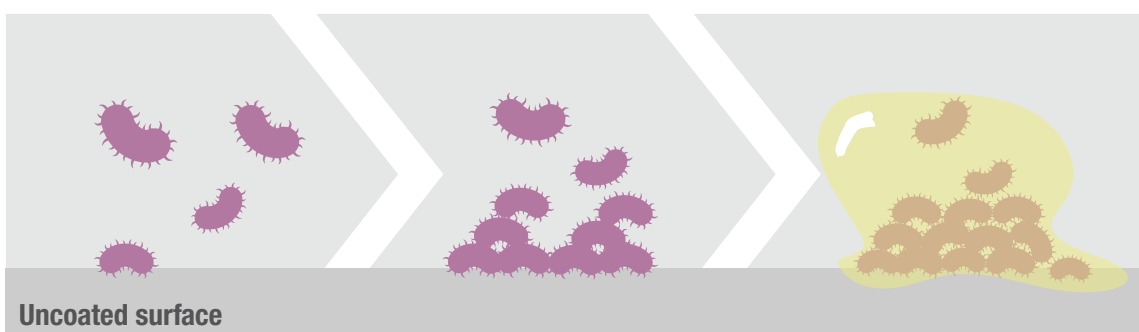
HYDROCYN Aqua® has been tested on several microorganisms following the ISO 11737 & ASTM E2315 standard tests. The tests show that the product is effective against both gram-positive and gram-negative bacteria (including MRSA), fungi and spores.[9]

MICROORGANISM	% Reduction
BACTERIA	
E. feacalis, VRE	*99.99%*
MRSA	*99.99%*
Mycobacterium bovis	*99.99%*
Gardnerella vaginalis	*99.99%*
Acinetobacter baumannii	*99.99%*
Klebsiella pneumoniae	*99.99%*
Klebsiella pneumoniae, CRE	*99.99%*

MICROORGANISM	% Reduction
FUNGI	
Candida albicans	*99.99%*
Candida tropicalis	*99.99%*
Candida parapsilosis	*99.99%*
Trichophytan mentagrophytes	*99.99%*
Sporothrix schenckii	*99.99%*
Candida auris	*99.99%*
SPORES	
Bacillus subtilis	*99.99%*
Clostridium difficile	*99.99%*
Clostridium sporogenes	*98.45%*

EFFECTIVE REDUCTION OF BIOFILM FORMATION

In clinical studies HYDROCYN Aqua® efficiently removes biofilm in a broad variety of microorganisms, including multi-resistant bacteria strains. In vitro tests show that HYDROCYN Aqua® Solution reduces biofilm concentration up to 99.9%. (Pseudomonas aeruginosa and MRSA).[8]



AFTER A FEW SECONDS

Bacteria begin to adhere to the surface.[10]

AFTER A FEW HOURS

Bacteria begin to multiply.[10]

AFTER A FEW DAYS

Bacteria form a biofilm. When they begin to disperse, there is an increased risk of infection.[10]

Improved WOUND HEALING

HOCl improves wound healing and increases keratinocyte migration

> Wound healing assay reveals povidone iodine-treated skin fibroblast cells were disrupted while stabilized HOCl solution treatment increased migration of keratinocytes.[6]

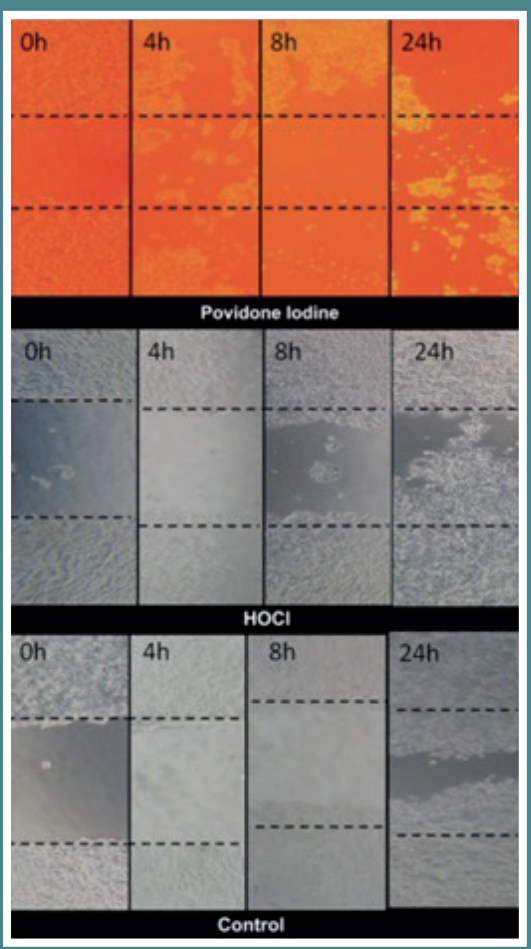


Figure shows images of wounded skin fibroblast cell mono-layer with 1/32 dilution of povidone iodine and hypochlorous acid solution at 24 hours. Dotted lines indicate wound boundaries at 0 hours[6]

