



Effective and Moisturizing Hand Hygiene

WASH, SANITIZE & MOISTURIZE

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This clinical study compares two product regimens for both antimicrobial efficacy (Phase 1) and skin moisturization (Phase 2). Regimen 1 was a three-part regimen consisting of a handwash formula [0.13% BZK (Benzalkonium Chloride)], a hand sanitizing formula (70 % v/v ethyl alcohol), and an antimicrobial moisturizing lotion (0.20% Benzethonium Chloride). Regimen 2 was a two-part regimen consisting of the same handwash formula and hand sanitizing formula used in Regimen 1 without the antimicrobial moisturizing lotion.

Methods

Phase 1 Testing – Antimicrobial Efficacy

Subjects were randomized to both configurations. The hands of nine subjects were tested per Regimen 1, and eight subjects per Regimen 2, over the course of 20 product application cycles, with microbial contamination occurring prior to the wash cycles for baseline and after product application cycles 1, 5, 10, 15 and 20. Samples were taken using the Glove Juice Sampling Procedure. The microorganism used was *S. marcescens*.

Phase 2 Testing – Skin Moisturization

Following a 48-hour conditioning period, randomization took place over the twenty total subjects, divided into two groups of ten subjects, for testing the two regimens, performing twenty product application cycles with the moisturization readings taken at baseline and after product applications 1, 5, 10, 15 and 20 using the Corneometer skin probe. For each sample, three Corneometer readings were taken and the values averaged.



Statistical Analysis

Two two-factor Analyses of Variance (ANOVA) models were used to evaluate the data for each of the two product regimens relative to 1) antimicrobial efficacy testing and 2) the skin moisturizing over the five wash times.

Results

Phase 1 Results – Antimicrobial Efficacy

Figure 1 shows the mean values of the Product Regimen 1 was more effective than Product Regimen 2 over the course of 20 handwash cycles. Reductions of the *S. marcescens* were significantly higher for Regimen 1 than for Regimen 2 throughout.

To determine if the three- and two-part evaluations were different, the sample times were pooled in the model. This gave a larger sample size for both products.

Figure 1. Interval Plot of log₁₀ Reduction of *S. marcescens*

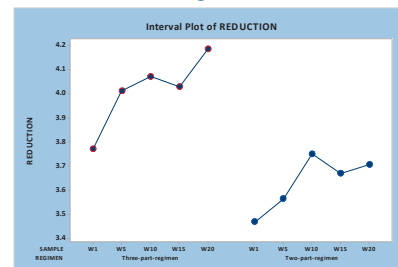


Table 1. Tukey pairwise comparisons: response = adj reading, term = regimen Grouping information using the tukey method and 95% confidence

REGIMEN	N	MEAN	GROUPING
THREE-PART PRODUCT REGIMEN	88	4.01275	A
TWO-PART PRODUCT REGIMEN	78	3.63216	B

Means that do not share a letter are significantly different.

Table 2. Tukey simultaneous tests for differences of means

Difference of regimen	difference of means	se of difference	simultaneous 95% ci	t-value	adjusted p-value	significance
Two-part product regimen – Three-part product regimen	-0.3806	0.0569	(-0.4930, -0.2681)	-6.69	0.000	significant

There were more reductions with the three-part regimen than the two-part regimen.

Descriptive statistics

This presents the sample size (n), means (\bar{x}), standard deviations, and other data manipulation table 6.

Table 3. Descriptive statistics Results For Regimen 1 (Handwash/sanitizer)

VARIABLE	SAMPLE	N	N*	MEAN	STDEV	MINIMUM	MAXIMUM
REDUCTION	1	18	0	3.7703	0.2826	3.0784	4.3317
	2	18	0	4.0106	0.4033	3.3534	4.7140
	3	18	0	4.0704	0.3669	3.6181	4.9445
	4	18	0	4.0282	0.3647	3.5904	4.8462
	5	16	2	4.1842	0.3505	3.6990	4.8653

Results For Regimen 2 (Handwash/sanitizer)

VARIABLE	SAMPLE	N	N*	MEAN	STDEV	MINIMUM	MAXIMUM
REDUCTION	1	16	0	3.4701	0.3523	3.0418	4.0783
	2	15	1	3.5659	0.3373	3.0593	4.0948
	3	16	0	3.7492	0.3757	3.2682	4.7282
	4	16	0	3.670	0.444	3.023	4.499
	5	15	1	3.7056	0.3613	2.9324	4.3923

Caused an increase in reductions by the three-part regimen over the two-part regimen at every wash. This was confirmed by a tukey test at $\alpha = 0.05$.

