Assessing the Potential of Various Skin Protectant Products to Interfere with Brief Absorption

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Abstract

Best practice care for prevention and treatment of Incontinence Associated Dermatitis (IAD) includes use of a moisture barrier cream, ointment, or film. However, it has been suggested that some barrier products, particularly those that are petrolatum-based, may interfere with brief absorption.[1,2] The objective of the study was to test the hypothesis that a unique polymer-based barrier cream has less potential to interfere with absorption of adult briefs than typical moisture barrier formulations.

A modified *in vitro* fluid rate absorption test was used to compare the effect of seven skin protectants on the rate of fluid absorption by disposable incontinence briefs. The skin protectants utilized either dimethicone, petrolatum, zinc oxide, or a combination of petrolatum/zinc oxide as active ingredients.

The results of this study confirm earlier reports using *in vivo* models that some skin protectants have the potential to interfere with absorbent brief function. 3M Cavilon Durable Cream had a lower potential for interfering with brief absorption function compared to Aloe Vesta Protective Ointment, Calmoseptine Ointment, Remedy Calazime Skin Protectant Paste and Secura Protective Ointment.

There seems to be no clear pattern in discerning between products based on active ingredients. This leads one to conclude that the inactive ingredients probably play a significant role in interfering with absorbent brief function. Health care professionals should take brief compatibility into account when selecting moisture barrier products for the prevention or treatment of IAD.

Background

In 2002, Hart provided the first published evidence that oil-based skin protectants have the potential to interfere with absorbent brief function.[1] In that study, a commonly used dimethicone moisture barrier (Cavilon Durable Barrier Cream) transferred significantly less ($p<0.001$) from the skin to absorbent briefs than either a petrolatum based ointment or a zinc oxide/castor oil protectant. Approximately 37% of the dimethicone cream transferred compared to 63% for both the petrolatum ointment and the zinc oxide/castor oil protectant. It was further demonstrated that the transfer of the dimethicone protectant cream did not have any effect on brief absorbency, as the briefs absorbed 96% of synthetic urine placed between the skin and the briefs, which was identical to the untreated control brief. In contrast, the absorbency of the briefs placed over the petrolatum ointment and zinc oxide/castor oil treated sites only absorbed 66% and 67% of the synthetic urine, respectively.

In 2005, Zehrer et al. provided additional evidence that petrolatum-based moisture barriers have the potential to interfere with absorbent brief function.[2] In that study, Cavilon No Sting Barrier Film (3M Health Care) was shown to not transfer from the skin nor interfere with brief absorptive function. However, from 59% to 69% of three commonly used petrolatum-based ointments did transfer from the skin to the brief, which decreased brief absorbency by 54% to 90% compared to untreated skin.

Objective

The current study was undertaken to test the hypothesis that a unique polymer-based barrier cream has less potential to interfere with absorption of adult briefs than typical moisture barrier formulations. However, the test methodology differs from the previous studies by applying the products directly to the inner lining of absorbent briefs and then comparing absorbency of the briefs to an untreated control using an *in vitro* absorbency test method.

Methods

Overview

A modified Fluid Intake Rate Test was completed on samples of four different brands of absorbent briefs* with seven different skin protectant products and an untreated control (no skin protectant). This test determined the amount of time required for the absorbent brief samples to take in 16 ml of saline test solution (0.9% solution of sodium chloride in distilled water at room temperature).

Selection of Briefs

Four different brands of absorbent briefs were used for this test.* For testing purposes, these products were converted into mini-briefs in a manner that retained structural integrity of the absorbent brief (Figure 1). A circle slightly larger than 1 inch diameter was drawn in the center of the exposed absorbent material to mark the target area for product application and testing.

Figure 1: Mini-Brief

Test Apparatus

The test apparatus used in this experiment is presented in Figure 2. Approximately 3 mm of the graduated cylinder protruded beyond the top plate of the assembly and this protrusion was pressed into the central portion of the mini-briefs with standardized weights. Sixteen ml of a colored 0.9% saline solution was poured into the graduated cylinder and the time for it to be absorbed into the mini-brief was recorded.

