Unique&Easy Micro-Encapsulation Solutions

Product Overview - 7019

HydroSal® BKC (Benzalkonium Chloride)

Smart Antimicrobial Protection That Reactivates With Water™

HydroSal® BKC is a controlled-release antimicrobial system that delivers Benzalkonium Chloride (BKC)—a well-establishedbroad-spectrum antimicrobial active widely used in hygiene and skin cleansing applications.

Leveraging Salvona's proprietary HydroSal® encapsulation technology, BKC is incorporated into sub-micron spheres that provide controlled release, help minimize irritation, and maintain potent antimicrobial activity over an extended period.

HydroSal® BKC was developed to maximize the effectiveness and utilization of Benzalkonium Chloride while offering a safer, longer-lasting, and more skin-friendly alternative to traditional alcohol-based antiseptic systems.

Core Functions

- Supports hygiene and freshness
- Helps maintain a cleaner skin environment.

The benefits of the encapsulation

- Provides sustained antimicrobial protection
- The encapsulation allows gradual release, ensuring long-lasting efficacy even after application.
- Improves safety and compatibility
- Reduces the harshness typically associated with BKC.
- Compatible with selected leave-on formulations when used within regional regulatory limits, unlike conventional alcohol-based systems.
- Enhances formulation stability
- Works across a wide pH range and in aqueous systems.

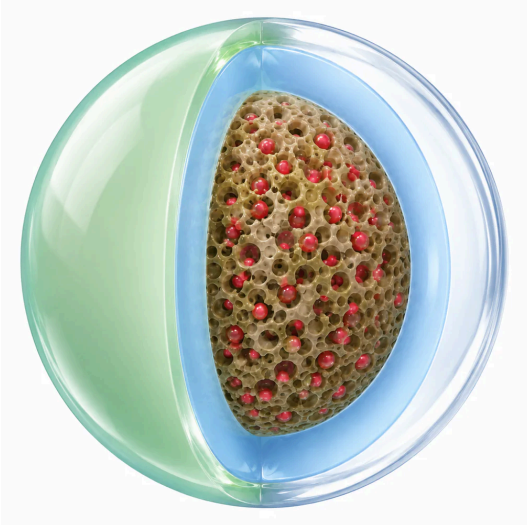


Illustration of HydroSal® Youth. Where the BKC is encapsulated in the core or the submicron sphere.

HydroSal™ BKC can be used across a wide range of personal care, hygiene, and cosmetic applications where long-lasting cleanliness, antimicrobial protection, odor control, or microbial balance are desired.

HydroSal® deposits an invisible reservoir of antimicrobial protection that remains on the skin after rinsing. The moisture-reactivated properties of HydroSal™ BKC make it particularly valuable in products where conventional BKC would be rapidly washed away or depleted.

- Facial Wash
- Body Wash
- Hand Wash
- Surface Cleaners

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HydroSal Technology

HydroSal® BKC Structure

HydroSal® BKC is based on Salvona's sub-micron encapsulation platform, where Benzalkonium Chloride is incorporated within microscopic oil-in-water delivery spheres, typically in the sub-micron range (approximately 1.0–10.0 microns).

The HydroSal® BKC system can be viewed as consisting of three functional regions that work together to transform Benzalkonium Chloride from an immediate-action disinfectant into a long-lasting antimicrobial protection platform.

1. External Aqueous Phase
The external aqueous phase allows easy incorporation into a wide range of formulations, including sprays, gels, wipes, hand sanitizers, cleansers, and leave-on products. It contributes to formulation clarity, elegance, and stability while providing formulators with maximum flexibility in product design.

2. Protective Encapsulation Shell
The protective encapsulation shell surrounds and isolates the BKC from the external environment, minimizing undesirable interactions with formulation ingredients, anionic materials, and surfaces that can prematurely deactivate free BKC.
The shell also promotes adhesion to skin and surfaces and responds to moisture, friction, or contact, providing controlled, on-demand release of the antimicrobial agent.

This unique architecture helps keep the active where it is needed most, delivering prolonged protection while reducing exposure to high concentrations that may contribute to irritation.

