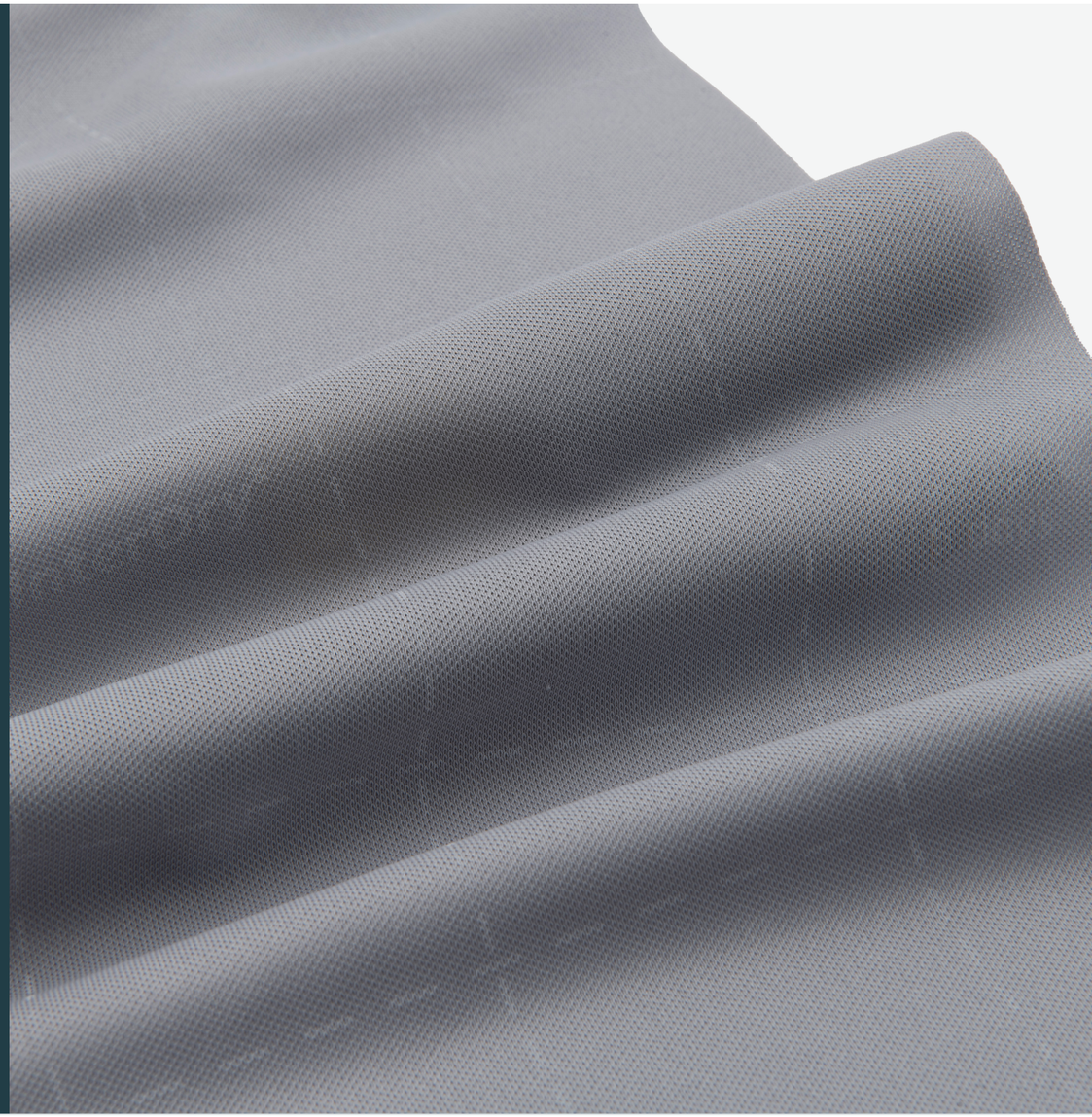
InterDry®

Moisture-wicking fabric
with antimicrobial silver

Evidence summary



Publication index

Clinical outcomes

InterDry® significantly improves patient outcomes within 5 days

User feedback

InterDry improves patient satisfaction and is patient preferred over traditional therapies

Comparative data

InterDry outperforms in all metrics important to skin fold management compared to commonly used absorptive fabrics

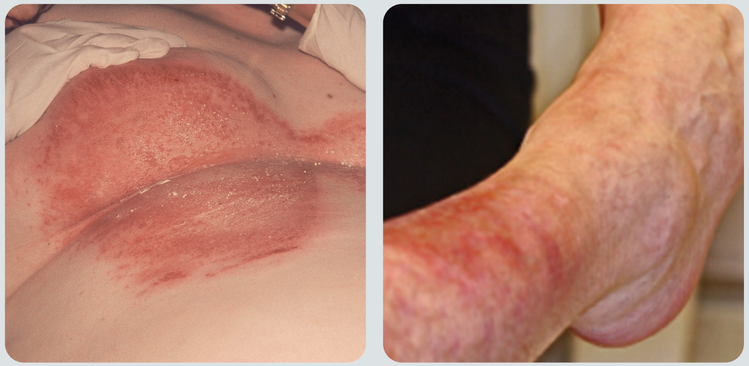
Cost effectiveness

InterDry reduces cost and treatment time compared to antifungal treatment protocols

The challenge

Intertrigo, also known as intertiginous dermatitis, is a common form of moisture-associated skin damage. It occurs as a result of prolonged exposure to perspiration within skin folds and beneath devices. It's estimated there are over 11 million people in North America who suffer from the condition.[1] An aging population and soaring prevalence of obesity has forced healthcare providers to pay increased attention to proper diagnoses and treatment of intertrigo.[2]

Intertrigo affects both patients and healthcare professionals. For patients, it can be painful and, if left untreated, may lead to secondary infection. For healthcare professionals, traditional therapies such as antifungals and linens do not target all the underlying causes of intertrigo, thereby leaving the condition unresolved.[2]



***To resolve intertrigo** it is critical to target all four causes:*

1

Moisture gets trapped within skin folds and beneath devices where air circulation is limited.[2]

2

Overly hydrated stratum corneum does not glide on opposing skin surfaces, leading to **friction damage.**[2]

3

Macerated skin becomes inflamed and denuded providing a breeding ground for **bacteria.**[2]

4

Fungus may develop on macerated, inflamed, denuded skin.[2]

Solution ›

1. Loomis, M. US Incidence and Prevalence of Skin Fold Complications. Coloplast Corp. Internal Analysis, Data on File. January 2017.
2. Sibbald RG, Kelley J, Kennedy-Evans KL, Labrecque C, Waters N. A practical approach to the prevention and management of intertrigo, or moisture-associated skin damage, due to perspiration: expert consensus on best practice. Wound Care Canada - supplement. 2013;11(2):1-21. Accessible at www.woundscanada.ca/docman/public/71-bpr-prevention-management-fall-2013/file.

The solution

InterDry® with FourFold Technology is an innovative moisture-wicking fabric with antimicrobial silver. It is designed to provide complete symptom relief[1] and prevent further skin damage from occurring by simultaneously targeting all four causes of intertrigo: moisture, friction, bacteria and fungus.[1]

InterDry is proven to improve clinical outcomes,[1] increase patient satisfaction,[2] and reduce treatment time and cost compared to traditional ITD therapies.[1]

FourFold Technology™

A proven approach for real relief

1

Wicks and translocates moisture away
from the skin with 100% polyester fabric

2

Reduces friction
with polyurethane coating

3

Fights bacteria
with antimicrobial silver in the fabric

4

Fights fungus
with antimicrobial silver in the fabric

Challenge

1. Kennedy-Evans KL, Viggiano B, Henn T, Smith D. Multi-site feasibility study using a new textile with silver for management of skin conditions located in skin folds. Poster presented at: 20th Annual Symposium on Advanced Wound Care; April 28 - May 1, 2007; Tampa, FL and 39th WOCN® Society Annual Conference; June 9-13, 2007; Salt Lake City, UT.
2. Product Evaluation InterDry Canada 2w016. Doc. No. VV-020577, Version 1.0. 2016.

