Senate Health, Education and Social Services Committee

Senator Paul Fischer, Chairman

A F.

Bob Steward

Procter & Gamble

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Senate Health, Education and Social Services Committee

Senator Paul Fischer, Chairman

Mike Kennedy

235-7745

Recycle

Senate Health, Education and
Social Services Committee

Senator Paul Fischer, Chairman

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Senate Health, Education and
Social Services Committee

Senator Paul Fischer, Chairman

Fred Shaefer
Kimberly Clark
401 N Lake St.
Neenah, WI
54956

Neenah W 721-2008 ✓

Fax 414-721-3129
Attn. Fred Shaffer
414-721 2787

~~2021-058-412~~

TELECOPY COVER SHEET

TO: Mr. Fred Shaffer
Kimberly Clark Co.
401 N. Lake St.
Neenah, WI 54956

414 - 721 - 3129

From: Alaska State Senate
Health, Education and Social Serivces Committee
Senator Paul Fischer, Chairman
P.O. Box V
Juneau, Alaska 99811

RE: Senate Bill 441
Single use Diaper Ban From Sale.

Date: March 2, 1990

Pages Including Cover: 4

Alaska State Legislature

SENATOR PAUL FISCHER, Chairman
SENATOR JIM DUNCAN, Vice Chairman
SENATOR AL ADAMS
SENATOR LLOYD JONES
SENATOR TIM KELLY

P.O. BOX V
ROOM 508
STATE CAPITOL
(907) 465-3762

Senate Committee on Health, Education and Social Services

Fred:

Here is a copy of the bill, which would ban disposable single use diapers and would also ban various beverages in containers composed of a combination of plastic and metal.

The hearing on this bill is March 14, 1990. 3:30 p.m. Juneau, AK

It will likely be a hearing only.

If you wish to send the committee information on this legislation, please send all information to the following address:

Senator Paul A. Fischer
Chairman
Senate Health, Education and Social Serivces Committee
P.O. Box V
Juneau, Alaska 99811

Attn. David Moses

Thanks DCM

Introduced: 2/6/90
Referred: HESS, L&C and Finance

6-2091A

BY SEN. KERTTULA

IN THE SENATE

SENATE BILL NO. 441

IN THE LEGISLATURE OF THE STATE OF ALASKA

SIXTEENTH LEGISLATURE - SECOND SESSION

A BILL

For an Act entitled: "An Act prohibiting the sale of certain beverages in certain containers and the sale of disposable single-use diapers that are not biodegradable."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

* Section 1. AS 46.06 is amended by adding a new section to read:

Sec. 46.06.095. PROHIBITED SALES. (a) A person may not sell or offer to sell

(1) disposable single-use diapers that are not biodegradable;

(2) a beverage in a container that is composed, excluding the closure device, of a combination of plastic and metal.

(b) A person who violates (a) of this section is guilty of a violation. Each sale or offer to sell is a separate offense.

(c) The department shall adopt regulations under the Administrative Procedure Act (AS 44.62) to provide guidelines to identify the items whose sale is prohibited under (a) of this section.

(d) In this section,

(1) "beverage" means beer or other malt beverage, wine, wine drink, and mineral water, soda water, or carbonated soft drink, in liquid form and intended for human consumption; in this subsection

(A) "other malt beverage" means a beverage obtained by the alcoholic fermentation, infusion, or decoction of barley, malt, hops, or other grain or cereal, and water, including beverages commonly referred to as ale, stout, or malt liquor;

(B) "wine drink" means a drink that consists of wine and concentrated or unconcentrated juice or flavoring material and that contains 7.5 percent or less alcohol by volume;

(2) "container" means an individual, separate, sealed glass, coated paper, metal, or plastic bottle, can, jar, or carton.

* Sec. 2. This Act applies to sales made on or after January 1, 1991.

Introduced: 2/6/90
Referred: HESS, L&C and Finance

6-2091A

BY SEN. KERTTULA

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SENATE BILL NO. 441

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(B) "wine drink" means a drink that consists of wine and concentrated or unconcentrated juice or flavoring material and that contains 7.5 percent or less alcohol by volume;

(2) "container" means an individual, separate, sealed glass, coated paper, metal, or plastic bottle, can, jar, or carton.

* Sec. 2. This Act applies to sales made on or after January 1, 1991.

Contact: Wendy Maurice
Phil Wirth
Ellen Werther

THE GOLDEN ANNIVERSARY OF DIAPER FREEDOM

Where Would America Be Without It?

HUMBLE BEGINNING

Although disposable diapers have been used in Europe for 50 years, they made their U.S. debut in 1958. Vic Mills -- Procter & Gamble researcher and grandfather -- is credited with inventing a forerunner of the modern single-use diaper used by 9 out of every 10 parents today.

PARENTS' PREFERENCE

Single-use products are the predominant diapering system today, accounting for 85% of all diaper changes in the U.S.

A PRACTICAL NECESSITY

For the 50% of working women with children under age 3, disposable diapering convenience is essential.

HOSPITALS' CHOICE

In a recent survey of the nation's 4,485 hospitals, over 95% (4,300) reported the use of disposable diapers in maternity wards.

DOWN WITH DIAPER RASH

Independent research and clinical studies confirm that super-absorbent diapers maintain healthy infant skin.

COST ECONOMY

Based on a 1986 study of 1,362 mothers -- which found that cloth diaperers used an average of 30 more diapers per week -- single-use diapers are less costly on average than diaper services.

ENERGY EFFICIENCY

Single-use diapers are more energy efficient in manufacture and use. Multiple-use products also consume more water in home laundering.

QUALITY TIME BONUS

Diapering with disposables saves a caregiver an estimated 78 hours a year in quality time -- equivalent to a two-week vacation.

- more -

AN AMERICAN CLASSIC

American Baby salutes single-use diapers as "the product that has done more than anything else to make parents' lives a little easier." A Consumer Reports distinction recognized the convenience diaper as one of "50 small wonders and big deals that revolutionized the lives of consumers."

# # #

Contact: Wendy Maurice
Phil Wirth
Ellen Werther

A PUBLIC HEALTH PRIMER

Q: Are single-use diapers more sanitary than cloth diapers?

A: Inadequate water temperatures and inferior home laundering practices can result in bacterial residues on cloth diapers. Home laundering problems include: improper sterilization due to low energy-efficient water temperatures, failure to rinse out detergents, skin reactions from harsh disinfectants, comingled laundry loads and bacteria breeding in diaper pails. A sanitary disposable diaper typically reduces bacteria counts to 2 per square inch from cloth's high of 10,000 per square inch, according to a study published in Clinical Pediatrics. The elimination of diaper pins and unhygienic diaper pails further reduces the risk of infection.

Q: Does the disposal of diapers present any risk of disease transmission to solid waste handlers?

A: No. Dr. John Fox, a former leading epidemiologist with the University of Washington School of Public Health, calculated the occupational risk of disease transmission from single-use diapers to be 1 per 1 million years. A 1980 EPA report confirms that no scientific evidence suggests that single-use diapers pose any health risk to sanitation workers, landfill operators or the general public. Four additional U.S. studies on the health of solid waste handlers also found "no risk" attributable to single-use diaper disposal. A recent review by a group of scientists headed by Dr. Richard Engelbrecht concluded in July 1989 that the presence of soiled diapers in the solid waste stream does not pose a significant health risk to solid waste workers or landfill operators.

Q: Can infectious materials from soiled diapers leach into groundwater?

A: After careful review, the EPA found "not one sound epidemiological study correlating an outbreak of any infectious disease in this country with the pathogen content of solid waste." On average, over 99.9% of the enteroviruses that enter landfills come from animal feces and sewage sludge. In the words of Dr. John Fox, "In brief, the chance of such viruses passing from a good landfill into the public water supply is that of the survival of the proverbial snowball in hell."

Q: Are there any unusual health risks associated with single-use diapers, such as indirect infection from polio vaccination?

A: To the contrary, if infection from baby diapers was a risk, it would have been detected first in cloth diaper service workers, who have high exposure to soiled diapers. According to the Centers for Disease Control, in 1962 -- when disposables accounted for 1/10 of 1% of diaper changes in the U.S. -- 691 polio cases were reported. This contrasts with a low of 8 such cases in 1986, when single-use products were used in 81% of diaper changes. In over 30 years, there has never been a single case of polio attributed to using disposable diapers.

# # #

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REFERENCES REGARDING DISPOSABLE DIAPERS AND PUBLIC HEALTH ISSUES

1. Ware, S.A. A Survey of Pathogen Survival during Municipal Solid Waste and Manure Treatment Processes, EPA 600/8-80-034. August, 1980.

2. Cooper, R.S. et al. Effect of Disposable Diapers on the Composition of Leachates from a Landfill, University of California, Berkeley, 1974.

3. Engelbrecht, R.S. Biological Properties of Sanitary Landfills Leachate in Virus Survival in Waste and Waste Water Systems, 1974.

4. Sobsey, M.D. et al. Studies in the Survival and Fate of Enteroviruses in an Experimental model of a Solid Waste Landfill and Leachate. American Journal of Public Health 64, 912 (1974).

5. Clark, C.S. et al. Incidence of Viral Infection Among Solid Waste Collectors, University of Cincinnati, report to Procter & Gamble Company, 1979.

6. Sobsey, M.D. Field Survey of Enteric Viruses in Solid Waste Landfill Leachates, American Journal of Public Health 68, 858 (1978).

SELECTED DIAPER RESOURCES

Additional information may be obtained by contacting the scientific, medical, industry and environmental experts listed below.