>

CONCLUSION: These findings support HOCl solution being an ideal wound care solution with a powerful and rapid killing effect on different types of microorganisms, antibiofilm and microbicidal effect within the biofilm.[6]

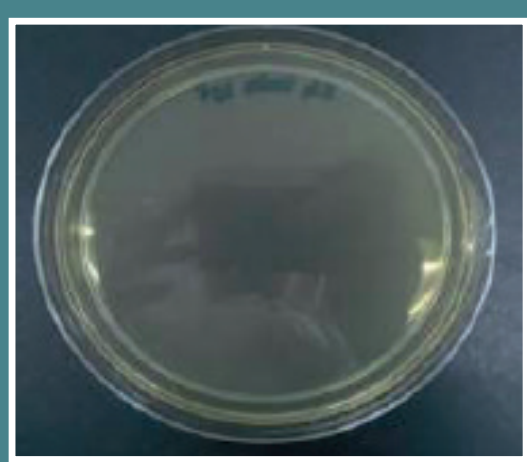
Compared TO SALINE, HYDROCYN AQUA® RAPIDLY AND EFFECTIVELY KILLS MICROBES[9]

IN-VITRO TIME KILL STUDY



0.9% NaCl saline solution

Figure 1: Images of Staphylococcus aureus bacterial colony after 1 minute exposure time



HYDROCYN Aqua®

This in-vitro study showed that electro activated super-oxidized solution (HYDROCYN Aqua®) is capable of reducing microbes (antibacterial) as compared to 0.9% NaCl saline solution. Furthermore, it shows the efficacy of HYDROCYN Aqua® as an ideal choice for wound irrigation and debridement with antimicrobial effects which helps to accelerate wound healing and prevents infections as compared to 0.9% NaCl saline solution which has limited or almost negligible antimicrobial effects.[9]

SAFETY

SCIENTIFICALLY PROVEN BIOCOMPATIBILITY[9]

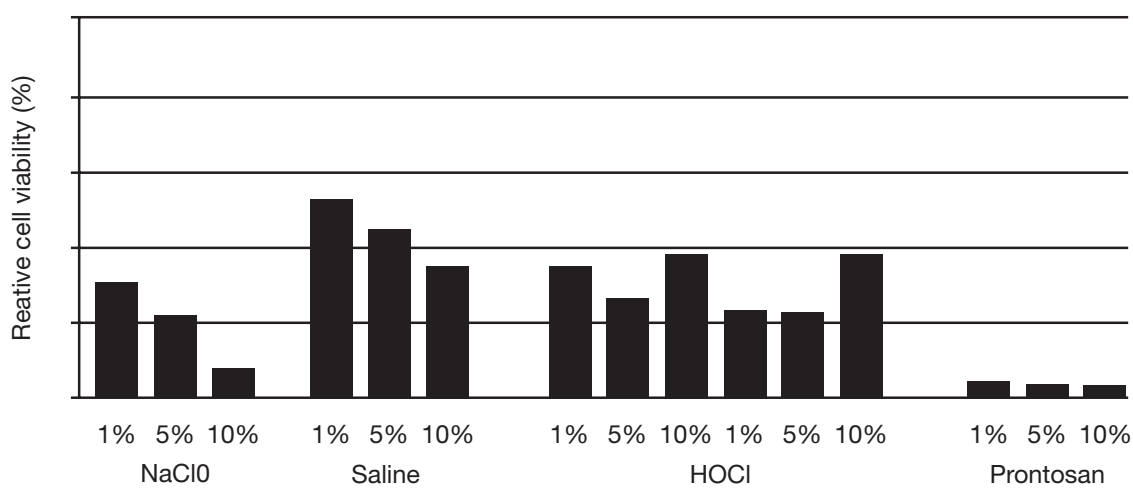
HYDROCYN Aqua® Solution has been tested for biocompatibility as per ISO 10993 & has passed following in-vivo and in-vitro studies.[9]