InterDry significantly improves patient outcomes within 5 days

Multi-site feasibility study using a new textile with silver for management of skin conditions located in skin folds

Karen Lou Kennedy-Evans, RN, FNP, APRN-BC; Barbara Viggiano, RN, WCC; Therese Henn, BSN, RNCS, ANP-BC, GNP-BC; Debra Smith, RN

Presented at the 20th Annual Symposium on Advanced Wound Care, April 2007
Presented at the 39th WOCN® Society Annual Conference, June 2007

Sponsored by Coloplast

Introduction

Intertrigo results from excess moisture and skin-to-skin friction occurring in natural skin folds, such as those found in the groin, abdomen, under breasts, legs, neck, and arms.[1] When intertrigo is left untreated, complications may result such as secondary bacterial or fungal infections.[2,3] Standard treatments consisting of drying agents, barrier creams, topical antifungals, and absorptive materials are often ineffective.

Purpose

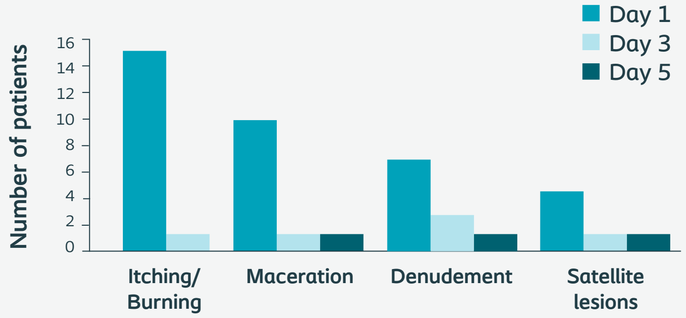
This feasibility study was designed to determine the efficacy of InterDry used in place of the standard treatments.

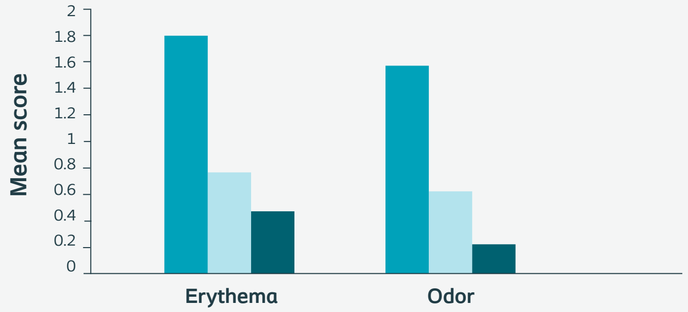
Methodology

Subjects were enrolled from two (2) long-term care centers after signing the IRB approved consent form. Assessments occurred on Day 1, 3, and 5 for erythema, maceration, denudement, itching/burning, satellite lesions and odor. The amount of test product used was recorded.

Subjects

Twenty-one (21) subjects entered the study, with twenty (20) having complete data. Mean age 53.8 years. Mean BMI 54.75. Data was collected from each subject on Day 1 (Baseline), Day 3, and Day 5. Missing data was treated using the Last Observation Carry Forward (LOCF) technique. The Paired Sign Test was used for all analyses.





Conclusion

1. Brown J, Wimpenny P, Maughan H. Skin problems in people with obesity. *Nurs. Stand.* 2004;18(35):38-42.
2. Janniger CK, Schwartz RA, Szepietowski JC, Reich A. Intertrigo and common secondary skin infections. *Am Fam Physician.* 2005;72(5):833-838.
3. O'Dell ML. Skin and wound infections: an overview. *Am Fam Physician.* 1998;57(10):2424-2432.

InterDry significantly improves patient outcomes within 5 days

Multi-site feasibility study using a new textile with silver for management of skin conditions located in skin folds

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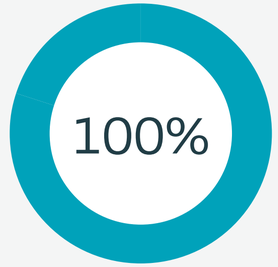
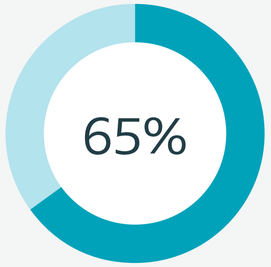
Conclusion

InterDry provided the environment to significantly relieve the subjects' symptoms of intertrigo and/or candidal intertrigo in a five (5) day period. InterDry is an innovative product with impressive and dramatic results eliminating the need for multiple products that were ineffective. The subjects liked using the new product. They appreciated the comfort of not having moist skin and the absence of messy powders or creams on their skin.

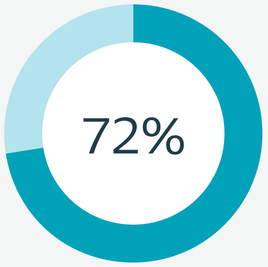
100%
of symptoms were resolved or significantly improved
within 5 days



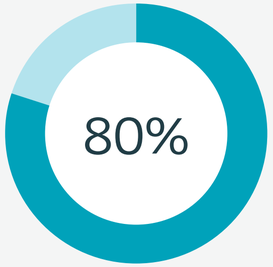
Resolution in itching, burning and maceration



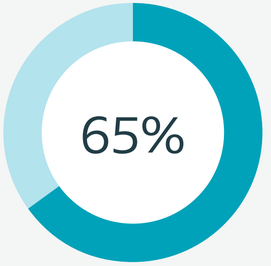
Resolution of erythema



Resolution of denudement



Resolution of satellite lesions



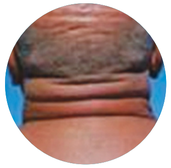
Resolution of odor

Study

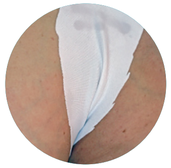
InterDry improves patient outcomes compared to antifungal treatment protocols

Skin-to-skin application sites

Manages skin damage in skin folds and/or skin-to-skin contact areas where intertrigo is present or anticipated.

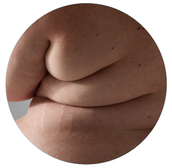


1: neck roll



2: axilla

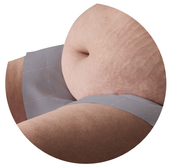
3: breast



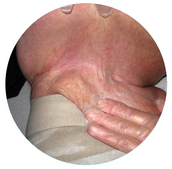
4: back

5: abdomen

6: between fingers



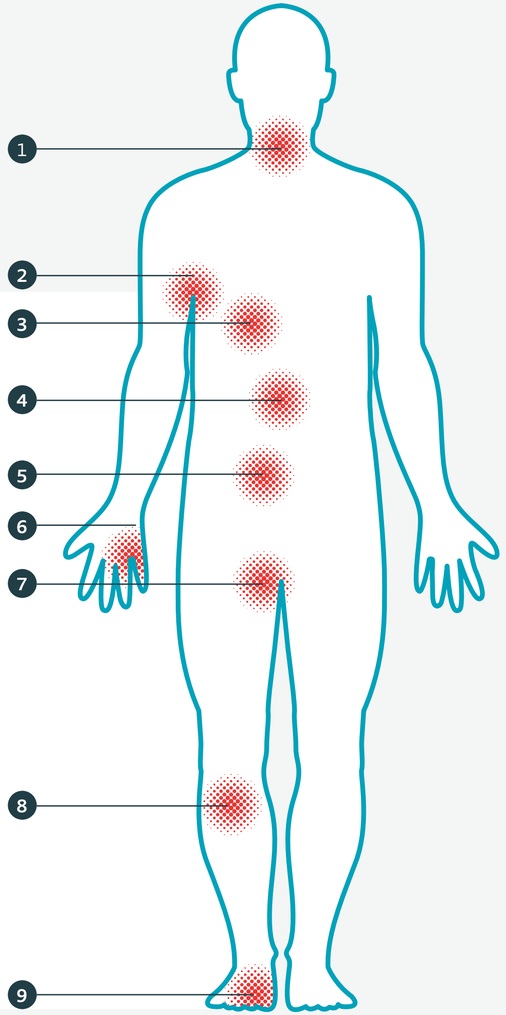
7: groin



8: back of knee

9: between toes

Skin-to-device application sites ›

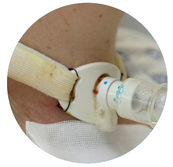


1. Kennedy-Evans KL, Viggiano B, Henn T, Smith D. Multi-site feasibility study using a new textile with silver for management of skin conditions located in skin folds. Poster presented at: 20th Annual Symposium on Advanced Wound Care; April 28 - May 1, 2007; Tampa, FL and 39th WOCN® Society Annual Conference; June 9-13, 2007; Salt Lake City, UT.
2. Freyberg J, Netsch D, Tessling J. Moisture management challenges for the WOC nurse. Presented at the 39th WOCN® Society Annual Conference, June 2007. Presented at the 22nd Annual Clinical Symposium on Advances in Skin and Wound Care, October 2007.