Scientific/Technical

Dr. Daryl Ditz
Cornell Waste Management Institute
(607) 255-8102

Dr. William Rathje
University of Arizona
(602) 621-6290

Dr. Richard Engelbrecht
University of Illinois
(217) 333-3822

Vickie Rocker
Portland Metropolitan
Service District
(503) 221-1646

Parenting

Arlene Rossen Cardozo
Author, Sequencing
(612) 333-6600

Vicky Lansky
Author, Practical Parenting
(612) 475-1505

Kay Willis
Mothers Matter
(201) 933-8191

Medical/Health

Dr. Laurence Foster
Oregon State Health Division
(503) 229-5821

Dr. Karen Laugel
Pedi-Care
(203) 381-9990

Dr. James Leyden
University of Pennsylvania Hospital
(215) 662-6151

Dr. William Sammons
Author, The Self-Calmed Baby
(802) 425-3007

Dr. Loraine Stern
Plaza Posada Medical Center
(805) 255-2229

Industry

Bruce Barman
Weyerhaeuser
(206) 924-3664

Malcolm Bellafronto
Pope & Talbot
(503) 228-9161

- more -

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Industry (continued)

Roger Bognar
American Paper Institute
(212) 340-0600

Ray Chambers
VMG Enterprises, Inc.
(206) 693-6688

Jack Christman
Whitestone Products Group
(201) 752-2700

Ron Lustik
Procter & Gamble
(513) 983-2177

Robert Mannino
American Tissue Corp.
(516) 435-9000

Terry Mills
Scott Paper Company
(215) 522-6753

Robert Munoz
Chicopee (Johnson & Johnson)
(201) 524-1293

George Murphy
Hospital Specialty Company
(312) 858-0200

David Pitassi
Veragon
(713) 682-3104

Randy Schaaf
Ultra Care Products, Inc.
(614) 387-1234

William Sease
Professional Medical Products
(803) 223-4281

# # #

Contact: Wendy Maurice
Phil Wirth
Ellen Werther

DIAPER DOLLAR-NOMICS

An Economic and Energy Evaluation

A COST COMPARISON

(Infant Diapers)

According to a national survey of 1,362 mothers conducted in 1986, cloth diaperers use nearly twice as many diapers per week. In the first two years of life, a cloth-diapered infant will use 3,120 more diapers than a disposable-diapered infant. Based on reported survey usage, infant disposables cost less than diaper services.

	Single-Use (on average)	Multiple-Use (on average)
Diapers Per Week	38	68
Cost Per Diaper	$.18-.22	$.15
Cost Per Week	$6.84-8.36	$10.20

A COST COMPARISON

(Adult Incontinents)

A study published in the July 1989 issue of Geriatric Nursing calculates the cost savings of single-use vs. multiple-use incontinent products to be $18,000, on an annual basis, for a 150-bed nursing home with 75 bladder impaired patients.

	Single-Use	Multiple-Use
Patient Cost Per Day	$3.35	$4.01
Annual Savings Per Patient	$240	$0.0

ENERGY BENEFITS

From production through final disposal, single-use diapers consume 55% less energy than home-laundered diapers.

- more -

ENVIRONMENTAL BENEFITS

A study conducted by Arthur D. Little, Inc. also concluded that disposables create less air pollution to manufacture and require 7 times less water than home-washed products.

TIME IS MONEY

The disposable diapering system trims 78 hours a year in changing efficiency from a caregiver's schedule. This translates into an annual per child savings of $261 for the minimum wage-earner and $750 for the average full-time salaried employee.

THE BOTTOM LINE

When laundry costs, product usage, energy utilization and time efficiency are factored into the equation, single-use diaper products are more cost-effective than multiple-use products.

# # #

Dispelling The Myths

THE TRUTH ABOUT DIAPERS

Contact: Wendy Maurice
Phil Wirth
Ellen Werther

THE MSW DEBATE IN PERSPECTIVE

How the Diaper Stacks Up Against the EPA's Agenda for Action

HIERARCHY

To achieve a 25% reduction in municipal solid waste (MSW) by 1991, the EPA advocates a four-tier strategy of : 1) source reduction, 2) recycling and composting, 3) waste-to-energy incineration, and 4) sanitary landfilling.

MSW CONTRIBUTION

Single-use diapers represent less than 2% of MSW. Archeologist Dr. William Rathje of the University of Arizona determined them to be 1% by weight and 1.5% by volume based on actual landfill digs.

SOURCE REDUCTION

The introduction of super-absorbent diapers in 1986 reduced the volume of diapers entering the waste stream by up to 50%.

RECYCLING

Components of single-use diapers, which are primarily cellulose, are recyclable in the manufacturing process and are currently being recycled by the industry. Recycling of diapers is underway in Seattle, WA, with an additional recycling facility scheduled to come on line in early 1990.

COMPOSTING

The high cellulose content of diapers makes them an ideal candidate for municipal solid waste composting. Composting can organically degrade diaper components and up to 60% of MSW into fertile humus for horticultural use.

INCINERATION

Disposable diapers can be incinerated safely in a waste-to-energy facility with no adverse environmental effects. Wood fibers from the cellulose, as well as the plastic liners and backsheets, burn completely and harmlessly when properly incinerated.

- more -

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LANDFILLING

Diapers can be safely landfilled, along with the rest of solid waste, without fear of disease transmission. A recent report of a Scientific Advisory Group headed by Dr. Richard Engelbrecht of the University of Illinois concluded that landfilled infant diapers and adult incontinence products do not pose a public health risk to water supplies, the community, waste handlers or landfill operators.

# # #

Contact: Wendy Maurice
Phil Wirth
Ellen Werther

THE GREAT DIAPER BIODEGRADABILITY MYTH

FICTION: "Biodegradable" diapers are a new and significant improvement over traditional brands.

FACT: All diapers -- even those not labeled "biodegradable" -- typically contain by volume up to 90% cellulose, which is entirely biodegradable over time when oxygen and water are present. Unfortunately, nothing much biodegrades in landfills.

FICTION: "Biodegradable diapers" break down in landfills.

FACT: To break down organically, materials must be exposed to sufficient moisture and nutrients. These conditions are "starved" in modern sanitary landfills to control leaching and groundwater contamination. There is no reputable evidence that "biodegradables" decompose faster in a sanitary landfill situation.

FICTION: Diapers labeled as "biodegradable" are environmentally superior.

FACT: Six environmental groups advocate a consumer boycott of so-called "degradable" diapers, claiming they don't decompose in oxygen starved landfills, release harmful chemicals when exposed to sun, air and water and complicate recycling. The groups include: the Environmental Defense Fund, the Environmental Policy Institute, Friends of the Earth, Natural Resources Defense Council, Public Citizen and the Coalition for Recyclable Waste.

FICTION: A "biodegradable" plastic backsheet is more desirable than one made of standard polyethylene.

FACT: One "biodegradable" diaper brand actually uses twice as much more plastic in its backsheet. According to Dr. Daryl Ditz of the Cornell Waste Management Institute, questions persist about the safety of accelerated "biodegradable particles" after decomposition. (If biodegradation were to occur, particle molecules might migrate, become volatile or release cher cals used in the product's manufacture.) Until the environmental consequences and efficiency of these products can be determined, U.S. and Canadian environmentalists advise caution.

- more -

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FICTION: Using "biodegradable" diapers will extend landfill capacity and reduce solid waste volume.

FACT: The starch added to the backsheet of diapers claiming biodegradability increases decomposition by only a fraction of 1%. Sixty percent of what now goes to landfills is "biodegradable." However, landfills are filling up because biodegradation doesn't occur to any great degree under sanitary landfill conditions. Therefore, the EPA Agenda for Action calls on recycling and composting initiatives -- rather than accelerated biodegradation -- as solid waste solutions.

FICTION: Improving the biodegradability of diapers will aid recycling and composting alternatives.

FACT: Cornstarch additives typically used in the manufacture of biodegradable plastic make them unsuitable for recycling. Also, the added plastic used in biodegradable diapers is undesirable in compost.

# # #

Dispelling The Myths
THE TRUTH ABOUT DIAPERS

Contact: Wendy Maurice
Phil Wirth
Ellen Werther

DIAPER DERMATITIS

What Every Parent Should Know About Diaper Rash Prevention

THE PROBLEM

Skin irritation occurs when the skin's protective function is weakened and irritated by trapped urine, fecal enzymes and ammonia-elevated pH levels that occur when urine and feces mix.

HOW DIAPERS HELP

Diapers with absorbent gelling material (AGM) lock urine away from baby's skin, resulting in a drier surface and more normal pH levels.

A MEDICAL OPINION

Pediatric physicians, dermatologists, toxicologists, nurses and public health professionals agree that keeping skin dry is important in maintaining healthy infant skin.

CLINICAL CONFIRMATION

At least 17 research studies, many published in such scientific journals as Pediatric Dermatology, the Journal of The American Academy of Dermatology and the Journal of Pediatric Health Care, confirm the effectiveness of AGM diapers in maintaining healthy infant skin. (See attached bibliography.)

MOTHERS KNOW BEST

Dry skin is a key factor in the decision by 9 out of every 10 parents to use disposable diapers, according to numerous consumer attitude surveys..

HOSPITAL REASSURANCE

Today, over 95% of the nation's hospitals with maternity wards use disposable diapers,

DAY CARE PREFERENCE

A 1988 study in Pediatric Dermatology reported that infants in day care environments are less likely to be affected with skin irritation when diapered in AGM disposables.

ADULT APPLICATION

A nursing home study published in the July '89 issue of Geriatric Nursing reports that 65% of patients improved skin condition with single-use incontinent products.

# # #

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SCIENTIFIC PUBLICATIONS ON DIAPER DERMATITIS AND CLINICAL EVALUATIONS OF INFANT DIAPERS CONTAINING ABSORBENT GELLING MATERIALS

DIAPER DERMATITIS ETIOLOGY STUDIES

1. Jordan, W.E., Lawson, K.D., Berg, R.W., Franxman, J.J. and Marrer, A.M., Diaper Dermatitis: Frequency and Severity Among a General Infant Population. Pediatric Dermatology 1986; 3:198-207.

2. Zimmerer, R.E., Lawson, K.D., and Calvert, C.J., The Effects of Wearing Diapers on Skin. Pediatric Dermatology 1986; 3:95-101.

3. Berg, R.W., Buckingham, K.W., and Stewart, R.L., Etiology Factors in Diaper Dermatitis: The Role of Urine. Pediatric Dermatology 1986; 3:102-106.

4. Benjamin, L., Clinical Correlates with Diaper Dermatitis. Pediatrician 1987; Suppl. 1 14:21-26.

5. Berg, R.W., Etiologic Factors in Diaper Dermatitis: A Model for Development of Improved Diapers. Pediatrician 1987; Suppl. 1 14:27-33.

