### INTRODUCTION

Healthcare-associated infections (HAIs), caused by a wide variety of common and unusual bacteria, fungi, and viruses during the course of receiving medical care, impose significant economic consequences on the healthcare system in the USA. Healthcare facilities are facing increasing pressures to minimize the total cost of infection and are highly committed to finding solutions including the use of antimicrobial dressings in wound management protocols.

Covalon Technologies has utilized an advanced technology to integrate two gold standard antimicrobial agents (chlorhexidine and silver) into a soft and hypoallergenic silicone adhesive, which is then coated on a breathable and transparent polyurethane film (SurgiClear™). The patented technology maintains the transparency of the dressing for up to seven days allowing continuous visual observation and preventing unnecessary dressing removal. The breathable dressing ensures optimal oxygen and moisture transport to skin maceration and leads to greater patient comfort. The dressing may be used to cover compromised skin and other primary dressings (Figure 1), while permitting patients to bathe and shower without saturating the dressing, and requires less frequent changes than standard gauze dressings.

The objective of this poster is to present the results of safety and efficacy evaluations of SurgiClear dressings. The safe use of SurgiClear was confirmed in a porcine partial thickness wound healing study and a Human Repeat Insult Patch Test (HRPT) using healthy human volunteers. In particular, the rate of wound closure was examined in the porcine study, while the study involving human volunteers evaluated the sensitization and irritation potential of SurgiClear in conjunction with an assessment of the level of pain experienced during dressing removal. The sustained antimicrobial performance of SurgiClear was assessed through a 7-day in-vitro time-kill study in combination with a 7-day human regrowth prevention study and an analysis of the level of bioburden in porcine partial thickness wounds.

### TEST METHODS

#### Partial Thickness Dermal Wound Model in Swine

A total of three Yucalan Miniature swine were used in the study conducted by NAMSA (Northwood, OH). The animals were within an acceptable weight range and the condition of their skin was suitable for the creation of four wounds measuring approximately 50 mm x 42 mm ± 1.0 mm on each side of the spine using a dermatome. Review and approval by the NAMSA Institutional Animal Care and Use Committee (IACUC) were obtained prior to conduct of the study. Dressing treatments consisted of SurgiClear, Tegaderm (acrylic film), and Telfa pads (gauze). Two samples of each treatment were applied per animal giving an overall total of six dressings per treatment. Dressings were changed every other day and wounds were photographed, assessed visually, (i.e., the area in mm² of each wound that was not epithelialized and the length and width using a steel ruler), imaged and re-dressed with the same test material until Day 10 (termination). On Day 9 prior to wound harvest the animals were incepted to determine the effects of SurgiClear treatment with subsequent harvest of the wound on each selected interval. It was determined that at least two-thirds of the wounds were fully healed by Day 10 from the extent and rate of wound healing.

#### Human Repeat Insult Patch Test and Regrowth Prevention Study

The patch test used to evaluate the potential of contact sensitization was a single-centered, blinded, and within-subject randomized trial conducted at Mt. Top Research (MTR) in Florida involving 244 volunteers, of which, 216 subjects (63 male, 153 female) completed the study. The study was conducted according to standard protocols and consisted of three mandatory phases, i.e. Induction, Rest, and Challenge. Volunteers assessed pain upon removal of patch at visits 4, 7, 10, and 12.

The capacity of dressings to suppress floral regrowth followed continuous patching for one minute with 70% isopropanol alcohol was evaluated in this study, which was a within-subjects randomized design where each subject served as his or her own control by using five test sites per test area (Figure 2). A total of 37 volunteers were enrolled and 34 completed the study. Bacterial skin counts were determined before and after skin prep (baseline) as well as after dressings were left in place for 4 or 7 days. Quantitative skin cultures by the William-Kempf scrubs technique were obtained from one side (by random assignment) after 4 days and the contralateral side after 7 days. Both clinical studies were approved by an external IRB. Healthy adult volunteers known not to be allergic to chlorhexidine and/or silver and without a primary skin disorder were screened before written consent was signed.

#### Statistical Analysis

A Friedman rank sum test was used to analyze the irritation data. The differences in mean log regrowth were compared via a paired student’s t-test. For the evaluation of wound healing rates and bioburden levels, statistical comparisons between treatment groups were conducted using One Way Analysis of Variance followed by Tukey’s test. Differences were considered significant at the 0.05 level.