InterDry improves patient outcomes compared to antifungal treatment protocols

Skin-to-device application sites

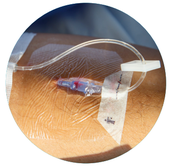
Manages skin damage between any skin-to-device application where the skin is still intact. Should not be used on open wounds.



A: trach ties

B: cervical collars

C: blood pressure cuffs

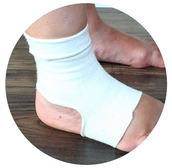


D: central lines

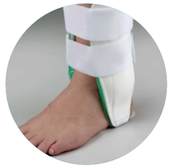
E: slings

F: arm casts

G: heel suspension devices

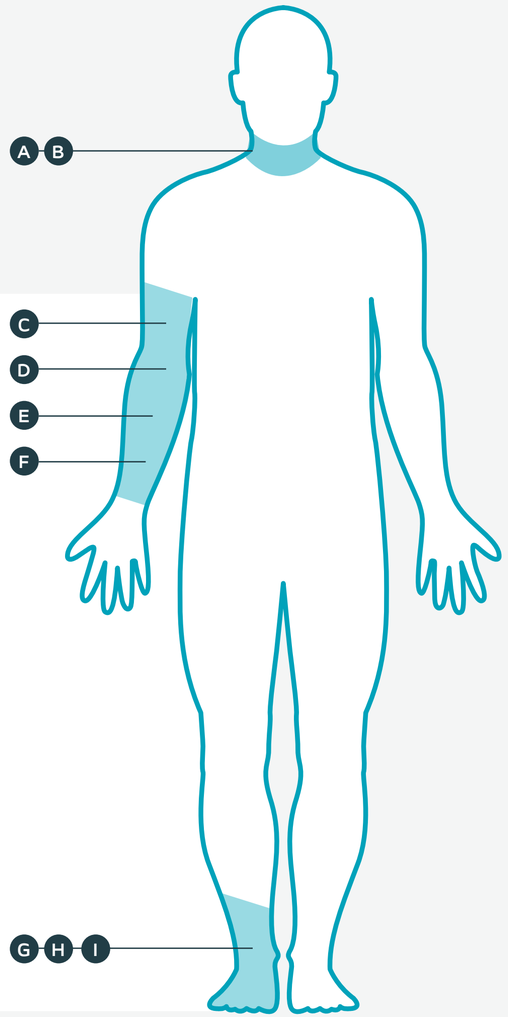


H: compression garments



I: removable air casts

Skin-to-skin application sites



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Patient case studies: Abdominal pannus

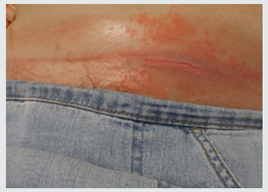
Patient case study 1[1]

Patient description: 80-year-old female, medical history includes obesity (5'3", 172 pounds, BMI 30.5), bilateral mastectomy, uncontrolled diabetes, hypertension, hyperlipidemia, and dementia.

Past treatments: No previous treatments.

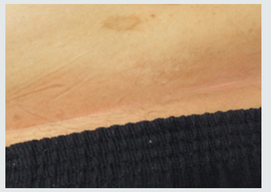
InterDry protocol: InterDry was applied to manage the complications associated with skin folds: moisture, friction and fungal/bacterial organisms.

Day 1



Severe case of ITD (erythema, maceration, satellite lesions, denuded skin at the base of the fold, odor and pain) underneath the large abdominal pannus.

Day 5 outcome



Erythema, satellite lesions, odor, denuded area and pain under the pannus was 100% resolved.

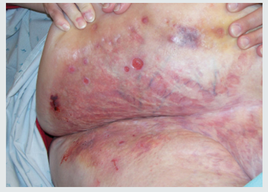
Patient case study 2[2]

Patient description: 41-year-old female patient presented with non-healing ulcers and rash under her abdominal pannus.

Past treatments: Oral and topical antifungal treatment, paper towels, washcloths and baby diapers. The rash and symptoms never resolved.

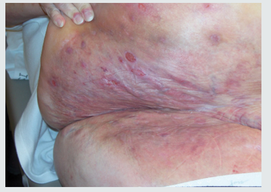
InterDry protocol: InterDry beneath the abdominal pannus.

Day 1



Candidal intertrigo with erythema, pain, cutaneous erosions with bleeding and a sweet odor due to a mild pseudomonas infection.

Day 7 outcome



Complete resolution of her candida intertrigo and resolving erosions. The patient returned to the surgeon who scheduled her bariatric surgery.

1. Haberer P. When ITD hits home: best practice tips for using a moisture-wicking fabric with silver for intertriginous dermatitis. 7th Annual Symposium on Advanced Wound Care, Southeast Region of the WOCN society. September, 2015.
2. Vorbeck, E. Evaluation of a skin fold management textile with antimicrobial silver complex in a variety of case studies. Mayo Health System, Minnesota.

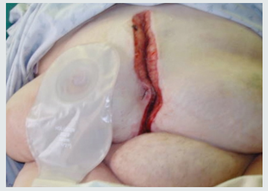
Patient case studies: Abdominal pannus

Patient case study 3[1]

Patient description: 71-year-old female patient, presented for surgical wound status post massive gastrointestinal bleeding and hemorrhagic shock. Subtotal colectomy with end ileostomy was performed to stop the massive gastrointestinal bleeding.

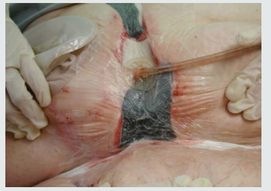
InterDry protocol: Two strips of InterDry were placed beneath the abdominal pannus fold; one on each side of the abdominal incision. The fabric was replaced with each negative pressure wound therapy (NPWT) dressing change which allowed for adhesion of the NPWT drape.

Day 1



NPWT was instituted; however the large abdominal pannus trapped too much moisture resulting in intertrigo with erosions and erythema. This made the adhesion of the drape impossible and was painful for the patient.

Outcome



The patient's intertrigo was resolved with no subsequent intertrigo throughout the duration of the NPWT.

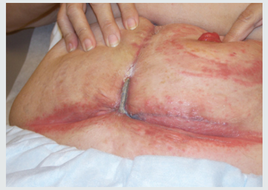
Patient case study 4[1]

Patient description: 67-year-old female patient presented for a follow-up after hospitalization for perforated sigmoid diverticuli with surgical intervention and subsequent diversion of fecal stream with end loop colostomy and Hartmann's pouch formation.

Past treatments: Oral antifungal regimen for 5 days in conjunction with an antifungal powder. Intertrigo did not improve.

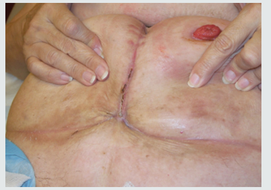
InterDry protocol: InterDry under the abdominal pannus using cotton underwear to keep fabric in place.

Day 1



Candidal intertrigo underneath the abdominal pannus and colostomy pouch with satellite lesions, erythematous papules, denudement, weeping and a musty odor. Patient complained her red rash was painful and itching.