6. Benjamin, L., Berg, R.W., Jordan, W.E., and Zimmerer, R.E., Etiology of Diaper Rash and the Effects of Diapers on Infant Skin Condition. International Dissolving Pulps Conference, TAPPI March 1987.

7. Gaunder, B.N. and Plummer, E., Diaper Rash: Managing and Controlling a Common Problem in Infants and Toddlers. Journal of Pediatric Health Care 1987; 1:26-34.

8. Berg, R.W., Etiology and Pathophysiology of Diaper Dermatitis. Adv. Dermatol 7, 75-98 (1988).

CLINICAL STUDIES WITH ABSORBENT GELLING MATERIAL DIAPERS

9. Campbell, R.L., Clinical Tests with Improved Disposable Diapers. Pediatrician 1987; Suppl. 1 14:34-38.

10. Seymour, J.L., Keswick, B.H., Milligan, M.C., Jordan, W.P. and Hanifin, J.M., Clinical and Microbial Effects of Cloth, Cellulose Core, and Cellulose Core/Absorbent Gel Diapers in Atopic Dermatitis. Pediatrician 1987; Suppl. 1 14:39-43.

11. Keswick, B.H., Seymour, J.L. and Milligan, M.C., Diaper Area Skin Microflora of Normal Children and Children with Atopic Dermatitis. Journal of Clinical Microbiology 1987; 25:216-221.

CLINICAL STUDIES WITH ABSORBENT GELLING MATERIAL DIAPERS

12. Campbell, R.L., Seymour, J.L., Stone, L.C. and Milligan, M.C., Clinical Studies with Disposable Diapers Containing Absorbant Gelling Materials: Evaluation of Effects on Infant Skin Condition. J. Amer. Acad. Dermatology 1987; 17:978-989.

13. Seymour, J.L., Keswick, B.H., Hanifin, J.M., Jordan, W.P. and Milligan, M.C., Clinical Effects of Diaper Types on the Skin of Normal Infants and Infants with Atopic Dermatitis. J. Amer. Acad. Dermatology 1987; 17:988-997.

14. Campbell, R.L., Bartlett, A.V., Sarbaugh, F.C. and Pickering, L.K., Effects of Diaper Types on Dermatitis Associated with Diarrhea and Antibiotic Use in Children in Day Care Centers, Pediatric Dermatology 1988; 5:83-87.

15. Austin, A.P., Milligan, M.C., Perrington, K. and Tweito, D.H., A Survey of Factors Associated with Diaper Dermatitis in Thirty-six Pediatric Practices. J. Ped. Health Care 2, 295-299 (1988).

MICROBIOLOGY EVALUATIONS OF ABSORBENT GELLING MATERIALS

16. B.H. Keswick, Evaluation of the Growth of Microorganisms in Diaper Absorbant Materials. Journal of Industrial Microbiology 3, 21-28 (1988).

POSTER PRESENTATIONS

17. Seymour, J.L., Keswick, B.H. and Milligan, M.C., Comparison of Diaper Rash in Babies with Atopic Dermatitis as Influenced by Diaper Type. Poster Session, American Academy of Dermatology Forty-fifth Annual Meeting, December 1986.

18. Campbell, R.L., Bartlett, A.V., Sarbaugh, F.C. and Pickering, L.K., Effects of Diaper Types on Diaper Dermatitis Associated with Diarrhea and Antibiotic Use in Infants and Toddlers. Poster Session, American Academy of Dermatology Forty-sixth Annual Meeting, December 1987.

SYMPOSIUM PROCEEDINGS

19. Proceedings of an International Symposium, Diapering and Infant Skin Care, Hakone, Japan, June 12, 1986, Pediatrician 14 S1 (1987)

20. Diaper Dermatitis: Later Insight into Pathogensis, Prophylaxis, and Therapy, Proceeding of Second International Conference on Diapering and Infant Skin Care, Dortmund, Germany. Editors Prof. Dr. H. Tronnier and Dr. G.J. Schmitt.

Contact: Wendy Maurice
Phil Wirth
Ellen Werther

ADULT INCONTINENCE

Coping with an Uncontrollable Condition

THE PROBLEM

More than 10 million adults in the United States suffer to some degree from impaired bladder control, a condition that typically restricts mobility, reduces independence and lowers self-esteem. The sedentary lifestyle of geriatric patients in nursing homes also makes them particularly susceptible to the weakening of delicate skin.

HOW INCONTINENCE PRODUCTS HELP

Single-use briefs can help adults eliminate embarrassing accidents and unpleasant odors comfortably and confidently. Their high absorbency results in drier skin and reduced occurrence of skin irritation and infection.

CAREGIVER BONUS

Today, more than 70 percent of the nation's nursing homes use single-use incontinence products. A study published in 1988 by the National Foundation for Long Term Health Care (NFLTHC) found disposables required 25% fewer changes than other products and eliminated 78% of all leaks.

QUALITY TIME

Disposable incontinent management systems yield fewer, quicker changes and clean ups. In a typical 100-bed nursing facility, this frees up 4 full-time nurse assistants for more demanding, intensive care.

SKIN CARE CONFIRMATION

A 1987 NFLTHC study reported that nursing homes in Ohio that did not use single-use incontinence products had three times more skin irritation among patients. The same study also disclosed that nursing homes in Colorado that did use single-use products had a lower incidence of irritation.

COST-EFFECTIVENESS

A report published in the July 1989 issue of Geriatric Nursing calculated the cost savings of single-use vs. multiple-use incontinent products to be $18,000, on an annual basis, for a 150-bed nursing home.

ENVIRONMENTAL NOTE

Single-use adult incontinence products represent less than 1/10th of one percent of the municipal waste stream.

# # #

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THE PROCTER & GAMBLE COMPANY
STATE & LOCAL GOVERNMENT RELATIONS
1 PROCTER & GAMBLE PLAZA, CINCINNATI, OHIO 45202-3315

February 27, 1990

Mr. Dave Moses
P.O. Box V
Juno, Alaska 99811

Dear Mr. Moses:

Here are some information kits related to the subject of "biodegradability in disposable diapers."

I would appreciate your providing these copies to the members of the Senate Health Committee, as we discussed today.

And, when Senate Bill 441 is actually sent for a hearing, I would be grateful if you would call me as soon as possible so that we might arrange to send some of our experts on biodegradability and disposable diapers to participate in the hearing.

Thanks again for the information you provided me today. I will probably give you a call every week or so on this subject and look forward to working with you.

Sincerely,

Robert B. Stewart

Robert B. Stewart

RBS441:eof

Attachments

Etiology of Diaper Dermatitis

This booklet was prepared for you by the makers of Ultra Pampers Plus because we know that when your patients turn to you for advice, you want to give them the most current and accurate information available. We hope you find this booklet informative. For your convenience, a selection of key scientific abstracts is enclosed at the back of the booklet.

Historical Perspective

Though diaper dermatitis was described in the medical literature as early as 1877 (1), it was not until 1905 that Jacquet (2) clearly defined the commonly occurring lesions and differentiated them from congenital syphilis. This point was also stressed by Adamson in 1908 (3). He identified simple irritation, streptococcal impetigo and seborrhoeic dermatitis as three common causes of dermatitis in the diaper area that needed to be distinguished from syphilis. He also proposed that "wet or soiled napkins" were a probable source of the local irritation observed in diaper dermatitis, but did not suggest a specific cause for the irritation.

The first attempt to identify the irritant source in diapers was by Zahorsky in 1915 (4). He used a series of case reports in which he noted the presence of both "ammoniacal diapers" and diaper dermatitis to conclude that ammonia was the primary source of irritation in diapers.

Zahorsky's proposal that irritation of the diaper region was caused by the presence of ammonia in diapers was further developed and reinforced in publications by Cooke in 1921 (5) and 1926 (6). He reported the isolation of a gram-positive bacillus from stool samples of infants with ammoniacal diapers. He called the organism *Bacillus ammoniagenes* after demonstrating that it produced ammonia from urine. On the basis of experiments with these bacteria, Cooke concluded that "the common erythematous or papulo-vesicular dermatitis of the gluteal region in infants is caused by ammonia in the diaper..."

The idea that direct irritation from ammonia in diapers was the primary cause of diaper dermatitis remained essentially intact and unchallenged until 1955. At that time, Rapp (7) reported that pads wetted with putrefied urine, which did not contain ammonia, caused skin irritation that was not pH dependent. He concluded that toxins produced from the enzymatic breakdown of amino acids in urine also contributed to the irritation of diaper dermatitis.

Further recognition that irritation leading to diaper dermatitis did not have a single source was provided by Burgoon, Urbach and Grover in 1961 (8). They divided the causes of diaper dermatitis into two major categories, predisposing factors and activating factors. The predisposing factors included reactive skin, seborrheic diathesis and systemic disease. The activating factors included maceration, sweat retention, contactants, goneigenic factors, infection and trauma. A similar concept was also used in a classification system proposed by Koblenzer in 1973 (9). He suggested that skin diseases in the diaper area should be divided into the following catagories:

1. Those occurring whether or not diapers are worn.
2. Those indicative of latent tendencies which are triggered by the wearing of diapers.
3. Those occurring in nonpredisposed individuals, as a direct consequence of wearing the diapers.

The classification systems of Burgoon et. al. (8) and Koblenzer (9) emphasized the importance of activating factors in the development of diaper dermatitis. At this time, ammonia from urine was still considered one of the most common activating factors. However, this began to change after Leyden et. al. (10) published a study on ammonia levels in urine from infants with and without diaper dermatitis. No significant difference was found in the urinary ammonia levels for the two groups. In addition, experimental application of highly ammoniacal urine on intact adult or infant skin did not produce irritation.

The demonstration by Leyden et. al. (10) that ammonia does not irritate intact skin, even at concentrations much higher than those measured in "ammoniacal diapers" again raised the question of what agent or mechanism is responsible for the development of diaper dermatitis. The answer to this question may be found in recent studies showing that wetness in the diaper area causes normal skin to be compromised. When skin is compromised, normal fecal proteases and lipases act as primary irritants in the diaper environment, as bile salts and increased alkalinity from the mixture of urine and feces potentiate their action on the skin.