3. BKC Reservoir Matrix
The internal reservoir acts as a depot of active Benzalkonium Chloride, releasing BKC gradually over time rather than delivering the entire dose immediately after application.
This controlled-release mechanism helps maintain effective antimicrobial concentrations for extended periods, improving active utilization efficiency and supporting longer-lasting antimicrobial performance.

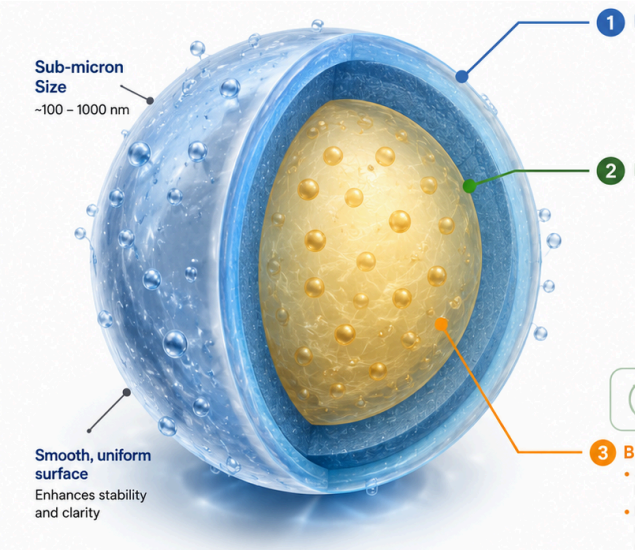


Figure 1:Illustration of HydroSal® Youth. where the BKC is encapsulated in the core or the submicron sphere.

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How HydroSal® Enhances the Efficacy of BKC

1. Sustained Release Extends Antimicrobial Activity
Conventional BKC is immediately available upon application, resulting in a high initial concentration that is rapidly depleted.

HydroSal® BKC provides a controlled-release profile that maintains effective antimicrobial concentrations for longer, extending protection after application.

2. Improved Surface Retention
Encapsulation improves the deposition and retention of BKC on skin and surfaces, reducing loss from evaporation, rinsing, or transfer.
This allows more of the active ingredient to remain where protection is needed.

3. Reduced Binding and Deactivation

Free BKC can bind to proteins, organic matter, and formulation ingredients, reducing the amount of active antimicrobial available.
Encapsulation protects a portion of the BKC until release, improving utilization efficiency and preserving activity.

4. Reduced Irritation Potential

Traditional BKC formulations expose the skin to the full concentration immediately upon application, which may contribute to irritation during repeated use.
Controlled release lowers the peak exposure concentration while maintaining efficacy, improving skin compatibility and making HydroSal® BKC suitable for leave-on applications.

5. Improved Stability

The encapsulation system protects BKC from environmental stresses and formulation incompatibilities, helping to maintain performance throughout the product's shelf life.

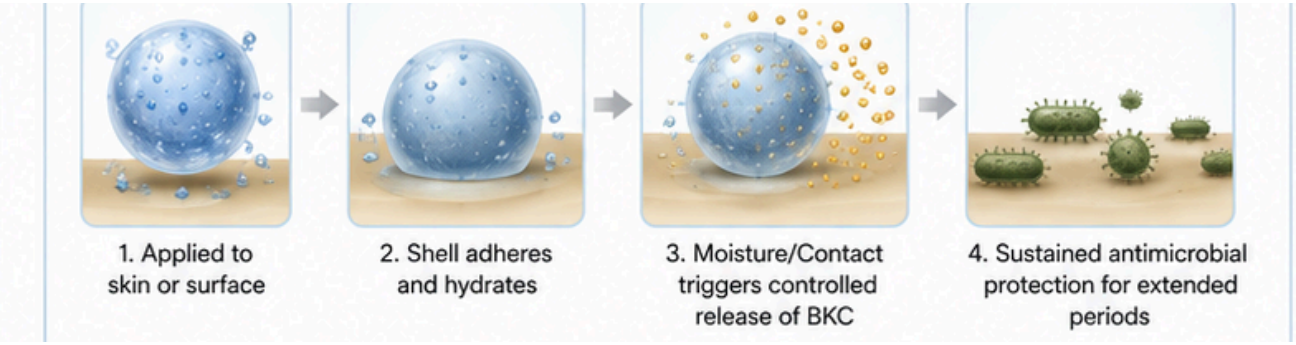


Figure 2:Illustration of the mechanism of adhesion and release.