Day 14 outcome



Complete resolution of candidal intertrigo beneath the abdominal pannus.

1. Vorbeck, E. Evaluation of a skin fold management textile with antimicrobial silver complex in a variety of case studies. Mayo Health System, Minnesota.

Patient case studies: Breast

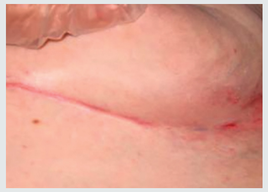
Patient case study 1[1]

Patient description: 53-year-old female with morbid obesity (BMI 62.8), angina, pulmonary embolism, venous insufficiency and bipolar disorder.

Past treatments: Cleansing with a body wash followed by a lotion and an antifungal powder two times a day and as needed.

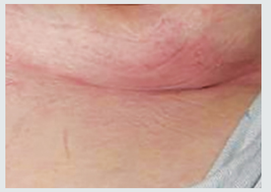
InterDry protocol: Cleanse the skin with Bedside-Care® Foam. Place InterDry in the skin fold. Reposition as needed. Replace if soiled. Discard on day five (5).

Day 1



Intertrigo under the left breast, which has been present for twelve (12) weeks. Symptoms included severe erythema, denudement, maceration, satellite lesions, odor and complaints of itching/burning.

Day 5 outcome



Complete resolution of denudement, maceration, satellite lesions, and odor. Slight erythema with dry flaking skin remains. No further complaints of itching/burning.

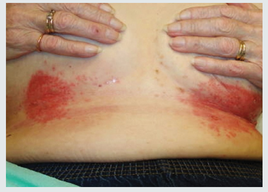
Patient case study 2[2]

Patient description: 92-year-old female patient presented for care of venous stasis ulceration.

Past treatments: Prescription antifungal powder applied twice daily and an oral antifungal administered daily for five days. The rash persisted and she was then treated with an antifungal cream applied two times daily for two weeks. Treatments were not effective.

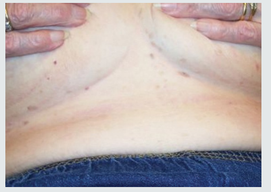
InterDry protocol: Two strips of InterDry under each breast using a cotton sports bra to keep fabric in place.

Day 1



Persistent, painful rash underneath her breasts. Candidal intertrigo with erythematous papules, satellite lesions, denudement, weeping and a musty odor.

Week 3 outcome



Patient followed up weekly with improvement noted at week 2 and resolution of symptoms and rash by week 3.

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2. Vorbeck, E. Evaluation of a skin fold management textile with antimicrobial silver complex in a variety of case studies. Mayo Health System, Minnesota.

Patient case studies: Breast

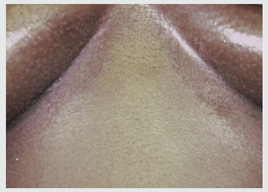
Patient case study 3[1]

Patient description: 39-year-old female presented with grade II lymphedema of the right arm.

Past treatments: Over the counter antifungal powder.

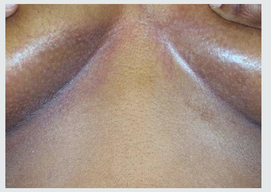
InterDry protocol: Apply the silver coated textile over the affected area and leave it in place. She was allowed to remove the fabric for the duration of her shower.

Day 1



Patient complained of intense pruritus and burning under both breasts.

Day 7 outcome



Skin dry but still with significant erythema present. No more pruritus or burning.

1. Maus E, Baylor D, Benavides S, Kinder L, Fife C, Guilliod R, Hawkins T, Robles M, Smith L, Virtute G. A case series using a polyurethane coated polyester textile impregnated with an antimicrobial silver complex for the management of maceration, odor and redness is skin folds. The experience from a wound healing and lymphedema management clinic. Hermann Center for Wound Healing and Lymphedema Management, University of Texas Health Science Center, Houston, Texas.

Patient case studies: Axilla

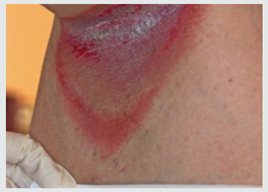
Patient case study 1[1]

Patient description: 44-year-old male presented with intertrigo in his axilla, panniculus and groin folds.

Past treatments: Antifungal-steroid cream combination.

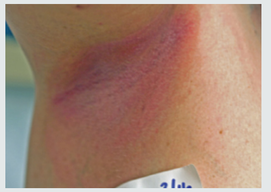
InterDry protocol: Treatment was changed from the cream to InterDry. A silicone dressing with an adhesive spray (on intact skin) was used to secure the silver fabric in place.

Day 1



Painful and moist desquamation.

Day 7 outcome



Within 24 hours, the moist desquamation was significantly improved. Completely healed within one week.

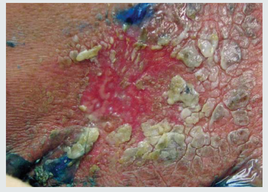
Patient case study 2[2]

Patient description: 60-year-old female with history of right-sided mastectomy.

Past treatments: Nystatin powder for 2 weeks.

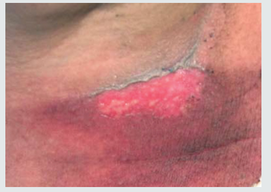
InterDry protocol: Apply the silver coated fabric over the affected area and leave it in place. She was allowed to remove the fabric for the duration of her shower.

Day 1



Denuded and erythematous skin and a foul odor at the right axillary fold. Patient complained of drainage, odor and pain.

Day 7 outcome



Skin had significantly less drainage and redness. Denuded skin almost completely healed.

1. Freyberg J, Netsch D, Tessling J. Moisture management challenges for the WOC nurse. Presented at the 39th WOCN® Society Annual Conference, June 2007. Presented at the 22nd Annual Clinical Symposium on Advances in Skin and Wound Care, October 2007.
2. Maus E, Baylor D, Benavides S, Kinder L, Fife C, Guilliod R, Hawkins T, Robles M, Smith L, Virtute G. A case series using a polyurethane coated polyester textile impregnated with an antimicrobial silver complex for the management of maceration, odor and redness is skin folds. The experience from a wound healing and lymphedema management clinic. Hermann Center for Wound Healing and Lymphedema Management, University of Texas Health Science Center, Houston, Texas.

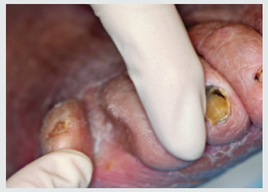
Patient case studies: Fingers and toes

Patient case study 1[1]

Patient description: 69-year-old paraplegic male with severe peripheral arterial disease and known occlusion of the aortoiliac junction.

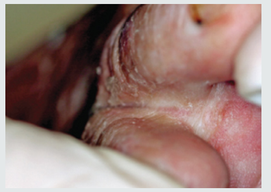
InterDry protocol: A one-inch strip of InterDry was woven between his toes and changed daily following bathing.

Day 1



Presented with maceration between his toes.

Day 3 outcome



Resolution of maceration.

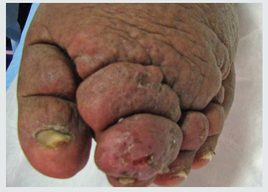
Patient case study 2[2]

Patient description: 52-year-old morbidly obese male presented with severe lymphedema of the lower extremities.

Past treatments: Over the counter antifungal powder.

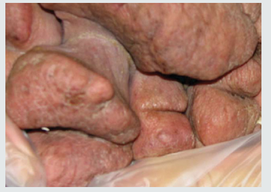
InterDry protocol: Apply the silver coated fabric over the affected area and leave it in place. He was allowed to remove the fabric for the duration of his shower.

Day 1



Skin macerated with foul smelling drainage suggestive of cutaneous candidiasis.

Day 5 outcome



Skin with significant less drainage and odor.