With this information, a deductive model for irritant diaper dermatitis has been developed. The key elements of this model, the work that led to its development and the clinical studies that verified its accuracy are presented in the following sections of this booklet.

What Causes Diaper Dermatitis

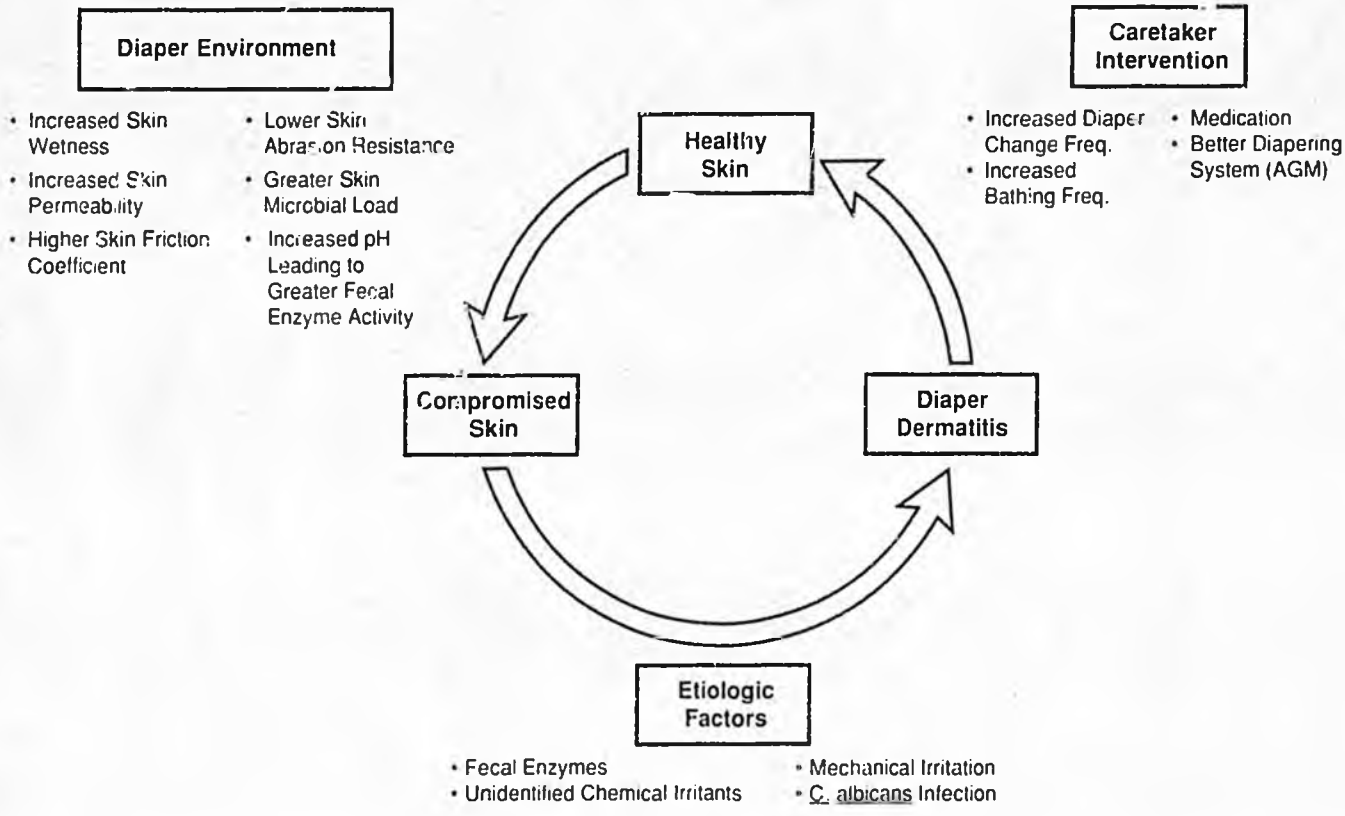
An intensive research program has been conducted to more fully understand the causes of diaper dermatitis. The key concepts developed from this work are presented below. A more detailed account of this area is available in a review by R.W. Berg (Abstract #1).

The investigations on the mechanisms of diaper dermatitis indicate that it is a cyclic process made up of three distinct stages.

Stage 1: Healthy Skin Becomes Compromised

The diaper dermatitis cycle begins when the protective function of the normal infant's stratum corneum is weakened or compromised. There are several ways that healthy skin can become compromised.

Wetness - Urine trapped in the semi-occluded environment of the diaper causes the skin to become hydrated. Hydrated skin is more susceptible to abrasion, is more easily penetrated by irritants and has increased numbers of microorganisms.



Fecal enzymes - The protease and lipase enzymes that are naturally present in feces attack the skin and cause irritation. Even in the absence of frank irritation, skin permeability is increased.

Interaction of urine and feces - Ammonia is formed when urease produced by fecal bacteria is allowed to act on the urea in urine. The ammonia raises the pH of the diaper environment. This leads to an increase in the activity of the protease and lipase enzymes present in feces and increased skin permeability. Both factors contribute to increased skin damage.

Stage 2: Attacks on Compromised Skin Can Lead To Diaper Dermatitis

Weakened or compromised skin is less able to act as a protective barrier. As a result, the following factors can work individually or in combination to cause an episode of diaper dermatitis.

Friction - The action of skin rubbing against skin or against the diaper, can result in chafing and skin damage.

Chemical and enzymatic irritation - Fecal proteases and lipases, in addition to other substances commonly present in urine and feces, can cause further irritation of the skin and lead to the development of irritant contact dermatitis.

Microbial infection - Microorganisms in the stool, especially *Candida albicans*, may infect the compromised skin. The longer lasting, more severe episodes of diaper dermatitis are often the result of candidal infections.

Stage 3: Restoration of Normal Skin

Resolution of the dermatitis, usually within 2 to 3 days, completes the cycle. Common diaper dermatitis tends to be self-limiting and episodic in nature. Caretaker intervention may play a role in the process. Changes in habits and practices, such as more frequent diaper changes or use of medications, are usually begun as the condition of the skin first begins to deteriorate. These actions allow the skin to return, at least temporarily, to a more normal state.

Interrupting The Diaper Dermatitis Cycle

The research that led to the development of this model for diaper dermatitis also led to the use of an absorbent gelling material (AGM) in diapers. The addition of AGM to the absorbent core of a diaper has three effects:

1. Reduced movement of wetness out of the diaper onto the skin.
2. Buffering at a pH close to that of normal skin is provided.
3. Mixing of urine and feces is decreased. This decreases ammonia formation and subsequent increases in pH and fecal enzyme activity.

Because of these actions, it was predicted that the AGM diapers would keep diapered skin dryer and at a more normal pH. If the diaper dermatitis model is correct, this should lead to a decrease in the incidence and severity of diaper dermatitis. To test this prediction, AGM diapers (Ultra Pampers) were compared with conventional disposable and home-laundered cloth diapers in a series of studies involving over 1600 children with normal skin, as well as atopic children, children on oral antibiotic therapy, and children with diarrhea. As predicted by the model, the results from these studies show that children who wore AGM diapers had dryer skin and less diaper rash.

Developments of the Diaper Dermatitis Model

In 1977, Leyden et. al. (10) demonstrated that an aqueous 1.6% solution of ammonia, five times the mean level found in diapers from infants with diaper dermatitis, was not irritating to the intact skin of either adults or infants. This work clearly challenged the notion that ammonia in soiled diapers was the primary cause of irritant diaper dermatitis, and reopened the question of what factor or factors were responsible for the development of diaper dermatitis. In the early 1980's, a series of studies was conducted to provide definitive information on the etiology of diaper dermatitis. The ultimate goal of this program was to use this information to develop a diape that would result in a decreased incidence and/or severity of diaper dermatitis.

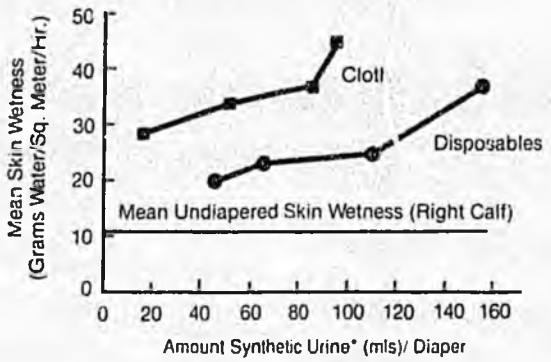
The investigations began with a series of clinical studies to identify factors which correlated with the frequency and severity of diaper dermatitis. These studies, reported by Jordan et. al. (Abstract #2) and Benjamin (Abstract #3), showed that age, diet, bowel movement frequency and diaper type were important factors in the occurrence of diaper dermatitis. This initial work led to detailed mechanistic studies on the development of diaper dermatitis.

The Role of Wetness

The first of these mechanistic studies focused on skin wetness. Previous work had suggested that increased levels of skin hydration may be important in the development of diaper dermatitis (11,12,13). To study this question, Zimmerer et.al. (Abstract #4) used patches made from both cloth and disposable diaper material loaded with synthetic urine. Using this model it was found that skin wetness was increased more with cloth diaper patches than with the disposable diaper patches. Measurements of skin wetness in the diaper area of infants wearing conventional disposable or cotton cloth diapers prewetted with synthetic urine confirmed this observation (Figure 1). Additional studies revealed several important characteristics of wet skin. First, skin that is wet is more permeable to low molecular weight compounds than skin that is dry. This suggests that the hydrated skin in the diaper area is probably more susceptible to low-molecular weight irritants than undiapered skin. Second, wet skin has a higher coefficient of friction and is more susceptible to abrasion than dry skin. Finally, wet skin supports more microbial growth than dry skin.

Figure 1.

Effect of Prewetted Diapers on Infant Skin Wetness†



*Distilled water containing 1% NaCl and 0.0025% Triton X-100

† Adapted from Zimmerer et. al. (Abstract #4).

The Roles of Feces and Urine

In its most common form, diaper dermatitis is an acute, irritant contact dermatitis. Though feces and urine are the two obvious sources of irritation in the diaper environment, identification of the specific components responsible for their action has been a source of controversy. To resolve this controversy, studies were done to clearly define the roles of feces and urine in the etiology of diaper dermatitis.

