

Evaluation of Hand Skin Condition in Two 5-Day Surgical Scrub/Hand Washing Studies Comparing a New Waterless/Brushless, Chlorhexidine Gluconate/Ethanol-Emollient Antiseptic Hand Preparation and Hibiclens[®]

by

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Abstract

Two randomized, blinded, bilateral comparison studies evaluated skin condition using two antiseptic hand preparation products during 5 days of controlled washing. Trained technicians applied treatments 6 times (scrub study) or 24 times (hand wash study) daily for 5 days to hands of healthy volunteers. Test products were a CHG (chlorhexidine gluconate)/ethanol antiseptic hand preparation in a unique emollient system, for waterless/brushless application; and Hibiclens® (Zeneca) applied with a brush (scrub study) and without a brush (handwash study). An Expert Grader evaluated skin for dryness, erythema, and roughness. Subjects completed a self-assessment questionnaire. Transepidermal water loss (TEWL) was measured by an evaporimeter and an electrical conductance meter was used to measure skin surface hydration levels. Overall, 58 subjects were enrolled. With the exception of 2 subjects (1 discontinued treatment) who reported irritation on the Hibiclens-treated hands, treatments were generally well tolerated. In general, skin treated with the CHG/ethanol-emollient hand preparation scored significantly ($p < 0.004$) better on evaluations of dryness and erythema, showed greater improvement in electrical conductance ($p < 0.003$), and, in the handwash study, demonstrated less moisture loss (TEWL) than skin treated with Hibiclens ($p < 0.002$). Subject assessments showed similar results. In conclusion, the CHG/ethanol-emollient hand preparation was gentler to skin, preventing dry, cracked hands and erythema, thereby helping to maintain the integrity of the stratum corneum.

Introduction

This poster describes the results of two studies designed to determine the effect on hand skin condition of a new waterless/scrubless chlorhexidine (1% CHG)/ethanol(61%)-emollient preparation (CHG/ethanol-emollient hand preparation). In these studies, CHG/ethanol-emollient hand preparation is compared with Hibiclens® (Stuart Pharmaceuticals, Wilmington, DE), a currently marketed presurgical antimicrobial hand-wash product containing 4% CHG in a detergent base.

Objectives

- To assess hand skin condition after multiple applications of the CHG/ethanol-emollient hand preparation as a surgical hand scrub in comparison with that of a marketed reference product.
- To assess hand skin condition after multiple applications of the CHG/ethanol-emollient hand preparation as a healthcare personnel hand wash compared with that of a marketed reference product.

Methods

Study Design

Two prospective, randomized, partially-blinded, bilateral comparison trials.

Treatments

All subjects received:

- A 3-day pretreatment washout period during which subjects used only Ivory® soap for handwashing.
- A 5-day treatment and evaluation period during which trained technicians administered the following treatments:

Study A: Surgical Scrub

- One hand and forearm received a 3 mL application of the CHG/ethanol-emollient hand preparation applied 6 times daily for 5 days, and
- The other hand and forearm received a 5 mL application of Hibiclens and was scrubbed for 3 minutes with a brush and water, 6 times daily for 5 days.

Study B: Healthcare Personnel Handwashing

- One hand received a 1 mL application of the CHG/ethanol-emollient hand preparation applied 24 times daily for 5 days, and
- The other hand received 2.5 mL of Hibiclens and was washed for 30 seconds with water, 24 times daily for 5 days.

Evaluation criteria

Skin Condition—Assessed at baseline and at various time points during the study.

Expert Grader's Assessment:

- Visual Scoring of Skin Condition (VSS)
 - 0 - Normal; no observable scale or irritation.
 - 1 - Very slightly scaly; occasional scale.
 - 2 - Slightly scaly; scale in sulci and on plateaus; scale more uniformly distributed but with no widespread uplifting.
 - 3 - Scaly; visible scale with whitish appearance of skin; uplifting of edges or scale sections; hand rough to touch.
 - 4 - Scaly to very scaly; more scale and separation of scale edges from skin; some evidence of cracking in sulci and on plateaus; skin may appear irritated with some reddening.
 - 5 - Very scaly; extensive cracking of skin surface; scales may be large; skin may appear very irritated with reddening and/or bleeding.
- Erythema Grading (On a 5-point scale, 0-4, where Grade 0 equaled no observable redness; Grade 4 equaled severe erythema covering >25% of the back of the hand; possibly with intense color, edema, or cracking).

- Tactile Roughness (Study B only) (On a 5-point scale, 0-4, where Grade 0 equaled normal, no observable roughness; Grade 4 equaled extreme roughness of the skin).
- Hand Skin Assessment (HSA)—Grader assessed appearance, intactness, and moisture content.

Subject Assessments (HSA)

Subjects scored hand skin condition on a scale of 1 to 7 in four dimensions. Possible range of total scores was 4 to 28 where 28 indicated totally healthy hands.