1. Freyberg J, Netsch D, Tessling J. Moisture management challenges for the WOC nurse. Presented at the 39th WOCN® Society Annual Conference, June 2007. Presented at the 22nd Annual Clinical Symposium on Advances in Skin and Wound Care, October 2007.
2. Maus E, Baylor D, Benavides S, Kinder L, Fife C, Guilliod R, Hawkins T, Robles M, Smith L, Virtute G. A case series using a polyurethane coated polyester textile impregnated with an antimicrobial silver complex for the management of maceration, odor and redness is skin folds. The experience from a wound healing and lymphedema management clinic. Hermann Center for Wound Healing and Lymphedema Management, University of Texas Health Science Center, Houston, Texas.

Patient case studies: Lower extremities

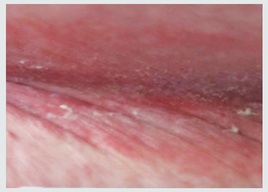
Patient case study 1[1]

Patient description: 46-year-old female receiving rehabilitation (physical therapy and weight loss) for morbid obesity (BMI 93.8).

Past treatments: Daily cleansing followed by an application of antimicrobial cream mixed equal parts with an antifungal cortisone cream daily and an antifungal powder as needed.

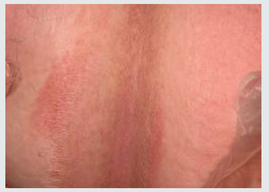
InterDry protocol: Cleanse the skin. Place InterDry in the skin fold. Reposition as needed. Replace if soiled. Discard on day five (5).

Day 1



Candidal intertrigo located in the right posterior thigh, which has been present for the past 98 days. Symptoms included severe erythema, denudement, maceration, satellite lesions, slight odor and complaints of itching/burning.

Day 5 outcome



Complete resolution of denudement, maceration, satellite lesions, and odor. Slight erythema remains. No further complaints of itching/burning.

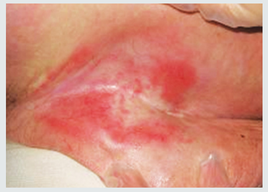
Patient case study 2[1]

Patient description: 34-year-old female receiving rehabilitation (weight loss and physical therapy) with morbid obesity (BMI 61.1).

Past treatments: Daily body wash followed by an antifungal ointment as needed. She wore lower leg lymphedema wraps.

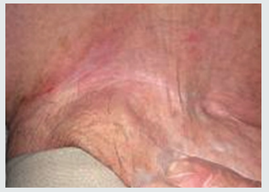
InterDry protocol: Cleanse the skin. Place InterDry in the skin fold. Reposition as needed. Replace if soiled. Discard on day five (5).

Day 1



Candidal intertrigo in the right popliteal area, which has been present for the past thirty-three (33) weeks. Symptoms included severe erythema, denudement, maceration, satellite lesions, moderate odor and complaints of itching/burning.

Day 5 outcome



Complete resolution of maceration, satellite lesions, and odor. Slight erythema remains. Denuded areas improving. Skin remains fragile and tears easily. No further complaints of itching/burning.

1. Kennedy-Evans KL, Viggiano B, Henn T, Smith D. Multi-site feasibility study using a new textile with silver for management of skin conditions located in skin folds. Poster presented at: 20th Annual Symposium on Advanced Wound Care; April 28 - May 1, 2007; Tampa, FL and 39th WOCN® Society Annual Conference; June 9-13, 2007; Salt Lake City, UT.

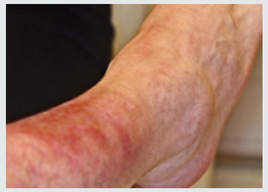
Patient case studies: Skin-to-device*

Patient case study 1[1]

Patient description: 42-year-old male presented with chronic, recurrent venous dermatitis to the lower extremities.

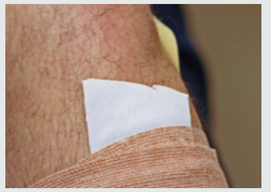
InterDry protocol: InterDry was used under the compression wrap to wick away excessive moisture, resulting in elimination of the maceration and venous dermatitis.

Day 1



Venous dermatitis and a new ulceration due to maceration caused by the excessive sweating.

Outcome



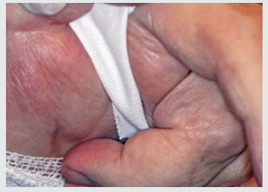
Elimination of the maceration and venous dermatitis.

Patient case study 2[1]

Patient description: 66-year-old male presented with contracture of the left hand requiring the use of a brace.

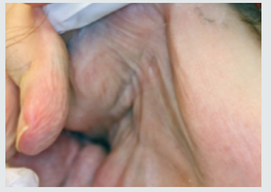
InterDry protocol: A two-inch strip of InterDry was placed in the palm of his hand and changed daily following bathing.

Day 1



The palm and interdigital spaces of the left hand frequently became macerated and malodorous, so he would stop using the brace.

Day 5 outcome



Prevented maceration and malodor from occurring, allowing uninterrupted treatment with the brace. His hand was dry and comfortable.

*InterDry should not be placed directly on an open wound.

1. Freyberg J, Netsch D, Tessling J. Moisture management challenges for the WOC nurse. Presented at the 39th WOCN® Society Annual Conference, June 2007. Presented at the 22nd Annual Clinical Symposium on Advances in Skin and Wound Care, October 2007.

InterDry improves patient satisfaction and is patient preferred over traditional therapies[1]

Patient evaluation using InterDry[2]

Aim

The aim of this product evaluation is to evaluate InterDry for skin fold management.

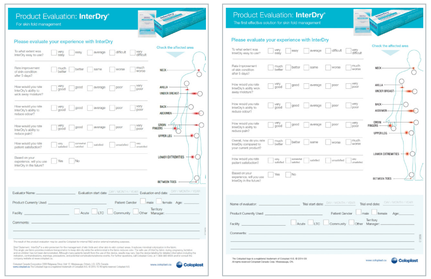
Methods

A total of 54 evaluations of subjects with affected skin areas on different body locations were included in this product evaluation. The product evaluation was performed in Canada between 2014-2016. InterDry was placed on the affected skin fold areas. The use of InterDry was evaluated by a health care professional on a 5-point scale with respect to ease-of-use, skin improvement after 5 days, the ability to wick away moisture, the ability to reduce odor, the ability to reduce pain, the ability to reduce discomfort and overall patient satisfaction. According to the US/Canadian instructions for use, each piece of InterDry may be used up to 5 days, depending on fabric soiling, odor, amount of moisture and general skin condition. Hence, it is assumed that this information was taken into consideration during the product evaluation.

Respondents

A total of 54 respondents have evaluated InterDry, see Table 1 for characteristics of the subjects involved. The distribution of the affected body areas is depicted in (Figure 1).

In the product evaluation, the respondents were asked about product currently used. The products currently used varied from nothing, powder and gauze to different kinds of topical product with or without antifungals.



	Number total	Questionnaire Version 1	Questionnaire Version 2
Number of respondents	**54**	**36 (67%)**	**18 (33%)**
Gender			
Male	18 (33%)	15 (42%)	3 (17%)
Female	33 (61%)	21 (58%)	12 (67%)
N/A	3 (6%)	0 (0%)	3 (17%)
Age			
21-30 years	1 (2%)	1 (3%)	0 (0%)
31-40 years	6 (11%)	5 (14%)	1 (6%)
41-50 years	0 (0%)	0 (0%)	0 (0%)
>50 years	35 (65%)	28 (78%)	7 (39%)
N/A	12 (22%)	2 (6%)	10 (56%)
Facility type			
Community care	6 (11%)	4 (11%)	2 (11%)
Acute care	24 (44%)	20 (56%)	4 (22%)
Long term care	22 (41%)	10 (30%)	12 (67%)
Other (complex care)	1 (2%)	1 (3%)	0 (0%)
N/A	1 (2%)	1 (3%)	0 (0%)
Duration of evaluation			
Range (in days)	3-31	3-31	3-28
Mean (in days)	10.4 (N=42)	10.2 (N=27)	10.7 (N=15)
Median (in days)	9.5 (N=42)	9.0 (N=27)	10.0 (N=15)

Table 1: Baseline characteristics of the included subjects
N/A: data missing/blanks/not filled out correctly or not evaluated

Affected body area	Number of respondents
Neck	2
Axilla	2
Under breast	15
Back	0
Abdomen	14
Groin	14
Fingers	0
Upper leg	0
Lower extremities	0
Between toes	1
>1	12

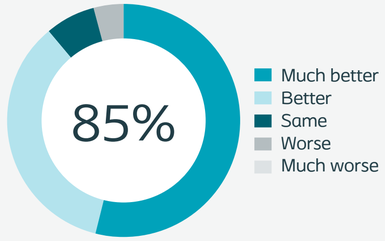
Figure 1: Distribution of affected body areas

Results

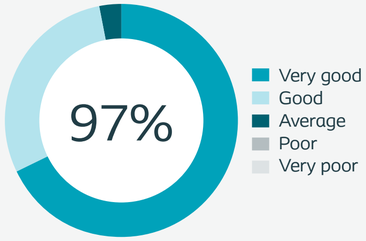
1. Product Evaluation InterDry Canada 2w016. Doc. No. VV-020577, Version 1.0.