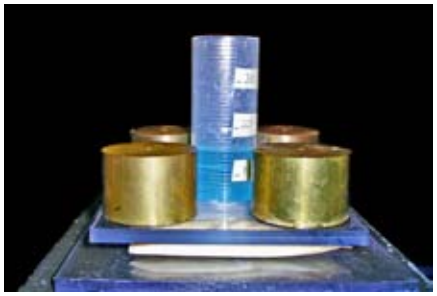


Figure 2: Test Apparatus

Selection of Test Products

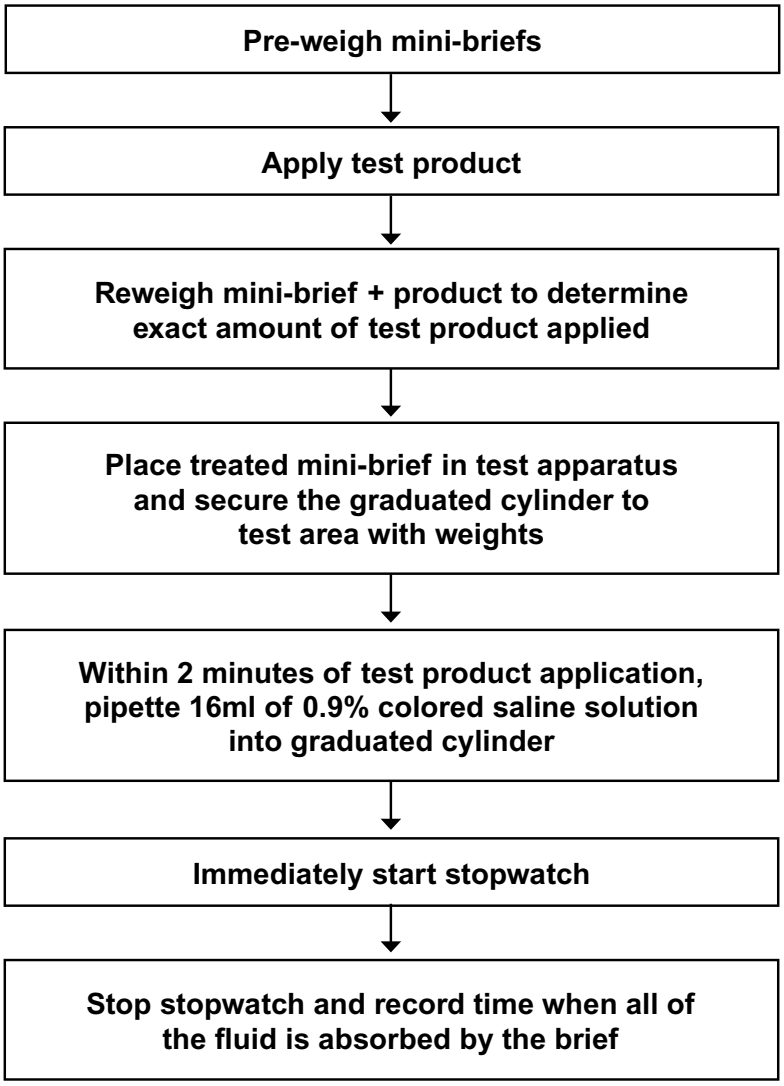
Seven different brands of skin protectants were tested in this experiment and coded Products A through G (Table 1). The test products were applied in a uniform fashion to the marked circles on the mini-briefs at a range-finding rate of 0.1 ml, 0.3 ml, and 0.75 ml. Pilot study tests showed that 0.1 ml was the lowest dose that could be uniformly spread over the test site. The higher two doses were chosen as convenience doses.

Table 1: Skin protectant test products used in the study.

Test Code	Product Name	Manufacturer	Active Ingredient (Amount)
A	Cavilon™ Durable Barrier Cream	3M	Dimethicone (1.3%)
B	Aloe Vesta® Protective Ointment	ConvaTec	Petrolatum (43%)
C	Sensi-Care® Protective Barrier	ConvaTec	Petrolatum (49%), Zinc Oxide (15%)
D	Calmoseptine® Ointment	Calmoseptine	Menthol (0.44%), Zinc Oxide (20.6%)
E	Remedy™ Calazime™ Skin Protectant Paste	Medline Industries	Menthol (0.2%), Zinc Oxide (20%)
F	Secura™ Protective Ointment	Smith & Nephew	Petrolatum (98.8%)
G	Secura™ Extra Protective Cream	Smith & Nephew	Zinc Oxide (30%)

Replicates

A total of 440 individual tests were completed. This included five replicates for each of the seven test products at each of the three application amounts for each of the four absorbent briefs. Additionally, five untreated control replicates were completed for each of the four absorbent briefs. Results of the five replicates were averaged together to determine the mean rate of fluid uptake under each test condition.