Biocompatibility Test	Result
Acute Dermal Toxicity Study	*No dermal toxicity*
In Vivo Studies; Intracutaneous Reactivity Test	*No evidence of erythema or oedema*
In Vivo Studies; Primary Skin Test	*No skin irritation*
Genotoxicity Studies	*No genotoxicity effect*
Cytotoxicity Studies	*No cytotoxic effect*
Acute Oral Toxicity Study	*No oral toxicity*
Skin Sensitization Study	*Non-sensitizing*
Ocular Irritation Study	*No ocular irritation*
Vaginal Irritation Study	*No vaginal irritation*
Acute Inhalation Toxicity Study	*No toxicity*

Rapid EFFECT ON BIOFILM BUT VIRTUALLY NO TOXICITY[11]

Ortega-Pena et al analyzed the effectiveness of different antiseptics. In general, the effectiveness of the antiseptics was associated with cytotoxicity, except for HOCl that showed an early response to biofilm formation without being excessively cytotoxic to fibroblasts.[11]

IN COMPARISON TO PRONTOSAN AND OTHER COMPOUNDS, HOCI SHOWED VIRTUALLY NO TOXICITY



Cytotoxicity of various liquid antiseptic formulations against human fibroblasts at 12 hours compared with control (culture medium). NaClO, sodium hypochlorite; HClO, hypochlorous acid; DADS-M, modified diallyl disulfide-oxide; SOS, superoxidation solution. Graph modified from its original version International Wound Journal ISSN 1742-480, Silvestre Ortega-Peña, Christian Hidalgo-González, Martin C Robson & Edgar Krötzsch

HYDROCYN AQUA® *compared* TO OTHER WOUND CARE SOLUTIONS

HYDROCYN AQUA® DIFFERS FROM OTHER HOCL COMPOUNDS: CLASS III MEDICAL DEVICE, ULTRA PURE WATER AND HIGH FREE AVAILABLE CHLORINE

Description	Normal Saline	Hydrogen Peroxide	Prontosan by B Braun Polyhexa-methylene biguanide (PHMB)	Ocetenidine dihydroch-loride (OCT)	Povidone iodine	HYDROCYN Aqua® solution
Main composition	Water, sodium chloride (NaCl)	Hydrogen peroxide	• Purified Water, • 0.1% Unde-cylenamido-propyl Betaine, • 0.1% Polyami-nopropyl Biguanide (Polyhexanide [PHMB])	Octenidine dihydrochloride	Polyvinyl pyrro-lidone (povidone, PVP)	Electro activated super-oxidized water
Antimicrobial properties	No	Yes	Yes	Yes	Yes	Yes
Anti-biofilm properties	No	Yes	Yes	Yes	Yes	Yes
Mode of action	Used as mechanical irrigation or debridement solution	Oxidation of microbial proteins and membrane lipids[12], DNA damage[13]	Prontosan® Wound Irrigation Solutions can be used treat and help prevent infections in acute and chronic wounds including: Traumatic wounds. Post-operative wounds. Chronic skin ulcers (e.g. venous, diabetic or pressure ulcers)	Binds to glycerol phosphate in cell membrane, polysaccharides in cell wall and bacterial enzymatic systems that cause leakage of cytoplasm[14]	Interferes with respiratory chain of microbes. Interact with protein cytoplasm membrane and hamper its function[15]	Microbial cell lysis through osmotic shock because of the internal pressure, the cell burst
Drawbacks/ contraindica-tions	No antibacterial properties, Edema due to excessive intake, potential for cross-contamination once the container has been opened[16]	Cause redness, stinging and irritation[17]	In very rare cases, there may be a mild burning sensation after application of Prontosan®, but this usually dissi-pates after a few minutes. Pronto-san® can cause allergic reactions such as itching (urticaria) and rashes (exant-hema). In rare cases (less than 1 out of 10,000), anaphylactic shock has been reported.[18]	Cause aseptic necrosis and chronic inflammation[19]	Can cause eyes, skin, respiratory tract irritation and stomach distress[20]	No known contraindications