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Product Overview - 7019-01

HydroSal® BKC (Benzalkonium Chloride)

Smart Antimicrobial Protection That Reactivates With Water™

Mechanism of Action

HydroSal™ BKC delivers immediate antimicrobial protection upon application by rapidly releasing a portion of the available Benzalkonium Chloride, providing instant activity against microorganisms.

As the formulation dries, the HydroSal™ polymeric shell forms a protective matrix on the treated surface, retaining a reservoir of encapsulated BKC within the deposited film.

When the surface is later exposed to moisture—such as water, perspiration, humidity, or repeated contact—the protective shell becomes hydrated and releases additional BKC from its internal reservoir. This moisture-triggered release replenishes the active antimicrobial agent and renews protection precisely when conditions become favorable for microbial growth.

The result is a smart antimicrobial delivery system that provides:

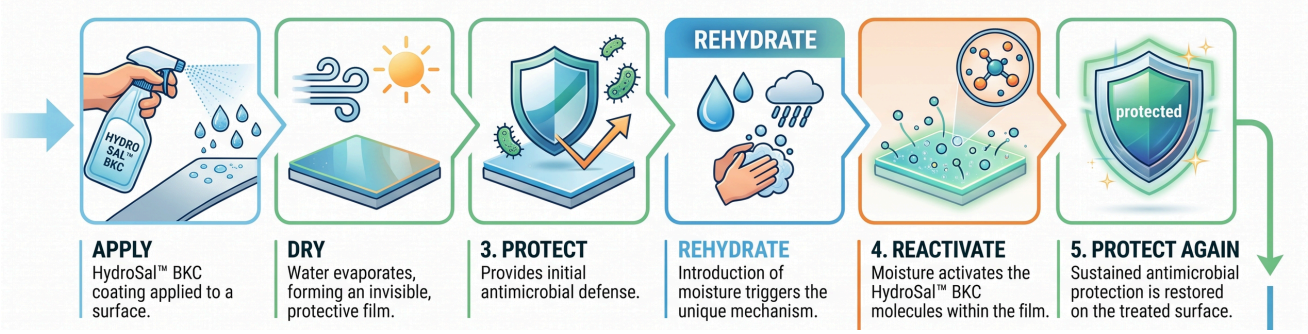
- Immediate antimicrobial action upon application
- On-demand reactivation in the presence of moisture
- Sustained release of fresh antimicrobial agent over time
- Long-lasting protection beyond conventional antiseptic systems
- Improved active utilization and reduced waste

HydroSal™ BKC transforms conventional Benzalkonium Chloride from a single-use disinfectant into a responsive antimicrobial platform that protects when dry, reactivates when wet, and continues working long after application.

Simple Mechanism

Apply → Dry → Protect → Rehydrate → Reactivate → Protect Again

This unique moisture-triggered reactivation mechanism makes HydroSal™ BKC particularly valuable in environments with alternating wet and dry conditions, such as skin, hands, hard surfaces, textiles, and high-touch areas—where microorganisms are most likely to proliferate. Valuable in environments with alternating wet and dry conditions—such as skin, hands, hard surfaces, textiles, and high-touch areas—where microorganisms are most likely to proliferate.



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HydroSal® BKC (Benzalkonium Chloride)

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Clinical Evaluation of HydroSal™ BKC
Skin Retention and Persistence Study

Objective

To compare the residual level, skin retention, and persistence of Benzalkonium Chloride (BKC) following application of HydroSal™ BKC versus an equivalent conventional, non-encapsulated BKC formulation.

The study is designed to determine whether the HydroSal™ delivery system improves the deposition and retention of BKC on the skin and maintains measurable levels of the active ingredient for a longer period after application.

Study Rationale

Conventional BKC is immediately available after application but may be rapidly removed, diluted, transferred, or depleted from the skin surface. HydroSal™ BKC is designed to deposit a polymeric reservoir on the skin, retain a portion of the active ingredient within the protective matrix, and gradually release BKC over time.