Phase 2 results – skin moisturization

Figure 2 shows that regimen 1 had significantly greater moisturizing effects compared to regimen 2. The addition of the antimicrobial lotion resulted in a larger mean change from baseline indicating larger moisturizing effects on the skin.

To simplify the results, the three-part product regimens was compared to the two-part product regimen by pooling the sample times. A Tukey comparison model was then applied to the data.

Figure 2. Interval plot of Moisturization

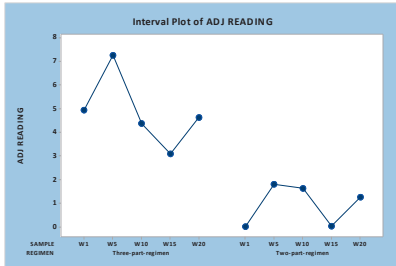


Table 4. Tukey Pairwise Comparisons: Response = Adj Reading, Term = Regimen Grouping Information Using the Tukey Method and 95% Confidence

REGIMEN	N	MEAN	GROUPING
THREE-PART PRODUCT REGIMEN	100	4.85067	A
TWO-PART PRODUCT REGIMEN	100	0.94067	B

Means that do not share a letter are significantly different.

Table 5. Tukey Simultaneous Tests for Differences of Means

Difference of regimen	difference of means	se of difference	simultaneous 95% ci	t-value	adjusted p-value	significance
Two-part product regimen – Three-part product regimen	-3.910	0.850	(-5.588, -2.232)	-4.60	0.000	significant

The product regimens were significantly different. Regimen 1 ($\bar{x} = 4.85$) was more moisturizing than Regimen 2 ($\bar{x} = 0.94$), as a result of the addition of the antimicrobial lotion to the product regimen.

Descriptive Statistics

For the specifics, the sample size (n), means (\bar{x}), standard deviations, and other data are presented in Table 6.

Table 6. Descriptive Statistics

Results for Product Regimen 1

Variable	Sample	N	N*	Mean	StDev	Minimum	Maximum
Adj Reading	Wash 1	20	0	4.92	4.72	-5.03	15.83
	Wash 5	20	0	7.25	5.49	-1.83	16.30
	Wash 10	20	0	4.37	6.69	-6.13	14.40
	Wash 15	20	0	3.09	6.29	-6.80	19.20
	Wash 20	20	0	4.62	6.72	-7.67	19.57

Results for Product Regimen 2

Variable	Sample	N	N*	Mean	StDev	Minimum	Maximum
Adj Reading	Wash 1	20	0	0.01	5.31	-10.00	7.07
	Wash 5	20	0	1.80	4.88	-7.27	9.00
	Wash 10	20	0	1.63	7.04	-14.40	13.17
	Wash 15	20	0	0.03	6.61	-10.93	11.33
	Wash 20	20	0	1.24	5.86	-11.13	8.53

The three-part product regimen was significantly more moisturizing to the hands than the two-part product regimen. They were statistically different when using the Tukey's test at $\alpha=0.05$.

Conclusion/Scientific Worth

The three-part product regimen produced more statistically significant antimicrobial reductions than the two-part product regimen. It also produced statistically significantly more moisture to the skin than the two-part system.

- Phase 1 data shows the mean values of the Product Regimen 1 is significantly more effective than Product Regimen 2 over the course of five handwash cycles. In fact, the reductions of the *S. marcescens* were significantly higher, through the whole course of the wash.
- Phase 2 data shows that Regimen 1 had greater change from baseline compared to Regimen 2, with Regimen 1 having greater moisturizing effects over the course of the consecutive wash cycles. Analysis of the data collected in this study indicate increased antimicrobial activity and skin moisturization benefits with the addition of the antimicrobial moisturizing lotion to a standard, two-part hand hygiene regimen. The added benefit of moisturization without compromising antimicrobial efficacy could result in increased adherence to hand hygiene programs, especially where multiple washes per shift are required.

References

A Two Phase Non-GLP Evaluation of the Antimicrobial Efficacy and Moisturizing Effects of a Three Part Regimen Compared to a Two Part Regimen BioScience Laboratories, Inc, Study #1603144-150, May 17, 2016; Products utilized in study Germ-X® Antibacterial Hand Soap Benzalkonium chloride 0.13%, Germ-X® Advanced Hand Sanitizer Ethyl alcohol 70% and Germ-X® Moisturizing Hand Sanitizer Lotion Benzethonium chloride 0.2%



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