Using the hairless mouse as a model system, Buckingham and Berg (Abstract #5, determined that the protease and lipase enzymes normally present in the feces of infants are responsible for most of the irritation caused by infant stool. Two other points, of equal importance, were also noted. First, enzymes not only irritate the skin directly, but also increase the susceptibility of the skin to other potential irritants such as bile salts. Second, protease and lipase activity increases sharply with a rise in pH. For this reason, small increases in the pH of the diaper environment could significantly increase the activity and irritancy of the enzymes in infant feces.

Berg et. al. (Abstract #6) found that the irritation potential of urine by itself was minimal. However, the combination of infant feces and urine caused significantly higher levels of irritation than that caused by feces alone. Further work showed that combining urine and feces allowed the formation of ammonia which caused

an increase in both the pH and the irritancy of the feces/urine mixture.

These observations were significant for two reasons. First, they were in agreement with findings on how diet and bowel movement frequency affect the occurrence of diaper dermatitis as noted in a clinical survey study of over one thousand infants (Abstracts #2 and #3). Second, they showed that the historic association between ammonia and diaper dermatitis was not wrong, but a misinterpretation. The primary irritants in the diaper environment are fecal protease and lipase, not ammonia. However, the activity and irritancy of the enzymes is increased when ammonia, formed by the action of fecal urease on urine, causes a rise in the pH of the diaper environment.

With the facts in hand, it was finally possible to propose a model for the development of diaper dermatitis (Abstracts #7, #8 and #9). The key aspects of the model are illustrated in the figure on page 4 of this booklet. In summary, it shows that wetness creates conditions which compromise the integrity of healthy skin. In this hydrated state, the skin is more susceptible to damage by abrasion, has a higher microbial load and its ability to act as a barrier is decreased. The skin is further compromised by increased fecal protease and lipase activity that occurs as the diaper area pH rises due to the presence of ammonia formed by the action of fecal urease on urine. The result is the development of diaper dermatitis. The cycle is completed over a period of 2 to 3 days as the dermatitis is resolved. Action by the infant's caretaker, such as more frequent diaper changes, more thorough cleaning of the diaper area and the use of topical medication, probably plays a role in the resolution of the dermatitis.

Clinical Confirmation of the Diaper Dermatitis Model

The results of laboratory experiments indicated that increases in skin wetness, skin pH and fecal enzyme activity are key factors involved in the development of diaper dermatitis. On the basis of this information, it was proposed that a diaper capable of minimizing the occurrence of these conditions would decrease the incidence and severity of diaper dermatitis in the infants who wore them. To achieve these effects, an absorbent gelling material (AGM) was added to the cellulose core of disposable diapers.

The AGM is a cross-linked polymer of sodium polyacrylate. This nontoxic material holds urine tightly and provides buffering capacity in the pH range of normal skin. It was predicted that by including AGM in the diaper core there would be a decrease in skin wetness, more normal skin pH, and less mixing of urine and feces resulting in lower fecal enzyme activity. The ability of AGM diapers to safely and effectively produce these effects, and to decrease the incidence and severity of diaper dermatitis, was tested and validated in an extensive series of clinical and microbiological studies using home-laundered cloth, conventional disposable, and AGM disposable diapers (Ultra Pampers).

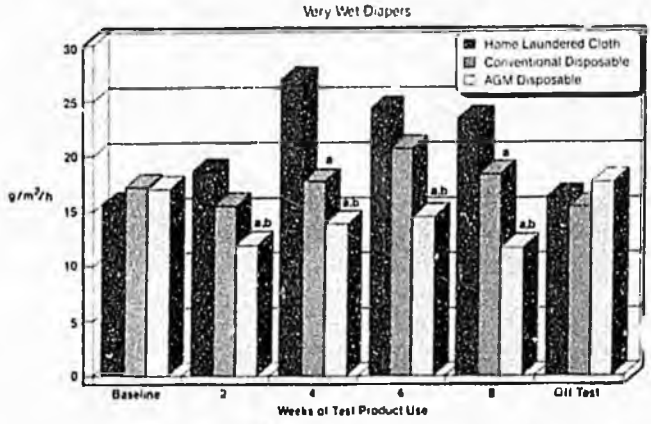
Studies in Infants with Normal Skin

A series of four controlled clinical studies was conducted among infants with normal skin (Abstracts #10 and #11). Earlier reports by Grant et. al. (14), Wiener (15) and Stein (16) have reported conflicting results about the effectiveness of cloth and disposable diapers in controlling diaper dermatitis. In the studies presented here, AGM disposable diapers were tested against conventional disposable and home-laundered cloth diapers, using a protocol that controlled variables, other than the diaper, that could affect the occurrence of diaper dermatitis.

The results from these four clinical studies show that infants who wore AGM diapers had lower skin wetness (Figure 2) and more normal

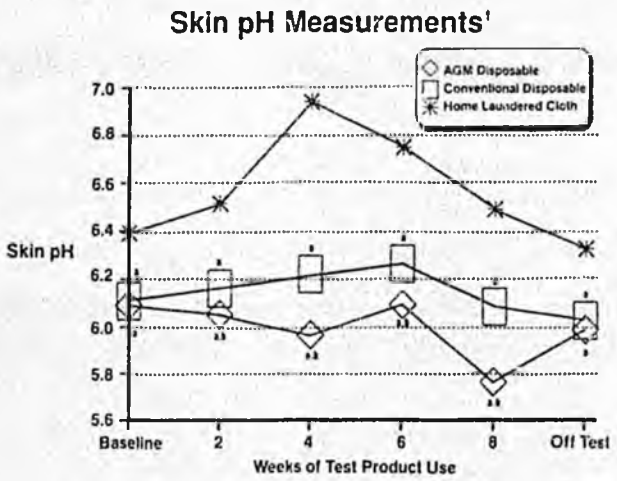
Figure 2.

TEWL Measurements[1]



[a]Statistically significant ($p \leq 0.05$) difference from home-laundered cloth
[b]Statistically significant ($p \leq 0.05$) difference from conventional disposable diapers
[1] Adapted from Campbell et. al. (Abstract #10)

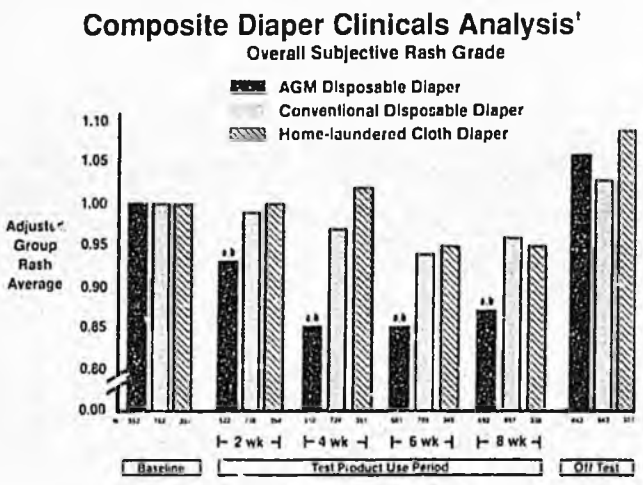
Figure 3.



[a]Statistically significant ($p<0.05$) difference from home-laundered cloth
[b]Statistically significant ($p<0.05$) difference from conventional disposable diapers
[1] Adapted from Campbell et al. (Abstract #10)

skin pH (Figure 3). An aggregate analysis across all studies showed a lower incidence of diaper dermatitis among infants who wore AGM diapers relative to those who wore conventional disposable or cloth diapers (Figure 4).

Figure 4.



[a]Significantly less ($p<0.05$) than home-laundered cloth group
[b]Significantly less ($p<0.05$) than conventional disposable diaper group
[1] Adapted from Campbell et al. (Abstract #10)

Evaluation in Infants Prone to Diaper Dermatitis

Diarrhea and the use of oral antibiotics are often associated with an increase in the incidence and/or severity of diaper dermatitis. Both diarrhea and oral antibiotic use are more frequent among children at day care centers than in a general population. In order to get a more complete assessment of the impact that use of AGM diapers has on the occurrence of diaper dermatitis, Campbell et al. (Abstract #12) conducted a prospective study on the frequency and severity of diaper dermatitis among children at day care centers. The results showed that children who wore AGM diapers had a lower mean diaper dermatitis grade during diarrhea episodes and periods of oral antibiotic use than children using conventional disposable diapers. Cloth diapers were not evaluated in this study since they were not normally used at the day care centers.

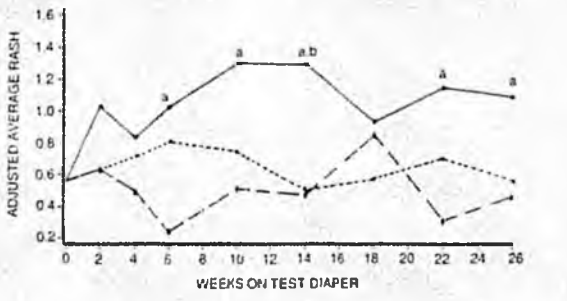
Evaluation in Infants with Atopic Dermatitis

The results of the clinical studies among infants with normal skin and among children with diarrhea or using oral antibiotics, clearly demonstrated that AGM diapers provide an environment that helps maintain the health of the skin in the diaper area. However, not all infants have the advantage of beginning life with normal skin. Atopic dermatitis is an inherited, cutaneous inflammatory condition that commonly occurs during infancy and affects up to 10% of children. It is characterized by dry, erythematous and highly pruritic skin which becomes excoriated, eroded and exudative as a result of rubbing and scratching. Increased hydration of the affected areas is important in relieving the dryness and pruritis associated with atopic dermatitis. Since AGM diapers cause less skin hydration than conventional disposable or cloth diapers, the question was raised whether the decreased level of skin wetness would increase susceptibility of the diaper area to irritation and result in an increased frequency of diaper dermatitis among infants with atopic dermatitis.

To address this question, a prospective, blind study was conducted to determine the relationship of home-laundered cloth, conventional disposable and AGM disposable diapers to the occurrence of diaper dermatitis in normal infants and infants with atopic dermatitis (Abstracts #13 and #14). As shown in Figure 5, at 5 of 8 grading periods, the group of infants with atopic dermatitis that wore AGM diapers had lower mean dermatitis grades than the conventional disposable diaper groups and had significantly lower scores than the home-laundered cloth group. These results clearly show that the use of AGM diapers does not make atopic skin in the diaper area more susceptible to irritants that cause diaper dermatitis.