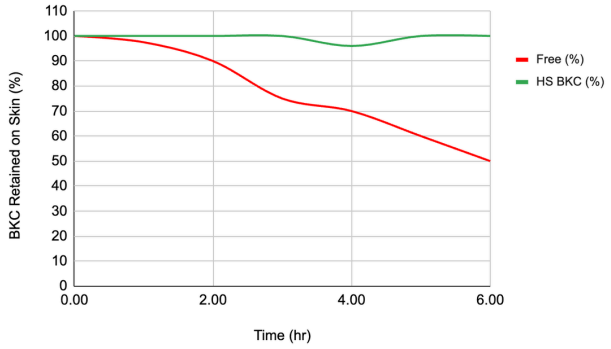
Methodology

A controlled, randomized, split-arm clinical study was conducted using eight healthy adult volunteers (n = 8) to compare the skin retention and persistence of Benzalkonium Chloride (BKC) delivered through HydroSal™ BKC versus a conventional non-encapsulated BKC formulation. Each subject received:

- Test Lotion: containing HydroSal™ BKC (encapsulated BKC) applied to one forearm.
- Control Lotion: containing an equivalent concentration of free Benzalkonium Chloride applied to the opposite forearm.

The assignment of treatment sites was randomized to minimize site-related variability. Following application and drying, skin samples were collected at 0, 1, 3, and 6 hours post-application to evaluate residual BKC levels on the skin surface.

Residual Benzalkonium Chloride was recovered using a standardized skin extraction procedure and quantified using High-Performance Liquid Chromatography (HPLC) with a validated analytical method capable of measuring the relevant BKC homologs.



Residual skin levels of Benzalkonium Chloride following application of HydroSal™ BKC and conventional free BKC formulations, measured by HPLC over 6 hours.

Results were expressed as:

- Residual BKC concentration on the skin surface
- Percentage of the initial applied dose remaining over time

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Results:

HydroSal™ technology significantly enhances the deposition and retention of Benzalkonium Chloride (BKC) on the skin, even in rinse-off applications such as body washes.

HPLC analysis demonstrated that a body wash formulated with HydroSal™ BKC retained more than 50% higher BKC levels on the skin than a commercial body wash containing an equivalent concentration of free (non-encapsulated) BKC.

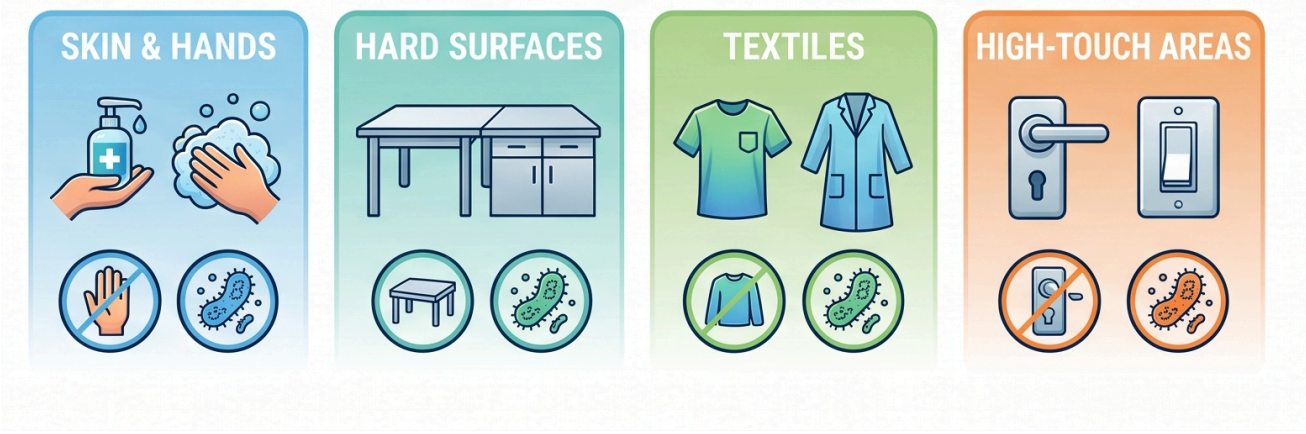
In addition, the encapsulated BKC maintained higher residual concentrations on the skin over time, supporting sustained availability of the active ingredient after application. In contrast, free BKC exhibited a rapid decline in residual skin levels following use, potentially reducing the duration of antimicrobial protection.