### RESULTS AND DISCUSSION

#### Partial Thickness Dermal Wound Closure

Significantly lower bioburden was detected in wound sites treated with SurgiClear. The differences were most pronounced on Day 10 when there was a minimum mean reduction of approximately 2.7 log in the total bioburden count on the SurgiClear sites in comparison to both of the control dressing sites (Figure 3).

#### Partial Thickness Dermal Wound Bioburden

Significantly lower bioburden was detected in wound sites treated with SurgiClear. The differences were most pronounced on Day 10 when there was a minimum mean reduction of approximately 2.7 log in the total bioburden count on the SurgiClear sites in comparison to both of the control dressing sites (Figure 3).

#### Antimicrobial Activity – In Vitro Time-Kill Test

The test results demonstrated that SurgiClear dressings can provide effective antimicrobial activity (i.e., 4-log reduction with a 1×10⁹ inoculation) against gram-positive and gram-negative bacteria as well as yeast over 7 days with log reduction values ranging from 4.21 (MRSA) to 6.15 (E. coli).

#### Antimicrobial Activity – In Vivo Time-Kill Test

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#### Human Repeat Insult Patch Test and Regrowth Prevention Study

Interpretation of the data was based on the pattern of reactivity of the patch during Induction compared to the severity and persistence of the reaction(s) observed at Challenge. Under the conditions of this study, there was no evidence of induced contact sensitization for SurgiClear.
A Novel Antimicrobial Clear Silicone Dressing with Chlorhexidine and Silver

Val DiTizio, Ph.D. and Mary Romano, B.Sc., Covalon Technologies Ltd, Mississauga, ON Canada L4Z 3E6

INTRODUCTION

Healthcare-associated infections (HAIs) in hospitals impose significant economic consequences on the healthcare system in the USA. HAIs are caused by a wide variety of microorganisms during hospitalization. Even though antimicrobial agents are used to disinfect the breaches or compromised skin, bacteria remain on the skin and bacterial re-growth will occur over time. Hence, healthcare facilities are facing increasing pressure to minimize the total cost of infection and are highly committed to finding solutions. One of the solutions is to incorporate antimicrobial agents within a dressing to be used as a protective cover on the breached or compromised skin to prevent the entrance of bacteria.

Covalon Technologies has utilized an advanced technology to integrate two gold-standard antimicrobial agents (chlorhexidine and silver) into a soft and hypoallergenic silicone adhesive, which is then coated on a breathable and transparent polyurethane film. The patented technology incorporates the incorporated silver from discoloration and maintains the transparency of the dressing for up to seven days allowing continuous visual observation and preventing unnecessary breaches or compromised skin to prevent the entrance of bacteria.

The objective of this poster is to present the results of a safety and efficacy evaluation of IV Clear dressings.

TEST METHODS

Human Repeat Insect Patch Test

The patch test evaluates the potential induction of contact sensitization by repetitive applications of materials to the skin of healthy human volunteers using the Murphy-King modification of the Draize test. Along with IV Clear, a reference control, i.e., Tegaderm CHG (3M, St. Paul, MN), was used for comparison purposes and was examined separately at the central patch area with the gel pad and the surrounding adhesive portion.

The HRPT was a single-centered, blinded, and within-subject randomized trial conducted at Hill Top Research (HTR) in Florida involving 244 volunteers, of which 216 subjects (63 male, 153 female) completed the study. The study consisted of three mandatory phases, i.e., Induction, Rest, and Challenge. A total of nine induction applications of the test articles spread to the parapinal region over three weeks. Test articles were applied on Mondays, Wednesdays, and Fridays, and worn for 48 hours or 72 hours on Fridays. Pain was recorded at each application every 72 hours up to the final application. Following the induction period, the volunteers had an exposure-free period of approximately two weeks (Rest Phase). During the Challenge Phase, a single 48-hour application of test articles was made to naïve sites for all volunteers. Evaluations were conducted at 30 minutes, 24 hours, and 48 hours post-placement. Additionally, pain upon removal was rated on a scale from 0 (no pain) to 10 (worst possible pain). Volunteers assessed pain upon removal at Study Visits 4, 7, 10, and 12.