InterDry improves patient satisfaction and is patient preferred over traditional therapies[1]

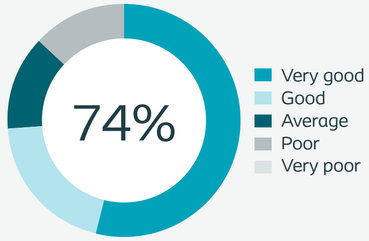
Results



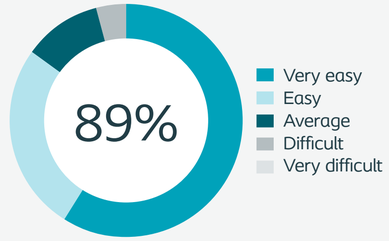
Skin condition rated as much better or better



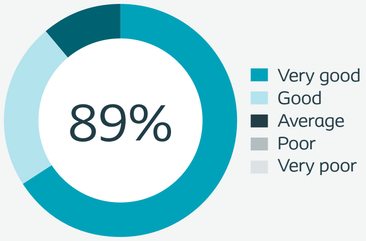
Ability to reduce discomfort rated as very good or good



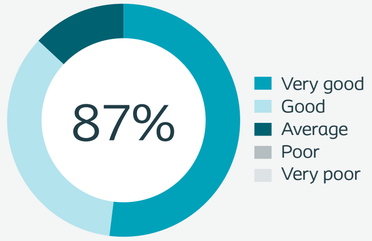
Ability to reduce pain rated as very good or good



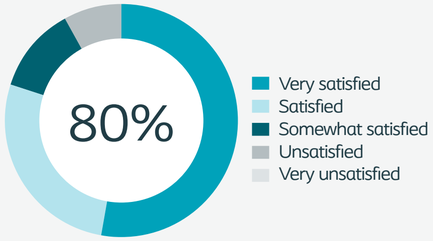
Ease-of-use as very easy or easy to use



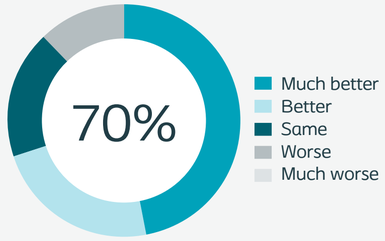
Ability to wick away moisture rated as very good or good



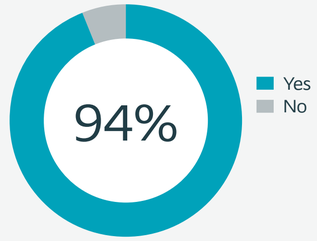
Ability to reduce odor rated as very good or good



Overall patient satisfaction was rated very satisfied or satisfied



Compared as much better or better to current product



Would recommend InterDry for future use

Back to study

InterDry outperforms in all metrics important to skin fold management compared to commonly used absorptive fabrics

Challenges associated with skin folds: an in-vitro comparison of four common materials

T. Pierce, Bachelor Mech. Eng., Coloplast US; H. Braunwarth, Ph.D. Chem., Coloplast Gmbh

Presented at Wild on Wounds® National Wound Conference; Las Vegas, NV, September 2018

Introduction

Skin-to-skin contact may lead to increased friction and trapped moisture; and it may increase microbial growth.[1] Overhydration of the skin due to trapped perspiration within opposing skin folds, commonly seen in the pannus, axillae and inguinal region coupled with skin-to-skin friction can initiate an inflammatory response. As a result, patients are at risk for numerous skin complications such as maceration, erythema, erosion, itching/burning, odor and pain.[2] In warm, moist environments, opportunistic microbes (i.e., *Staphylococcus aureus, Pseudomonas aeruginosa* and *Candida albicans*) may rapidly colonize, which may also lead to odor.[3]

Rationale

In-vitro-testing was conducted of four materials related to moisture management, friction and antimicrobial efficacy. Many products sold in the market today are unable to satisfy all three criteria on their own.[4]

Methods

Test products are commonly used materials: 100% cotton pillowcase, InterDry with ionic silver, Kerlix® AMD Antimicrobial Gauze with PHMB, 48% poly - 52% cotton blend pillowcase.

The test measuring the moisture management capabilities is based on the horizontal wicking of fabrics (time taken for fluid to move to the edge of the test area in mm2/s, AATCC TM-198:2013). Friction was measured by the force created when passed over a standardized platform (Sled Friction and Coefficient of Friction, ASTM D1894-14). Antimicrobial activity was measured as log reduction in suspension with *S. aureus, P. aeruginosa* and *C. albicans* as test organism (AATCC TM-100:2012).

Results

Overall InterDry with ionic silver and Kerlix AMD Antimicrobial Gauze with PHMB showed the most consistent antimicrobial activity: InterDry (log RF 5.01 [methicillin-resistant *Staphylococcus aureus*], 4.47 [*P. aeruginosa*] and 5.01 [*C. albicans*]) and Kerlix AMD (log RF 5.01 [methicillin-resistant Staphylococcus aureus], 3.68 [*P. aeruginosa*] and 4.46 [*C. albicans*]). The cotton and poly-cotton blend pillowcases showed no antimicrobial activity. (Figure 1)

InterDry showed the highest horizontal wicking rate. The horizontal wicking rate (mm2/s) was from 165.7±31.2 (InterDry) to 19.8±2.6 (100% cotton pillowcase). (Figure 2)

InterDry showed the lowest static coefficient of friction. The range for the coefficient of friction was from 0.25±0.02 (Kerlix AMD Antimicrobial Gauze) to 0.20±0.0 (InterDry). (Figure 3)

Conclusion

1. Sibbald RG, Kelley J, Kennedy-Evans KL, Labrecque C, Waters N. A practical approach to the prevention and management of intertrigo, or moisture-associated skin damage, due to perspiration: expert consensus on best practice. *Wound Care Canada.* 2013;11(2):36-43.
2. Janniger CK, Schwartz RA, Szepietowski JC, Reich A. Intertrigo and common secondary skin infections. *Am Fam Physician.* 2005;72(5):833-8.
3. Metin A, Dilek N, Bilgili SG. Recurrent candidial intertrigo: challenges and solutions. *Clin Cosmet Investig Dermatol.* 2018;11:175-85.
4. Tessling J, Freyberg J, Netsch D. Moisture management challenges to the WOC nurse. *J Wound Ostomy Continence Nurs Supplement.* 2007;34(3S):S54.

InterDry outperforms in all metrics important to skin fold management compared to commonly used absorptive fabrics

Challenges associated with skin folds: an in-vitro comparison of four common materials

T. Pierce, Bachelor Mech. Eng., Coloplast US; H. Braunwarth, Ph.D. Chem., Coloplast Gmbh

Presented at Wild on Wounds® National Wound Conference; Las Vegas, NV, September 2018

Conclusion

The proprietary ionic silver complex in InterDry, paired with the low coefficient of friction and increased rate of horizontal wicking from the unique fabric construction provides a solution for broad spectrum antimicrobial properties for odor reduction and moisture management for the challenges associated with skin folds.