These findings suggest that HydroSal™ technology improves the utilization efficiency of BKC by increasing skin deposition, reducing active loss, and maintaining a reservoir of antimicrobial agent available for prolonged protection.

Key Benefits

1. More than 50% higher BKC retention on the skin
2. Enhanced deposition, even in rinse-off applications
3. Improved active utilization efficiency
4. Longer-lasting antimicrobial availability
5. Potential for extended protection compared with conventional BKC syste

HydroSal™ BKC may help transform wash-off antimicrobial systems into long-lasting protection platforms that continue working long after rinsing.



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HydroSal® BKC (Benzalkonium Chloride)

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INCI:

Benzalkonium Chloride, Polyvinyl Alcohol, Alcohol denat., Sodium Acetate, Ethylhexylglycerin, Methyl Acetate, Methyl Alcohol, Water (Aqua/Eau),

Regulatory Note

- Complies with U.S. FDA, EU Cosmetic Regulation (EC) No. 1223/2009, and China IECIC listings for topical and hygiene applications when used within approved limits.
- Free of alcohol, parabens, and formaldehyde donors.

Parameter	Specification	Method / Notes
Appearance	Translucent liquid dispersion	Visual
Odor	,	Organoleptic
pH (25 °C)	5.0 – 7.0	pH meter
Active Content (BKC)	8 – 12 % w/w	
Solids Content	20 – 30 %	Gravimetric
Viscosity (25 °C)	200 – 800 cP	Brookfield LV, Spindle #2
Particle Size (D50)	1 – 10.0 µm	Laser Diffraction
Density (25 °C)	1.02 – 1.06 g/mL	ASTM D891



HydroSal® BKC. A, in the concentrated solution and B, the diluted version.



HydroSal® BKC (Benzalkonium Chloride)

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Shelf life: 24 months. Store in a sealed container, RT.
Store tightly closed at 15 – 25 °C; protect from freezing.

Applications

- Hand sanitizers (non-alcoholic / hybrid)
- Hygiene sprays, wipes, lotions
- Deodorant and foot-care products
- Hair/scalp purifiers and post-cleansing rinses
- Household and surface hygiene formulation.

Regulatory Considerations

Claims such as "kills bacteria," "antiviral," "antibacterial," "disinfects," or specific kill times typically fall under antimicrobial or biocidal regulations and may require registration, efficacy testing, and approval depending on the country and application.

For cosmetic or personal care products, safer positioning often includes:

- Helps maintain skin hygiene
- Supports a clean skin environment
- Provides long-lasting freshness
- Helps reduce odor-causing microorganisms
- Supports skin cleanliness between washes

Products Where HydroSal™ BKC Creates the Most Value

- Acne facial washes — antimicrobial protection that continues after rinsing.
- Body washes — long-lasting freshness and odor control.
- Alcohol-free hand sanitizers — prolonged protection without dryness.
- Whole-body deodorants — control odor-causing microorganisms.
- Scalp products — support scalp hygiene and freshness.
- Foot care products — prolonged odor protection.
- Protective hand creams — ideal for healthcare workers and frequent handwashing.

Strong Marketing Concepts

- Works long after rinsing
- Protection that wakes up with water
- Protects when dry. Reactivates when wet.
- The antimicrobial that keeps coming back to work
- Fresh protection, activated by life

Claims depend on local regulations and supporting efficacy data.

The strongest differentiating claim for HydroSal™ BKC is likely:
"Works long after rinsing™"
paired with:
"Protection that stays dry, wakes up with water, and keeps working when you need it most."