- **Appearance:** 1=Abnormal, red, blotchy, rash; 7=Normal, no redness, blotching, rash.
- **Intactness:** 1=Many abrasions or fissures; 7=Completely intact, no abrasions or fissures.
- **Moisture Content:** 1=Extremely dry; 7=Normal amount of moisture.
- **Sensation:** 1=Extreme itching, burning or soreness; 7=No itching, burning, or soreness.

Skin Conductance

The Skin Surface Hydrometer (Skicon®-200; IBS, Japan) measures the electrical conductivity (micro ohms) of the stratum corneum.

Transepidermal Water Loss (TEWL)

An evaporimeter measures the amount of water lost through damaged skin, in grams per square meter per hour (g/m²/h).

Safety:

Adverse Events—All observed or reported adverse events were documented for relationship to study product, severity, action taken, and outcome.

Subjects

Healthy, male or female, subjects 18 to 65 years old, having hands with a 0-3 VSS score at baseline.

Statistical Methods

- Skin Condition—Expert Grader and Self-Assessments – Change from baseline was calculated for each hand at each time period, with the primary analysis to be Day 5 change from baseline. A Wilcoxon Signed-Rank test was used to compare the two treatments. Significance was assessed at p≤0.05.
- Conductance Evaluations—Change from baseline was calculated for Conductance on each hand. A paired t-test was used to compare the two treatments. Significance was assessed at p≤0.05.
- TEWL—Change from baseline to Day 5 was used to calculate TEWL for each hand. A paired t-test was used to compare the two treatments. Significance was assessed at p≤0.05.

Results

In Study A, 18 subjects were enrolled and treated; 18 subjects completed the treatment with the CHG/ethanol-emollient hand preparation, and 17 completed the treatment with Hibiclens. One subject was discontinued from the Hibiclens treatment due to Grade 5 irritation on the Hibiclens-treated hand. In Study B, 40 subjects were enrolled, treated, and completed the study. Mean age was 40.5 years in Study A and 42.6 years in Study B.

Table 1

Expert Grader Assessments – Mean Change from Baseline to End of Day 5				
Skin Assessments	Direction of Normal	CHG/ethanol-emollient hand preparation	Hibiclens	P-Value
Study A				
VSS (dryness)	↓	-0.2	1.2	0.0001
Erythema	↓	0.4	1.0	0.0039
HSA Total Score	↑	-0.7	-4.0	0.0023
Study B				
VSS (dryness)	↓	-0.8	1.7	0.0001
Erythema	↓	0.6	1.1	0.0001
Tactile Roughness	↓	0.1	1.1	0.0001
HSA Total Score	↑	0.5	-4.6	0.0001

Subject Self-Assessments – Mean Change from Baseline to End of Day 5				
Skin Assessments	Direction of Normal	CHG/ethanol-emollient hand preparation	Hibiclens	P-Value
Study A				
Appearance	↑	-0.4	-1.2	0.0371
Intactness	↑	-0.5	-0.8	ns
Moisture Content	↑	-0.6	-1.6	0.0111
Sensation	↑	-1.0	-1.8	0.0371
HSA Total Score	↑	-2.5	-5.3	0.0064
Study B				
Appearance	↑	-0.4	-1.5	0.0001
Intactness	↑	-0.3	-0.9	0.0035
Moisture Content	↑	-0.4	-2.4	0.0001
Sensation	↑	-0.2	-1.1	0.0003
HSA Total Score	↑	-1.2	-5.9	0.0001

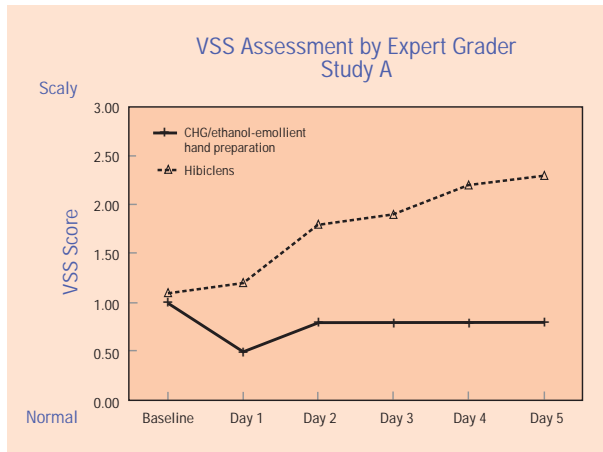
Instrumentation – Mean Change from Baseline				
Skin Assessments	Direction of Normal	CHG/ethanol-emollient hand preparation	Hibiclens	P-Value
Study A				
Conductance (μS)	↑	58.5	11.6	0.0006
TEWL (g/m ² /hr)	↓	4.1	5.0	ns
Study B				
Conductance (μS)	↑	10.5	-5.6	0.0025
TEWL (g/m ² /hr)	↓	2.7	4.0	0.0017

Study A:

- Hands treated with the CHG/ethanol-emollient hand preparation scored significantly better (p<0.004) than hands treated with Hibiclens in Expert Grader VSS and Erythema Assessments when scores for “change from baseline to the end of Day 5” were compared.
- Expert Grader HSA scores for change from baseline to the end of Day 5 for appearance, intactness, moisture content, and total score were also significantly better (p<0.05) for the CHG/ethanol-emollient hand preparation-treated hands compared with Hibiclens.
- Similarly, Subject Self-Assessments of HSA scores for change from baseline to the end of Day 5 for appearance, moisture content, sensation and total score were also significantly better (p<0.04) for the CHG/ethanol-emollient hand preparation-treated hands compared with Hibiclens. Intactness did not differ significantly (p=0.25).
- Skin Conductance scores were measured from Day 1 baseline to the end of Day 1. The conductance score for the CHG/ethanol-emollient hand preparation group increased 58.5 micro ohms, while Hibiclens increased 11.6 micro ohms. There was a statistically significant (p=0.0006) improvement in skin conductance with the CHG/ethanol-emollient hand preparation compared with Hibiclens.

- TEWL—The difference between treatments for changes from Day 1 baseline to the end of Day 5 were not statistically significant ($p=0.1971$).

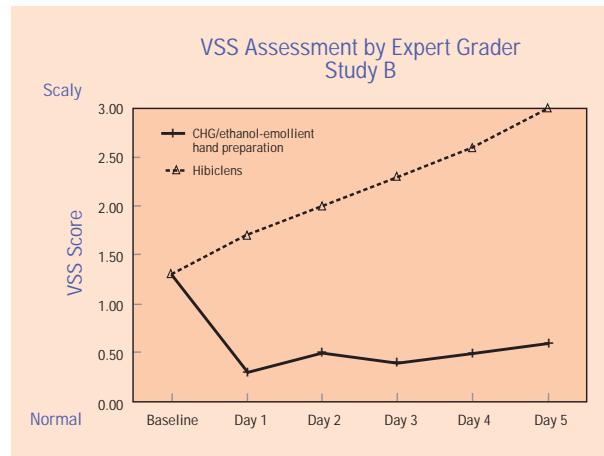
Figure 1



Study B:

- Hands treated with the CHG/ethanol-emollient hand preparation scored significantly better ($p\leq 0.0001$) than hands treated with Hibiclens in Expert Grader VSS, Erythema Assessment, and Tactile Roughness Assessment when scores for change from Day 1 baseline to the end of Day 5 were compared.
- Expert Grader HSA scores for changes from baseline to the end of Day 5 for appearance, intactness, moisture content, and total score were also significantly better ($p\leq 0.0001$) for the CHG/ethanol-emollient hand preparation-treated hands compared with Hibiclens.
- Similarly, Subject Self-Assessments of HSA scores for changes from baseline to the end of Day 5 for appearance, moisture content, intactness, sensation and total score were also significantly better ($p\leq 0.004$) for the CHG/ethanol-emollient hand preparation-treated hands compared with Hibiclens.
- Skin Conductance scores were measured from Day 1 baseline to the end of Day 1. The conductance score for the CHG/ethanol-emollient hand preparation increased 10.5 micro ohms, while Hibiclens decreased -5.6 micro ohms. There was a statistically significant ($p=0.0025$) improvement in skin conductance with the CHG/ethanol-emollient hand preparation compared with Hibiclens.
- TEWL—Scores were measured from Day 1 baseline to the end of Day 5. The TEWL score for the CHG/ethanol-emollient hand preparation increased 2.7 gm^2/hr , while Hibiclens increased 4.0 gm^2/hr . There was a statistically significant ($p=0.0017$) difference with Hibiclens resulting in more transepidermal water loss during the study than the CHG/ethanol-emollient hand preparation.

Figure 2



Safety

- One adverse event was reported during Study A: A grade 5 irritation on the VSS score for the Hibiclens-treated hand at Day 4 after application 2 was considered mild and probably related to the study. This subject's hand was discontinued from the study. Irritation resolved without treatment after 2 days.
- One adverse event was reported during Study B: A grade 5 irritation on the VSS score for the Hibiclens-treated hand at the final assessment was considered mild, probably related to the study, and resolved after 2 days of treatment with Vaseline®.

Conclusions

- The CHG/ethanol-emollient hand preparation produced scores for skin condition consistent with more favorable changes from baseline (towards normalcy of skin condition) than were observed with Hibiclens.
- The CHG/ethanol-emollient hand preparation was less drying and more gentle to the skin than Hibiclens.
- The CHG/ethanol-emollient hand preparation helped prevent dry cracked skin and erythema, and helped maintain the integrity of the stratum corneum.
- The CHG/ethanol-emollient hand preparation was associated with statistically significantly better skin condition scores for appearance, intactness, moisture content, and sensation than Hibiclens.
- The CHG/ethanol-emollient hand preparation was well tolerated in both studies.



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