InterDry outperforms in all three metrics important to skin fold management by increased moisture wicking, low coefficient of friction and thus low friction and reduced microbial growth.

Figure 1. **Log Reduction After 24 Hours**

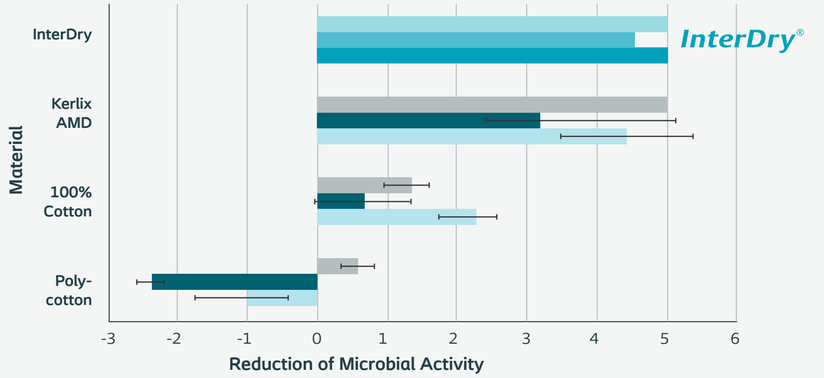


Figure 3: Results of the antimicrobial activity test (AATCC TM-100:2012) with the test organisms methicillin-resistant *Staphylococcus aureus*, *P. aeruginosa* and *C. albicans* after 24 hours contact time. **InterDry and Kerlix AMD showed the most consistent antimicrobial activity.**

Figure 2. **Horizontal Wicking Rate**

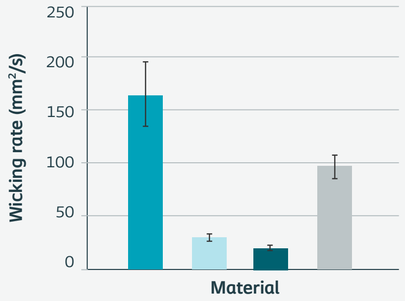


Figure 1: Results of the Horizontal Wicking in-vitro test (AATCC TM-198:2013). **InterDry showed the highest horizontal wicking rate.**

Figure 3. **Static Coefficient of Friction**

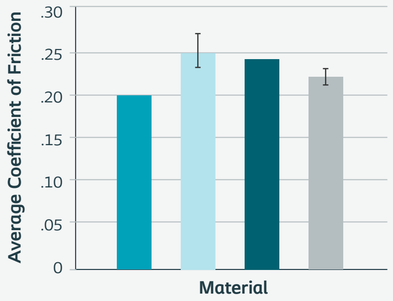
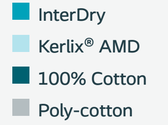


Figure 2: Results of the in-vitro test of the Sled Friction (ASTM D1894-14). **InterDry showed the lowest static coefficient of friction.**



Back to study

InterDry reduces cost and treatment time compared to antifungal treatment protocols

Author: Susan Gallagher, PhD, MSN, MA, CBN, HCRM, CSPHP

Economic concerns of ITD

Some experts contend that prevention is a more appropriate alternative to treatment and recommend a number of preventive strategies. For example, patients are advised to control blood sugar, use cotton undergarments, lose weight, avoid tight clothing and avoid unnecessary antibiotic or steroid use. Experts suggest keeping the area dry and exposed to the air as much as possible to prevent recurrences.

As indicated in the McMahon study,[1] many individuals have resolution of the ITD once their general conditions improve. However, recurrence of ITD is common. Recurrences lead to direct and indirect costs. Indirect costs include time from work, home and family; travel time to providers; embarrassment from odor; threats to productivity due to discomfort; frustration and more. Direct costs might include dressings, antibiotics, laboratory studies, home, office or acute care, expenses not covered by the patient's insurance carrier and more.

Skin fold management has become an ongoing struggle for many individuals from a

humanistic, clinical and economic perspective

1. McMahon R. The prevalence of skin problems beneath the breasts of in-patients. *Nursing Times.* 1991;87(39):48-51.

InterDry reduces cost and treatment time compared to antifungal treatment protocols

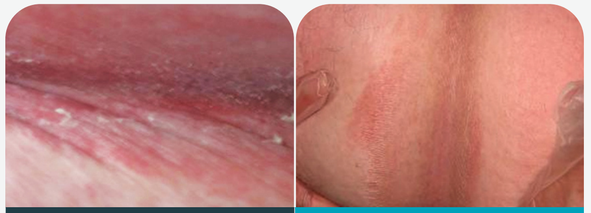
Economic value case study 1[1]

Patient description: 46-year-old female receiving rehabilitation (physical therapy and weight loss) for morbid obesity (BMI 93.8).

Symptoms: Candidal intertrigo located in the right posterior thigh, which has been present for the past 98 days.

Total cost of savings
$326.13

Resolution time
5 days



	Antimicrobial cream, antifungal cortisone and antifungal powder	InterDry protocol
Erythema score	3 - Severe	**1 - Slight**
Denudement	Yes	**No**
Maceration	Yes	**No**
Satellite lesions	Yes	**No**
Itching/burning	Yes	**No**
Odor score	1 - Slight	**0 - None**
Duration	**98 days**	5 days
Cost/week	**$23.84**	$7.63
Total cost	**$333.76**	$7.63

1. McMahon R. The prevalence of skin problems beneath the breasts of in-patients. *Nursing Times.* 1991;87(39):48-51.

InterDry reduces cost and treatment time compared to antifungal treatment protocols

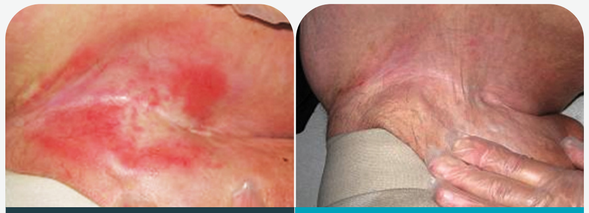
Economic value case study 2[1]

Patient description: 34-year-old female receiving rehabilitation (weight loss and physical therapy) with morbid obesity (BMI 61.1).

Symptoms: Candidal intertrigo in the right popliteal area, which has been present for the past thirty-three (33) weeks.

Total cost of savings
$135.17

Resolution time
5 days



	Antifungal ointment	InterDry protocol
Erythema score	3 - Severe	**1 - Slight**
Denudement	Yes	Yes: skin fragile, tears easily
Maceration	Yes	**No**
Satellite lesions	Yes	**No**
Itching/burning	Yes	**No**
Odor score	2 - Moderate	**0 - None**
Duration	**231 days**	**5 days**
Cost/week	**$4.35**	**$8.33**
Total cost	**$143.55**	**$8.33**

1. Kennedy-Evans KL, Viggiano B, Henn T, Smith D. Multi-site feasibility study using a new textile with silver for management of skin conditions located in skin folds. Poster presented at: 20th Annual Symposium on Advanced Wound Care; April 28 - May 1, 2007; Tampa, FL and 39th WOCN® Society Annual Conference; June 9-13, 2007; Salt Lake City, UT.

InterDry reduces cost and treatment time compared to antifungal treatment protocols

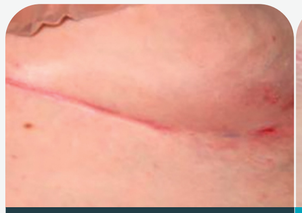
Economic value case study 3[1]

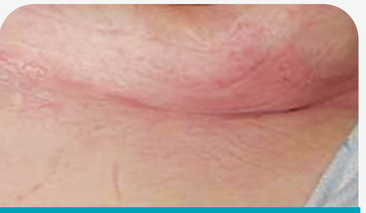
Patient description: 53-year-old female with morbid obesity (BMI 62.8), angina, pulmonary embolism, venous insufficiency and bipolar disorder.