Results

Of the three doses of skin protectant applied to the mini-briefs, 0.1 ml provided the best discrimination between products. At a dose of 0.1 ml, approximately 95% of the mini-brief samples absorbed all of the fluid in less than five minutes. In contrast, about 41% of the samples took in all the fluid at the 0.3 ml dose, and only 14% at the 0.75 ml dose. Therefore, the conclusions for this analysis are confined to the lower application dose used in this study.

Statistical Analysis

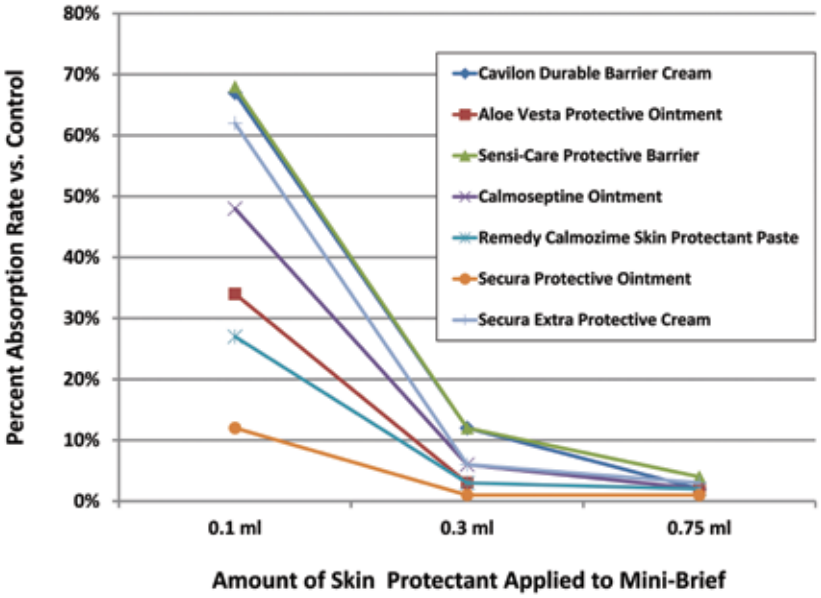
The time for fluid uptake for each of the skin protectants at each of the three application doses for each of the four brands of absorbent briefs were compared to untreated controls for the same brand of absorbent brief. The percent decrease in fluid uptake rate was then calculated for each of the skin protectants and reported as the mean percent decrease across the four brands of absorbent briefs (Figure 3).

With regard to Cavilon Durable Barrier Cream which has a significantly different formulation than all the others (polymer-based, dimethicone containing emulsion), ANOVA comparison testing at the 0.1 ml dose showed that there were statistical differences ($p<0.05$) between it and Aloe Vesta Protective Ointment, Calmoseptine Ointment, Remedy Calazime Skin Protectant Paste, and Secura Protective Ointment.

Table 2: Product Comparisons at the 0.1 ml dose that are <u>not</u> Significantly Different. All other product comparisons are significantly different ($p<0.05$).

Product	Product	p-value
A	C	0.9999
A	G	0.9584
B	D	0.0541
B	E	0.8403
C	G	0.8507
D	G	0.1108

Figure 3: Effect of Skin Protectant on Fluid Uptake Function of Absorbent Briefs



Conclusions

In this study, Cavilon Durable Barrier Cream had a lower potential for interfering with brief absorption function than Aloe Vesta Protective Ointment, Calmoseptine Ointment, Remedy Calazime Skin Protectant Paste, and Secura Protective Ointment.

The results confirm earlier *in vivo* reports that there are differences in the potential of commonly used skin protectants to interfere with absorbent brief function; however, there appears to be no relationship between active ingredient type and brief interference. It is possible that inactive ingredients in some ointment and paste products play a significant role in interfering with brief absorbency.

Key Points

- ***Cavilon Durable Barrier Cream has a lower potential for interfering with brief absorption function.***
- ***There appears to be no relationship between the type of active ingredient and interference with brief function.***

References

1. Hart J. Assessment of incontinence pad blocking potential of 3M Cavilon Durable Barrier Cream compared with Sudocrem and zinc & castor oil. Nursing Scotland 2002;July/August:15.
2. Zehrer CL, Newman DK, Grove GL, Lutz JB. Assessment of diaper-clogging potential of petrolatum moisture barriers. Ostomy Wound Manage 2005;51(12):54-8.

* **Absorbent Briefs Used in the Test**

Brief 1: Depend® Fitted Briefs Maximum Protection (Kimberly-Clark)
Brief 2: Comfort-Aire® HC (Medline Industries)
Brief 3: Tena® Flex Maxi (SCA Hygiene Products AB)
Brief 4: Prevail® Briefs (First Quality)

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