Figure 5.

Average diaper rash grades for the three diaper test groups with atopic dermatitis†



a) significantly higher than AGM cellulose diaper groups ($p<0.05$)
b) significantly higher than cellulose diaper groups ($p<0.05$)
† Adapted from Seymour et. al. (Abstract #14)

Microbiological Evaluations

Cloth, conventional disposable and AGM diapers were compared for their ability to affect microbial growth both *in vitro* and on diapered skin (Abstract #15). An *in vitro* study was done to determine if any of the diaper materials, when wetted with urine, contributed to the bacterial nutrient pool or if they enhanced the growth capacity of the substrate surface. In the presence of urine, none of the diaper materials assisted in the growth of selected microorganisms isolated from the skin (Table 1).

Studies on the microbiology of diapered skin also included a comparison of the microbial skin flora of atopic and nonatopic infants and the effect of diaper type on the balance of skin microflora. The only significant difference was a higher isolation frequency of *Staphylococcus aureus* from the skin of atopics. The association between the presence of *S. aureus* and atopic disease is well known (17).

Comparison of the microflora in diapered and nondiapered areas, showed that none of the diapers tested caused a change in the microfloral balance. However, the number of organisms on diapered skin was closer to that of undiapered skin for infants that used the AGM diapers. This is probably because the AGM diaper keeps the skin drier than cloth or conventional disposable diapers.

Table 1.

Growth of Microorganisms on Diaper Swatches†

Organism	Starting Inoculum (log_{10} CFU/ml)	Diaper Swatches*	Log_{10} CFU/ml at Incubation Time (h):		Log Change From 0 h at Incubation Time (h):	
			5	24	5	24
C. albicans	3.5	None	3.9	7.2	0.5	3.6
		Disposable	3.9	6.8	0.5	3.3
		AGM Disposable	4.1	6.9	0.6	3.5
		Cloth	3.9	7.7	0.4	4.2
S. aureus	4.3	None	4.8	8.0	0.5	3.7
		Disposable	5.0	7.8	0.7	3.5
		AGM Disposable	4.2	6.9	-0.2	2.5
		Cloth	5.1	8.0	0.8	3.7
E. coli	3.4	None	4.1	8.9	0.7	5.5
		Disposable	4.6	9.3	1.1	5.9
		AGM Disposable	4.3	8.9	0.8	5.6
		Cloth	4.3	9.1	0.8	5.6
P. vulgaris	3.6	None	3.7	7.8	0.2	4.5
		Disposable	4.0	8.3	0.4	5.1
		AGM Disposable	3.8	8.6	0.3	5.4
		Cloth	3.6	7.5	0.0	4.3

* Diaper swatches (diameter, 2 in. [5.08cm]) were inoculated with the test organisms suspended in urine at 10 times the volume per weight and incubated for either 5 or 24 h at 37°C. Values are the means of duplicate experiments.
† Adapted from Keswick et. al. (Abstract #15).

Conclusion:

The results of laboratory studies led to the proposal of a model that describes the etiology of diaper dermatitis. The model predicted that skin wetness, skin pH and fecal enzyme activity are important factors in the development of diaper dermatitis. The results of the clinical and microbiologic studies noted above, clearly support the model by showing that a disposable diaper containing AGM can safely and effectively reduce the occurrence and severity of diaper dermatitis through its ability to maintain a healthier, environment for skin by reducing skin wetness, maintaining a more normal skin pH and reducing the mixing of urine and feces.

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ABSTRACT #1

ETIOLOGY AND PATHOPHYSIOLOGY OF DIAPER DERMATITIS

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Adv Dermatol 3:75-98, 1988

Common diaper dermatitis is a group of skin disorders that result from attack of the skin by physical, chemical, enzymatic, and microbial factors in the diaper environment. The integrity of healthy skin is compromised by the very nature of the diaper environment, and normal intact skin therefore remains an elusive goal of current diapering practices. Moist occlusion promotes miliaria, and causes an increase in the coefficient of skin friction. Skin hydration and an increase in skin pH result in impaired barrier function, and fecal enzymes begin to attack the skin, further degrading its normal ability to cope with its environment. Skin in this weakened state is susceptible to a variety of biological, chemical, and physical insults that can cause or aggravate diaper dermatitis. These include attack of the skin by fecal enzymes and other irritants in urine and feces, mechanical abrasion, and infection by *C. albicans*.

Diapering is unquestionably an effective and convenient way of localizing an infant's excreta. Unfortunately, infant skin was not designed to operate continuously in the resulting environment, and is frequently unable to weather this assault. However, by improving the inherently adverse relationship between diapers and diapered skin, one can have a significant effect on the incidence and severity of diaper dermatitis. A diaper that keeps skin drier will result in skin that is less permeable to irritants, supports less microbial growth, is less susceptible to chafing damage, and has less contact with irritants in urine and feces. A diaper that maintains the environment closer to the normal acidic pH of skin will promote skin that is less permeable to irritants, and reduce the irritancy of fecal enzymes. Finally, a diaper that limits the mixing and spreading of urine and feces will result in less potentiation of enzyme activity and less contact of the skin with fecal irritants.

Diaper dermatitis, by definition, cannot exist in the absence of diapers. Moreover, diaper dermatitis will become less troublesome for the infant population to the degree that diapered skin can be provided an environment closer to that of undiapered skin.

ABSTRACT #2

DIAPER DERMATITIS: FREQUENCY AND SEVERITY AMONG A GENERAL INFANT POPULATION

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Pediatric Dermatology 3 (3): 198-207, 1986

The frequency and severity of diaper dermatitis was measured among a Midwestern suburban population of 1089 infants ranging in age from 1 to 20 months. No diagnosis of specific etiology was made. Fecal samples were collected and analyzed for *Candida albicans*, and information on family characteristics, infant diet, general health, history of rash, and diapering habits and practices was collected by questionnaire. The distribution of the severity of observed diaper rash can be described as a logarithmic-normal function, implying several multiplicative causative factors. Within the total severity range, there appear to be three subcategories of diaper rash, differing in some manner, perhaps reflecting different etiologies. The frequency of observed diaper rash was a function of the maturity of the infant, reaching a maximum around 9 to 12 months of age. The prevalence of severe rash correlated with the presence and level of fecal *C. albicans*. Infants diapered exclusively in disposable diapers showed less rash ($P < 0.001$) than those diapered exclusively or sometimes in cloth diapers.

ABSTRACT #3

CLINICAL CORRELATES WITH DIAPER DERMATITIS

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Diapering and Infant Skin Care. Proc. Int. Symp., Hakone 1986
Pediatrician 14: suppl. 1, 21-26, 1987

Three types of clinical studies were carried out to better understand diaper dermatitis in a general infant population. In 'snapshot' clinical studies, skin condition under the diaper was evaluated at a given point in time across a large base of infants. Correlations were sought between diaper dermatitis incidence and severity and a number of factors, including sex, diet, maturity, type of diaper, history of allergy, contact with fecal matter, presence of *Candida albicans*, and diaper change frequency. Severe diaper rash correlated strongly with the presence of *C. albicans*, and the frequency of rash correlated with duration of contact with feces and inversely with diaper change frequency. Diaper rash peaked at ages 9-12 months and was lower for breast-fed than for formula-fed infants. Exclusive use of disposable diapers correlated with lower rash levels than when some or all cloth diapers were used. In a longitudinal study, infants were observed daily for 50 days in order to determine the frequency and duration of rash episodes. In this study, the tendency for some infants to be rash-prone was clearly indicated. In a third type of study, over 10,000 infant visits to physicians' offices were used to record skin condition. Results showed a three- to four-fold increase in diaper rash if the child had diarrhea during the previous 48 h.

ABSTRACT #4

THE EFFECTS OF WEARING DIAPERS ON SKIN

R. E. Zimmerer, Ph.D., K. D. Lawson, Ph.D., and C. J. Calvert
The Procter & Gamble Company, Cincinnati, Ohio
Pediatric Dermatology 3 (2): 95-101, 1986

Wearing dry and wet cloth and disposable diaper materials has certain effects on the degree of skin wetness. These, in turn, affect the coefficient of skin friction, the skin's susceptibility to abrasion damage, its permeability, and its support of microbial growth. These effects were explored using an adult model wearing forearm patches. The adult model was validated by comparisons of skin wetness and friction values for infants and adults determined under similar conditions. Skin wetness was proportional to diaper wetness. With increased skin wetness, there were increased coefficients of friction and increased abrasion damage, skin permeability, and microbial growth. Cloth diaper material produced wetter skin than did disposable diaper material at equivalent loadings.

ABSTRACTS #5

ETIOLOGIC FACTORS IN DIAPER DERMATITIS: THE ROLE OF FECES

Kent W. Buckingham, Ph.D., and Ronald W. Berg, Ph.D.
The Procter & Gamble Company, Cincinnati, Ohio
Pediatric Dermatology 3 (2): 107-112, 1986

While the etiology of diaper dermatitis in infants is complex, it is generally believed to involve an interaction between skin and irritants in feces and urine. Proteases and lipases were identified as the major irritants in the feces of infants, and bile salts were found to potentiate the damage produced by the action of fecal enzymes on skin. Fecal enzymes also increased the permeability of skin, thereby increasing potential susceptibility to other irritants in the diaper environment.

ABSTRACT #6

ETIOLOGIC FACTORS IN DIAPER DERMATITIS: THE ROLE OF URINE

Ronald W. Berg, Ph.D., Kent W. Buckingham, Ph.D., and Robert L. Stewart
The Procter & Gamble Company, Cincinnati, Ohio
Pediatric Dermatology 3 (2): 102-106, 1986

Diaper dermatitis may result after repeated or prolonged contact of skin with urine and feces. A hairless mouse model was used to elucidate the role of urine in this process. The results of this work suggest that an important function of urine in the etiology of diaper dermatitis is to increase the pH of the diaper environment by breaking down urea in the presence of fecal urease. This rise in pH increases the activities of fecal proteases and lipases, which can damage skin. Urine can also increase the permeability of diapered skin to irritants and can directly irritate skin when exposure is prolonged.