Products	HYDROCYN AQUA® SOLUTION	Microcyn® by Sonoma Pharmaceuticals	Granudacyn® by Möln-lycke
Intended use	HYDROCYN Aqua® is indicated as a wound wash, debridement agent & cleaning solution for acute and chronic wounds such as stage I-IV ulcers, venous stasis and diabetic ulcerations, post-surgery wounds, burns (1st and 2nd degree) and pressure ulcers. It is also can be used in wound moistening and control malodour. It can also be used for instillation in NPWT devices, and in peritoneal.	Intended for moistening absorbent wound dressings and for debriding and cleaning acute and chronic dermal lesions, such as stage I-IV pressure ulcers. Stasis ulcers, diabetic ulcers, post-surgical wounds, first and second degree burns, abrasions and minor irritations of the skin.	Granudacyn® is an irrigation solution for cleansing and moisturising acute, chronic and contaminated wounds, as well as for first and second degree burns.
Ingredients	• Hypochlorous acid (0.003%) • Sodium chloride and sodium hypochlorite (<0.1%) • Ultra pure water with NEUWATER® Technology	• Hypochlorous acid (0.003%) • sodium hypochlorite (0.04%) • sodium chloride (0.023%) • purified water (99.9%)	• Hypochlorous acid (0.005%) • sodium hypochlorite (0.005%) • sodium chloride • purified water
Product pH	Neutral (6.5-8.0)	Neutral (7.0-7.5)	Neutral (7.0-7.5)
Medical device	Class III	Class IIb	Class IIb
Free Available Chlorine	100 pm	30-85ppm	50ppm
Shelf Life	24 months	24 months/ 36 months	24 months unopened, 60 days opened.
Synthesis	Simple electrolysis process of diluted salt.	Simple electrolysis process of diluted salt.	Simple electrolysis process of diluted salt.
Internal/external	Can be used internally	Can be used internally	Can be used internally (perito-neal lavage
Preservatives	None	Yes	None)
Certifications	MDA, HALAL, CE, FDA	MDA, CE, FDA	CE Class IIb Medical Device Not FDA registered
Complications	No known contraindications.	No known contraindications.	No known contraindications.

How to use
HYDROCYN AQUA® SOLUTION AND GEL

1 RINSE



Soak gauze with HYDROCYN Aqua® solution and rinse the wound meticulously

2 SOAK



HYDROCYN Aqua® solution – soaked gauze on wound bed for 1 to 10 min.

3 CLEAN



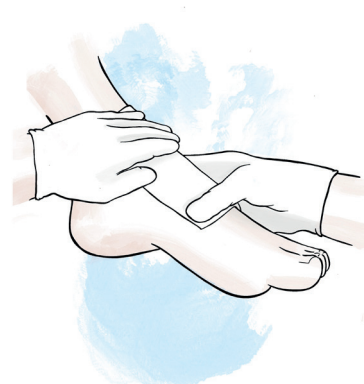
Clean the wound using HYDROCYN Aqua® solution

4 APPLY GEL



Apply HYDROCYN Aqua® gel or gel spray to the entire wound site to maintain a moist wound bed and for a soothing and bacteriostatic effect.

5 DRESS



Dress the wound depending on wound type.

Change and repeat procedure every 1-3 days and extend through the healing process

Note: this is for general use but different treatment protocols should be retained for different kinds of wounds.

INDICATIONS

HYDROCYN Aqua® is a range of biocompatible, gentle and safe wound care products for all stages of acute, chronic and infected wounds, such as stage I-IV ulcers, venous stasis and diabetic ulcerations, bed sores, surgical wounds as well as first and second degree burns.

THE HYDROCYN AQUA® PRODUCT RANGE

The HYDROCYN Aqua® product range consists of various solutions and gels. Used together they provide the ideal solution for effective wound healing. The HYDROCYN Aqua® solution contains HOCl that effectively cleans and reduces microbial load and biofilm in the wound.

The HYDROCYN Aqua® gel and gel-spray contains hypochlorite that slowly releases HOCl which keeps the wound protected against infection during dressing changes. The gel also moisturizes the wound, which is important for optimal wound healing.

Product Code Bactiguard Wound Care	Type	Volume	Packing Quantity
SOLUTION			
HW3CE700	Spray	100 ml	50
HW34E100	Cap	250 ml	24
HW34E700	Spray	250 ml	24
HW35D100	Cap	500 ml	12
HW36D100	Cap	1000 ml	6
HW35C102	Irrigation Bag	500 ml	12
HW36C102	Irrigation Bag	1000 ml	6
HW3H103	Gauze, 8-Ply	10x10 cm	25 units x 16



Product Code Bactiguard Wound Care	Type	Volume	Packing Quantity
GEL			
HW40F900	Gel tube	15 g	20
HW41F900	Gel tube	30 g	20
HW42C900	Gel tube	50 g	12
HW4CB900	Gel tube	100 g	6
GEL SPRAY			
HW42E800	Gel spray	50 g	50
HW4CG800	Gel spray	100 g	42




Wound healing
CAN BE COMPLEX
THE TREATMENT
DOESN'T *have to be*
1
Effectively clean wounds by rapidly removing bacteria and biofilm.
2
Mimics body's own immune response to effectively kill microbes within 60 seconds.
3
Biocompatible, non-stinging and tissue friendly.

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