Symptoms: Intertrigo under the left breast, which has been present for twelve (12) weeks.

Total cost of savings
$101.39

Resolution time
5 days





	Antifungal powder x2 daily and PRN	InterDry protocol
Erythema score	3 - Severe	1 - Slight: dry flaking skin continues
Denudement	Yes	**No**
Maceration	Yes	**No**
Satellite lesions	Yes	**No**
Itching/burning	Yes	**No**
Odor score	1 - Minimal	**0 - None**
Duration	**84 days**	**5 days**
Cost/week	**$8.68**	**$2.77**
Total cost	**$104.16**	**$2.77**

1. Kennedy-Evans KL, Viggiano B, Henn T, Smith D. Multi-site feasibility study using a new textile with silver for management of skin conditions located in skin folds. Poster presented at: 20th Annual Symposium on Advanced Wound Care; April 28 - May 1, 2007; Tampa, FL and 39th WOCN® Society Annual Conference; June 9-13, 2007; Salt Lake City, UT.

Intertiginous dermatitis has been shown to consist of both fungal and bacterial organisms

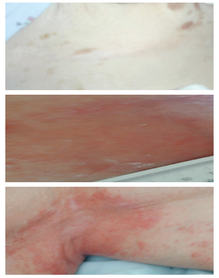
Proper treatment should target both types of microorganisms

Identification of organisms colonized at sites of intertriginous dermatitis in hospitalized patients: preliminary results

Theresa Hackmann, BSN, RN, Laura McMullen, BSN, RN
Advisors: Janet E. Cuddigan, PhD, RN, CWCN, CCCN; Joyce Black, PhD, RN, CWCN, CPSN; Kristy Edwards, MD, CWS

Background

Intertriginous dermatitis, also known as intertrigo, is an inflammatory skin condition affecting opposing cutaneous or mucocutaneous surfaces.[1] For the purposes of this study the degree of erythema on areas of intertrigo was graded as mild, moderate or severe.



Mild

Moderate

Severe

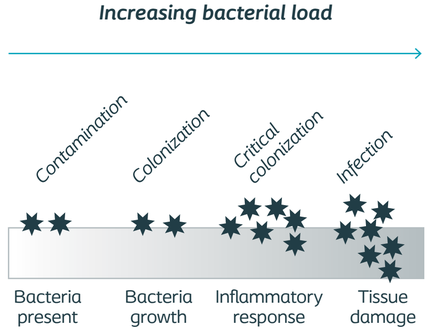
Significance

The incidence and prevalence of intertrigo in hospitalized patients has not been reported in the literature. Intertrigo is often treated empirically, without knowing the exact microorganisms involved. Disruption of the stratum corneum may result in a variety of complications such as bacterial or fungal skin infections and bothersome symptoms, including itching, burning and pain.[1] Clinicians are often uncertain of the exact etiology and reflexively assume the diagnosis of Candida intertrigo.[2] More astute assessments and treatment modalities are needed to alleviate the pain and discomfort associated with intertrigo.

Conceptual framework

$$\textit{Risk of bacterial infection} = \frac{\textit{Dose of bacteria x virulence}}{\textit{Host resistance}}$$

All skin is colonized with normal flora and some may also be contaminated with other microorganisms found in the hospital environment. Intertrigo develops between warm, moist skin folds, an ideal environment for bacterial growth. Theoretically, intertrigo may develop as the number and/or virulence of these organisms increase in hospitalized patients with lowered host resistance. Once bacteria reach the stage of critical colonization, an inflammatory response develops. Infection (local, regional or systemic) is the next step in the continuum.



Results

1. Janniger CK, Schwartz RA, Szepietowski JC, Reich A. Intertrigo and common secondary skin infections. *Am Fam Physician*. 2005;72(5):833 -838.
2. Honig PJ, Frieden IJ, Kim HJ, Yan AC. Streptococcal intertrigo: an underrecognized condition in children. *Pediatrics*. 2003;112(6 Pt 1):1427 -1429.

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Methods

The hospital wound nurse or staff nurse notified the study coordinator of potential subjects with intertrigo. Anaerobic, aerobic, and fungal cutaneous swab cultures were taken from a maximum of two sites of intertrigo per patient using standard procedures established by the site hospital.

Subjects were asked about the presence or absence of itching or burning, and to rate their intertrigo associated pain on a scale of 0 (no pain) to 10 (worst pain ever). Using the identical intertrigo evaluation forms in the Intertriginous Dermatitis Data Collection Tool, two investigators independently evaluated objective clinical indicators of intertrigo including intensity of odor, erythema level, presence of maceration and satellite lesions. The investigators did not consult with one another regarding their assessment findings. Skin pH was measured using standard hospital pH test strips and skin temperature was taken using the YSI Temperature Probe. All steps of the data collection were completed in a single, one hour session with the subject during the months of July to October.

Purposes

1. Identify common microorganisms involved in intertriginous dermatitis by culturing sites of intertrigo purposively selected by erythema level.
2. Determine inter-rater reliability for various clinical assessments of intertrigo.

Results

Sample description: 15 cultures were obtained from 9 hospitalized patients (7 female, 2 male). Age ranged from 40-93. Pain scores ranged from 0 to 8.

Data analysis: Due to the preliminary nature of the data, statistical analysis was limited to descriptive analysis of culture results and intraclass correlations to evaluate inter-rater reliability of clinical assessments.

Data analyses addressed these research questions >

< *Study*

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Research questions

Q1: What pathogens are most commonly cultured from sites of intertrigo?

Organism	Gram stain	# Times cultured
Staphylococcus species coagulase negative	+	12
Proteus mirabilis	-	8
Diphtheroids	+	5
Enterococcus faecalis	-	5
Candida albicans		4
Vancomycin-resistant *Enterococcus faecium*	-	3
Escherichia coli	-	2
Streptococcus viridans group	+	1
Group D Enterococcus	-	1
Acinetobacter baumannii/ haemolyticus	-	1

Q2: Do microorganisms vary by anatomic site of intertrigo?

No correlations can be drawn based upon the types of organisms and the anatomic location from which they were cultured on the body.

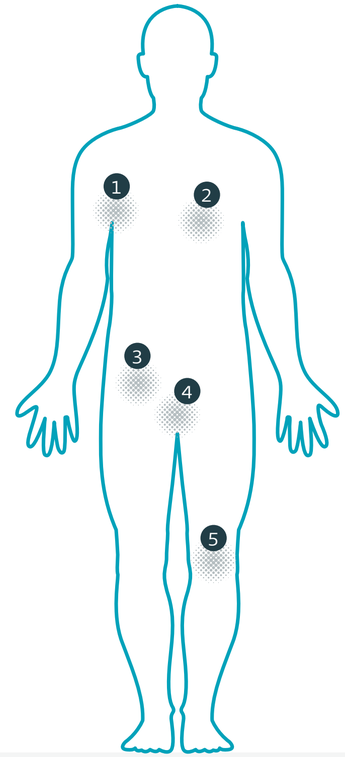
1: Axilla
- *Proteus mirabilis*
- *Enterococcus faecalis*
- Staphylococcus species coagulase negative
- *Candida albicans*
- VRE

2: Breast
- *Proteus mirabilis*
- Staphylococcus species coagulase negative
- Diphtheroids

3: Pannus
- Staphylococcus species coagulase negative
- *Proteus mirabilis*
- *Enterococcus faecalis*
- *Candida albicans*
- *Escherichia coli*

4: Groin
- Staphylococcus species coagulase negative
- *Candida albicans*
- Diphtheroids
- *Proteus mirabilis*
- *Enterococcus faecalis*

5: Knee
- *Proteus mirabilis*
- Staphylococcus species coagulase negative



1. Janniger CK, Schwartz RA, Szepietowski JC, Reich A. Intertrigo and common secondary skin infections. Am Fam Physician. 2005;72(5):833 -838.
2. Honig PJ, Frieden IJ, Kim HJ, Yan AC. Streptococcal intertrigo: an underrecognized condition in children. Pediatrics. 2003;112(6 Pt 1):1427 -1429.

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