ABSTRACT #7

ETIOLOGIC FACTORS IN DIAPER DERMATITIS: A MODEL FOR DEVELOPMENT OF IMPROVED DIAPERS

Ronald W. Berg, Ph.D.
The Procter & Gamble Company, Cincinnati, Ohio
Diapering and Infant Skin Care. Proc. Int. Symp., Hakone 1986
Pediatrician 14: suppl. 1, 27-33, 1987

Common diaper dermatitis is an episodic disease that results from attack of the skin by physical, chemical, enzymatic, and microbial factors in the diaper environment. A model for the cyclic nature of this disease has been developed which incorporates various roles these factors play as they interact to produce skin with compromised physical properties, and further damage it to produce diaper dermatitis. Resolution occurs naturally or through caretaker intervention, resulting in mean episodic durations of 2-3 days. The model predicts that preventing excessive skin hydration, maintaining skin near its normal physiologic pH, and minimizing interaction of urine and feces (which increases pH and fecal enzyme activity) will result in decreased incidence and severity of diaper dermatitis.

ABSTRACT #8

ETIOLOGY OF DIAPER RASH AND THE EFFECTS OF DIAPERS ON INFANT SKIN CONDITION

L. Benjamin, Ph.D., R. W. Berg, Ph.D., W. E. Jordan, Ph.D., and R. E. Zimmerer, Ph.D.
The Procter & Gamble Company, Cincinnati, Ohio
International Dissolving Pulps Conference,
TAPPI: 265-268, March, 1987

The skin in the diapered area of infants is adversely affected by the environment created by diaper wearing, and diaper rash is a common result of exposure to this environment. Changes in diaper construction and materials can promote skin which is drier, less permeable to irritants, supports less microbial growth, is less susceptible to chafing damage, and has less contact with irritants in urine and feces. The result is skin which is less prone to diaper rash.

ABSTRACT #9

DIAPER RASH: MANAGING AND CONTROLLING A COMMON PROBLEM IN INFANTS AND TODDLERS

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[a] The University of Kentucky School of Nursing, Lexington, Kentucky
[b] The Procter & Gamble Company, Cincinnati, Ohio
J. Pediatr Health Care 1: 26-34, 1987

Knowledge of the most current and valid scientific data available should serve as the basis for health care that is either given or recommended. Using this framework, this article presents recent research reported by scientists about the causes and occurrences of diaper rash. A model illustrating the process of the development of diaper rash is suggested from these recent research findings. Contributing factors to diaper rash are stated and management by prevention is emphasized. This article also assesses early signs of diaper dermatitis, differentiates the common types of these rashes, and recommends nursing interventions and common treatments.

ABSTRACT #10

CLINICAL STUDIES WITH DISPOSABLE DIAPERS CONTAINING ABSORBENT GELLING MATERIALS: EVALUATION OF EFFECTS ON INFANT SKIN CONDITION

Robert L. Campbell, Ph.D., Jon L. Seymour, Ph.D., Logan C. Stone, Ph.D.,
and Michael C. Milligan, M.B.A., The Procter & Gamble Company, Cincinnati, Ohio
J Am Acad Dermatol 17: 978-987, 1987

Disposable infant diapers with absorbent gelling material (cross-linked sodium polyacrylates) incorporated into the core were clinically evaluated for their effect on infant skin condition. Absorbent gelling materials tightly hold water and provide pH control by a buffering capacity as well as by helping to segregate urine apart from feces. Four clinical studies were conducted with each following a rigid protocol that controlled for variables of diet and age in addition to the diaper material that may influence the development of diaper dermatitis and helped to control for any inherent bias in the study. This allowed for the controlled assessment of skin condition with respect to diaper type. Absorbent gelling material-containing disposable, conventional (100% cellulose core) disposable, and home-laundered cloth diapers were test products. In these studies 1614 infants were initially enrolled with 522 of them assigned to absorbent gelling material disposable, 738 to conventional disposable, and 354 to home-laundered cloth diapers. Objective measurements of skin wetness (transepidermal water loss) and skin pH, as well as double-blind grading of diaper dermatitis, were the measures of skin condition. Absorbent gelling material disposable diapers were associated with significantly reduced skin wetness, closer to normal skin pH, and lower degrees of diaper dermatitis when compared to conventional disposable or home-laundered cloth diapers. The results are consistent with the hypothesis that better control in the diaper area of skin wetness, skin pH, and the prevention of the mixing of urine and feces produces a better diaper environment.

ABSTRACT #11

CLINICAL TESTS WITH IMPROVED DISPOSABLE DIAPERS

Robert L. Campbell, Ph.D.
The Procter & Gamble Company, Cincinnati, Ohio
Diapering and Infant Skin Care. Proc. Int. Symp., Hakone 1986
Pediatrician 14: suppl. 1, 34-38, 1987

Etiologic factors in the development of episodic diaper dermatitis include skin wetness and skin damage from fecal enzymes. In addition, when urine and feces mix, the activities of fecal enzymes increase as the pH rises from production of ammonia. An improved disposable diaper has been developed to provide better control of these factors by improved wetness and pH control. The improved diaper contains absorbent gelling materials (AGMs) blended into the diaper's cellulose core. AGMs are nontoxic, cross-linked polyacrylate polymers. They bind water tightly, give pH control by providing a buffering capacity, and in a diaper help to segregate urine and feces, thereby reducing the potential for increases in pH from ammonia production. To assess the effectiveness of this diaper, four 16-week clinical home-use tests were conducted with the AGM disposable versus conventional cellulose core disposable and home-laundered cloth diapers. Rigid group randomized stratification of infant maturity, diet, and initial level of diaper dermatitis provided control of factors other than the diaper that impact on development of diaper dermatitis. Skin wetness as measured by transepidermal water loss immediately after diaper removal, skin pH, and blinded visual evaluation of diaper dermatitis were used as skin condition measures. The use of AGM disposable diapers was associated with significantly reduced skin wetness and closer to normal skin pH as compared with the use of conventional disposable or home-laundered cloth diapers. Considered as ar aggregate, the four clinical studies showed that AGM disposable diapers provide a better diaper environment and are associated with significantly lower degrees of diaper dermatitis than conventional disposable and home-laundered cloth diapers.

ABSTRACT #12

EFFECTS OF DIAPER TYPES ON DIAPER DERMATITIS ASSOCIATED WITH DIARRHEA AND ANTIBIOTIC USE IN CHILDREN IN DAY-CARE CENTERS

Robert L. Campbell, Ph D.,[a] Alfred V. Bartlett, M.D.,[b] Frank C. Sarbaugh,[a]
and Larry K. Pickering, M.D.[b]
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[b]The University of Texas Medical School at Houston, Houston, Texas
Pediatric Dermatology 5 (2): 83-87, 1988

Infants and toddlers in day-care centers have a relatively high frequency of diarrhea and/or oral antibiotic use, and may be at increased risk of developing diaper dermatitis when diapered. A six-month, prospective, double-blind study was conducted in day-care centers in Houston, Texas, to determine the frequency of diarrhea, antibiotic use, and diaper dermatitis in infants and toddlers wearing conventional (cellulose-only core) disposable diapers or disposable diapers with a core of absorbent gelling material (AGM) and cellulose. A questionnaire was administered weekly to the day-care staff to gather health information, and weekly visual examinations were made of children with diaper dermatitis. The frequency of diarrhea was 1.9 episodes per child-year and that of antibiotic use was 3.3 courses per child-year. Infants diapered in disposable diapers with AGM had a significantly (P 0.032) lower mean grade of diaper dermatitis during diarrhea episodes and a lower (P 0.054) mean grade during antibiotic use, compared to those diapered in conventional disposable diapers. There was no significant difference between groups with regard to isolation of *Staphylococcus aureus* or *Candida albicans* from superficial skin cultures of the diapered area. The results indicate that diarrhea and antibiotic use occur frequently in children in day-care centers, and that the severity of diaper dermatitis is less in children wearing AGM disposable diapers than those wearing conventional disposable diapers in that setting.

ABSTRACT #13

CLINICAL AND MICROBIAL EFFECTS OF CLOTH, CELLULOSE CORE, AND CELLULOSE CORE/ABSORBENT GEL DIAPERS IN ATOPIC DERMATITIS

J. L. Seymour, Ph.D.[a], B. H. Keswick, Ph.D.[a], M. C. Milligan, M.B.A.[a],
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Diapering and Infant Skin Care. Proc. Int. Symp., Hakone 1986
Pediatrician, 14: supp. 1, 39-43, 1987

Atopic dermatitis (AD) is an inherited cutaneous inflammatory condition which may affect 10% of infants. Persons with this diathesis are more susceptible to irritants and to superficial infections. Little is known about diaper rash and diapering materials in AD. In this study we set firm criteria to identify a large group of infants with AD for comparison with a nonatopic, normal control group in terms of (1) severity of diaper dermatitis; (2) relationship of diaper dermatitis to diaper materials; and (3) influence of modifying factors (bacterial and candidal colonization/infection, diarrhea, antibiotics, other illnesses, food allergy or intolerance). Babies with eczema were recruited and, from a group of 2,443 respondents, 87 satisfied carefully defined criteria for atopic dermatitis. A similarly sized (90) control group matched for age, sex, and weight was selected for absence of features of atopy or familial atopic history. Infants were assigned into balanced subgroups wearing cloth diapers, conventional cellulose diapers, or diapers containing cellulose and absorbent gelling material (AGM). Assessment of grading for atopic parameters showed statistically significant differences between the AD and normal groups at every visit. Mean diaper rash grades, as assessed by the same physicians at each visit, were significantly higher in the AD group wearing cloth diapers compared with those in AGM subgroups at five of eight visits. There was significant correlation between AD severity and diaper rash scores overall and in the AD cloth group, but not in other subgroups. Quantitative total bacterial plate counts were significantly lower in AGM than cloth diaper areas on three of eight sampling periods in the AD group. Surprisingly, samplings from inside and outside diaper areas showed *Staphyloccus aureus* colonization in only 65 and 20%, respectively, among AD subjects. Repeated isolation of *S. aureus* was characteristic of fewer than one third of the infants with AD. In assessing contributory factors for diaper rash, clearly the strongest was AD, followed by diarrhea and use of antibiotics.