HydroSal® BKC (Benzalkonium Chloride)

Smart Antimicrobial Protection That Reactivates With Water™

Marketing claims

Facial Cleansers and Acne Washes
- Acne-prone skin cleansers
- Clarifying face washes
- Oil-control cleansers
- Post-treatment cleansers

Potential claims:
- Works long after rinsing
- Supports a cleaner skin environment
- Long-lasting freshness
- Helps maintain skin hygiene

Body Washes
- Daily hygiene body washes
- Sports body cleansers
- Men's body washes
- Whole-body deodorant washes

Potential claims:
- Long-lasting freshness beyond the shower
- Wash-off cleansing with leave-behind protection
- Odor control support

Hand Washes
- Frequent-use hand cleansers
- Workplace hygiene washes
- Healthcare hand washes

Potential claims:
- Protection between washes*
- Residual freshness after washing

Cleansing Wipes
- Facial cleansing wipes
- Gym wipes
- Travel wipes
- Refresh wipes

Hand Sanitizers
- Alcohol-free sanitizers
- Moisturizing sanitizers
- Sensitive skin sanitizers

Protective Lotions and Creams
- Barrier creams
- Healthcare worker hand creams
- Protective hand lotions

Foot Care
- Foot creams
- Athlete's foot support products
- Foot sprays
- Foot deodorants

Whole Body Deodorants
- Underarm products
- Full-body deodorants
- Intimate freshness products

Scalp Hygiene Products
- Anti-dandruff shampoos
- Scalp cleansers
- Scalp sprays
- Post-workout scalp refreshers

Hair Care
- Protective hair mists
- Hair refresh sprays
- Helmet hair refresh products

Oral Care
- Mouth rinses
- Breath freshening products
- Oral hygiene sprays
- Denture cleaning products

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Antiseptic / Protective Hand Lotion with HydroSal® BKC + HydroSal® AquaSkin		
Type: Leave-on, lightweight moisturizing antiseptic lotion Target pH: 5.5–6.0		
Phase A (Water Phase)		
Ingredient	Weight (%)	Function
DI Water	Q.S.	Solvent
Glycerin	3.0	Humectant
HydroSal® Aqua Skin	5.0	Moisturizing
Xanthan Gum	0.20	Thickener
Hydroxyethyl Cellulose	0.40	Thickener
Phase B (Oil)		
Caprylic/Capric Triglyceride	4.0	Emollient
Cetearyl Alcohol	2.0	Thickener, Stabilizer
Glyceryl Stearate	2.0	Emulsifier
Glycolipids	1.0	Emulsifier
Dimethicone (350cSt)	0.50	Skin Protectant
Phase C (Cool Down Phase)		
HydroSal® BKC	2.0	AntiMicrobial System
Tocopherol Acetate (Vitamin E)	0.30	Antioxidant
Fragrance (Optional)	0.10	Sensory
Citric Acid/NaOH	Q.S.	pH balance

Procedure

1.Disperse Xanthan, HEC in water; mix until uniform.
2. Add Glycerin and HydroSal® AquaSkin under moderate agitation.
3. Heat Phase A and Phase B separately to ~75 °C.
4. Slowly add Phase B into A while homogenizing (medium shear).
5. Cool to below 40 °C while stirring.
6. Add Phase C ingredients in sequence, mixing gently.
7. Adjust pH to 5.5–6.0

Hard-Surface Antiseptic Spray with HydroSal® BKC + HydroSal® MOC (Malodor Control).		
Type: Ready-to-use antimicrobial & deodorizing surface spray Target pH: 6.0 – 7.0		
Ingredient	**Weight (%)**	**Function**
DI Water	Q.S.	Solvent
HydroSal® BKC	2.0	Antimicrobial
HydroSal® Malodor Control	1.5	Malodor Control
Glycerin	0.50	Wetting Aid, Prevents Streaking
Nonionic Surfactant	0.50	Spreading/Cleaning Aid
Fragrance (Optional)	0.10	Sensory
Citric Acid/NaOH	Q.S.	pH balance

Procedure
1) Add HydroSal® BKC to deionized water and stir gently.
2) Add HydroSal® MOC, mix until uniform.
3) Add surfactant and glycol, then fragrance (if used).
4)Adjust pH to 6 – 7
5) Filter (100 µm) and fill into trigger-spray bottles.

Performance Features

- Broad-spectrum antimicrobial action (bacteria, fungi, viruses).
- Odor elimination via controlled release of HS MOC actives.
- Non-alcoholic, non-flammable, and residue-free.

HydroSal® BKC

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Peer-reviewed references related to the efficacy and use of Benzalkonium Chloride (BKC) for topical/skin applications

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