Human Repeat Regrowth Prevention Study

The capacity of dressings to suppress floral regrowth following cutaneous prepping for one minute with 70% isopropyl alcohol was evaluated in this study, which was a within-subjects randomized design where each subject served as his or her own control by using the test sites per test area (Figure 2). A total of 37 volunteers were enrolled and 34 completed the study. On study day 1, two skin sites located in the center of the two test areas were sampled for baseline floral counts. Using a randomization schedule, one test area (right or left) was prep'd with 70% isopropyl alcohol for one minute. After the site air dried, an immediate post-prep floral sample was obtained and the test dressings were applied following a randomization schedule. The dressings were left in place for 4 or 7 days.

Quantitative skin cultures by the Williams-Kimpin scrub cap technique were obtained from one side (by random assignment) after 4 days and the contralateral side after 7 days. Two locations on the skin under each dressing were sampled using the scrub technique. The areas sampled for IV Clear were under the center of each dressing and at an area of at least 1.0 cm distance from where the center sample was taken.

TEST METHODS (CONT’D)

The two locations sampled under the Tegaderm CHG dressing were under the center of the dressing (area covered by the hydrogel) and an area underneath the clear mesh tape area. This study was performed at HTR in Florida.

Source of Subjects for Clinical Studies

Both clinical studies were approved by an external IRB. Healthy adult volunteers not known to be allergic to chlorhexidine and/or silver and without a primary skin disorder were screened before written consent was signed.

Antimicrobial Activity Test – Time-Kill Test

A QEP compliant and modified ISO 22196 assay was performed to monitor the antimicrobial activity of dressings over time. The log reductions of microorganisms inoculated onto IV Clear dressings were determined by harvesting representative colonies at 0, 12, 24, 48, and 96 hours. The log reductions were calculated subtracting the average of the common log of the number of viable organisms recovered at a defined contact time from that immediately after inoculation. Eight microorganisms were used in this test, which included Candida albicans. Candida tropicalis, Enterobacter cloacae, Klebsiella pneumoniae, Pseudomonas aeruginosa, Staphylococcus aureus (MRSA), Staphylococcus epidermidis, and Enterococcus faecalis (VRE). IV Clear dressings aged for 13 months at 25°C ± 2°C / 50% ± 5% RH were used in this study. All tests were performed in triplicate.

RESULTS AND DISCUSSION

Human Repeat Insect Patch Test

Sensitization

Interpretation of the data was based on the pattern of reactivity of the vehicle patch during Induction when compared to the severity and persistence of the reaction(s) observed at Challenge. Under the conditions of this study, there was no evidence of induced contact sensitization for IV Clear and Tegaderm CHG scored separately for the central patch area and surrounding tape portion.

Irritation

Analyses of irritation scores during Induction showed that IV Clear produced the least irritation of the test articles. Based on the time the patch was removed, IV Clear produced significantly less irritation (p<0.05) than the surrounding tape portion of Tegaderm CHG at all evaluation and overall. Additionally, sites patched with IV Clear exhibited significantly less irritation (p<0.05) than the center patch area of Tegaderm CHG at all time points (Visits 4 and 7) and overall.

Pain on Removal

Both clinical studies were approved by an external IRB. Healthy adult volunteers not known to be allergic to chlorhexidine and/or silver and without a primary skin disorder were screened before written consent was signed.

CONCLUSIONS

Conclusions

Clinical studies and an in vitro antimicrobial activity test demonstrated that IV Clear offers:

- Powerful antimicrobial activity against diverse microbial species.
- Antimicrobial effect throughout the entire surface area of the dressing providing a larger area of protection.
- Non-Clear and significantly less irritating in cutaneous skin compared to Tegaderm CHG.
- Pain sensation on dressing removal ten times lower than Tegaderm CHG.

REFERENCES


IV Clear is a trademark of Covalon Technologies Ltd, Mississauga, ON, Canada. All other trademarks are the property of their respective owners. IV Clear and Mary Romano are employees of Covalon Technologies.
Log Reduction Results

Note: Reduction of microorganisms relative to initial concentrations.