ABSTRACT #14

CLINICAL EFFECTS OF DIAPER TYPES ON THE SKIN OF NORMAL INFANTS AND INFANTS WITH ATOPIC DERMATITIS

Jon L. Seymour, Ph.D.[a], Bruce H. Keswick, Ph.D.[a], Jon M. Hanifin, M.D.[b],
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J. Am. Acad. Dermatol 17: 988-997, 1987

Cloth diapers, cellulose core diapers (conventional disposable diapers), and cellulose core diapers containing absorbent gelling material were examined for their effects on diaper rash and skin microbiology of normal infants and infants with atopic dermatitis in a 26-week double-blind clinical trial. Infants with atopic dermatitis wearing the diapers containing absorbent gelling material had significantly lower diaper rash grades than infants with atopic dermatitis wearing cloth diapers at five of eight grading visits. Infants with atopic dermatitis wearing conventional cellulose core diapers had statistically less rash at one of eight visits. There was no statistically significant difference between diaper types at three of the eight visits. At no time did the cloth group have less diaper rash than the conventional cellulose or absorbent gelling material disposable diaper group. A statistical correlation between the severity of general atopic dermatitis outside the diaper area and the diaper rash condition under the diaper occurred only in the atopic dermatitis group wearing cloth diapers. Isolation of microorganisms from the intact, uninvolved skin surface both inside and outside the diaper showed no biologically significant changes in the presence or numbers of selected skin organisms. Repeated isolation, at multiple grading visits of *Staphylococcus aureus* from uncompromised skin inside the diaper area was infrequent but correlated with the diagnosis of atopic dermatitis when observed.

ABSTRACT #15

DIAPER AREA SKIN MICROFLORA OF NORMAL CHILDREN AND CHILDREN WITH ATOPIC DERMATITIS

Bruce H. Keswick, Ph.D., Jon L. Seymour, Ph.D., and M. C. Milligan, M.B.A.
The Procter & Gamble Company, Cincinnati, Ohio
Journal of Clinical Microbiology 25 (2): 216-221, 1987

In vitro studies established that neither cloth nor disposable diapers demonstrably contributed to the growth of *Escherichia coli, Proteus vulgaris, Staphylococcus aureus,* or *Candida albicans* when urine was present as a growth medium. In a clinical study of 166 children, the microbial skin flora of children with atopic dermatitis was compared with the flora of children with normal skin to determine the influence of diaper type. No biologically significant differences were detected between groups wearing disposable or cloth diapers in terms of frequency of isolation or log mean recovery of selected skin flora. Repeated isolation of *S. aureus* correlated with atopic dermatitis. The log mean recovery of *S. aureus* was higher in the atopic groups. The effects of each diaper type on skin microflora were equivalent in the normal and atopic populations.

"Reducing Illness in Group Child Care Settings - The Role of Diapers"

R. W. Berg

Procter & Gamble Company

Oral Presentation at the Annual Meeting of the National Association for the Education of Young Children

November 3, 1989

Atlanta, Georgia

REDUCING ILLNESS IN GROUP CHILD CARE SETTINGS:

THE ROLE OF DIAPERS

(NAEYC Presentation 11/3/89)

I am going to show you a videotape this morning that demonstrates the importance of diapers in providing a healthy environment for children in group care. The tape describes a study we conducted with two disposable diapers that differ in their ability to contain runny BM that might occur during an outbreak of diarrhea in a day care center. Following the videotape, I would like to briefly share the results of a similar study we conducted to compare a disposable single-use diaper and cloth diapers with plastic overpants.

<<< Show Tape >>>

After the study described in the videotape was complete, we conducted a clinical study in day care centers, comparing levels of fecal bacteria on environmental surfaces and hands of children and day care workers when the same two diapers were used, and we found consistently lower levels of contamination with the better-containing diaper. So, the results of the day care simulation study are consistent with an actual use study in day care centers, thus strengthening the connection between good containment and good health.

Cloth diapers are used for a variety of reasons by a small segment of the population, and we were interested to know how they would perform

in a similar study. So, we compared cloth diapers with plastic overpants and a version of diaper B, the better containment diaper, in a small pilot study that was designed to be more quantitative than the one I just showed you. This was accomplished by computer image analysis of floor segments under carefully controlled UV lighting conditions, in addition to subjective grading of diaper leakage. (Table 1) In this study, only 8%, or 1 of 12 of the disposable diapers leaked artificial BM, while 50% of the cloth diapers leaked. Not only were cloth diapers more likely to leak, but when they did, the leakage occurred to a much greater extent. On a 0-3 scale, the disposable leak scored a grade of 1, while the mean of the cloth group was a grade of 2.8. The disposables tended to look like this (children in non-leaking disposable diapers), while the cloth diapers tended to look like this (children in leaking cloth diapers)

This diaper leakage resulted in contamination of the room environment and the results of computer image analysis of the floor are shown here (Table 2). Use of disposable diapers resulted in significantly less contamination of the floor, and when contamination was present, it was significantly less concentrated. When toys were observed under UV light, no contamination was observed on those from the disposable diaper group, but as you might imagine, those from the cloth group looked like this (contaminated toy) or this (contaminated toy).

The message I want to leave with you this morning is that diaper containment is an important factor for promoting good health in group child care. Diapers that leak during diarrhea outbreaks result in

environmental contamination with enteric pathogens, leading to an increased risk of disease transmission. These data support the conclusion that cloth diapers are a poor choice for use in day care centers. While the elastic leg bands of plastic overpants probably can make the cloth diapering system fairly occlusive, diaper capacity and fluid binding are very important for preventing leakage of diarrheal BM. Disposable diapers, particularly those containing absorbent gelling material, have a fluid handling capacity that is many times that of cloth diapers. Once the limited fluid handling capacity of the cloth diaper is exceeded, liquid BM is free to leak from the diaper and contaminate the environment. Furthermore, the additional handling and storage of soiled diapers inherent to cloth use is likely to provide additional opportunities for the spread of enteric disease.

In conclusion, as the videotape pointed out, diapers that provide better BM containment offer an approach to improved health care that we call "passive intervention" - that is, unlike handwashing and other hygienic measures, no special actions are required. Use of disposable diapers therefore represents a positive and easily accomplished part of maintaining quality health care in day care centers.

R. W. Berg

10/25/89

REDUCING ILLNESS IN GROUP CHILD CARE SETTINGS:

THE ROLE OF DIAPERS

(Videotape Script 9/21/89)

Day care is a rapidly growing industry important to the changing lifestyle of our country. During the past 15 years, the number of working families with children less than one year old has doubled from 25% to 48%. In the next five years, this number is expected to increase again by 50%. Currently, there are approximately one million children under age 3 enrolled in organized child care facilities.

Day care brings children together who are susceptible to infection and disease. Diarrhea is a major illness among children in day care centers. Day care center children average 2.8 episodes per year, or about 30% more episodes than children cared for at home. Microorganisms that cause diarrhea are spread from child to child by direct personal contact and from contamination of the day care center environment by fecal matter.

This diagram illustrates how the spread of fecal microorganisms occurs. From one ill child, the index case, other children pick up the microorganisms from environmental objects, from other children, or from day care personnel. The children become infected when they place their hands or shared objects into their mouths. As the number of ill children in the center increases, the opportunity for the spread of infection to other children and their families increases.

TABLE 1. BM leakage from disposable and cloth diapers.

Diaper Group	N	No. Leaking Diapers (%)	Mean Leakage Grade*
Disposables	12	1 (8%)	1
Cloth	12	6 (50%)	2.8

*Mean of diapers that leaked BM

TABLE 2. Contamination of Floor with Artificial BM

Diaper Group	Area Contaminated (%)	Mean Intensity of Contaminated Areas
Disposables	0.11*	54*
Cloth	0.95	76

*Significantly different from cloth group at $p<0.05$ (Student's t)

This chain of infection results in increased direct health care costs, and even larger indirect costs associated with lost parental work time. Furthermore, there is ample evidence that infectious diseases may be spread from day care centers to individual home environments and to the community at large. The enteric disease transmission chain is not just a day care problem, but has links wherever diapered children interact with susceptible individuals.

Previous studies in day care centers have detected fecal bacteria at a significant frequency on objects like toys, furniture and hands of children and day care personnel. Data show increased contamination during outbreaks of diarrhea.

Medical experts believe that a reduction in fecal contamination of the day care center environment will lead to a reduction of diarrheal disease transmission. One way to accomplish this is through the use of diapers that are better able to contain runny BM. Diapers that reduce BM leakage therefore have the potential to reduce fecal contamination in day care centers and to disrupt the transmission of diarrheal disease.

The goal of the study described on this videotape was to provide a visual demonstration of diaper containment and how leakage can lead to contamination of the environment. While the focus here is on day care, the same hygienic benefits apply wherever one finds diapered children, including neighborhood play groups and family units.

We compared BM leakage from two disposable diapers differing in containment performance in a simulated day care center, by incorporating an ultraviolet visible brightener into an artificial BM added to the diapers. The children were diapered, and 50 milliliters of artificial BM containing the fluorescent compound were delivered into the back of the diaper using a calibrated pump. The children played in a simulated day care center environment for 45 minutes. Each child's legs and hands, as well as the room environment, were then photographed under ultraviolet light.

Percent of Diapers That Leaked BM

Diaper A		Diaper B	
N	%	N	%
33/36	96	23/48	48

Following the play period, the percent of diapers that leaked BM was determined, and the data are shown here. The results show a 50% difference in containment performance between the two diapers. 33 out of 36, or 96% of the A diapers leaked, while only 23 out of 48, or 48% of diaper type B showed leakage.

The consequences of BM leakage can be seen in these pictures taken after 12 children wearing Diaper A loaded with artificial BM had played in the room for 45 minutes. Contamination by the

artificial BM, seen as light blue fluorescence, is visible on the floor, toys, chairs and other objects in the room. These pictures clearly support the model of disease transmission proposed earlier. Children playing in this environment are likely to pick up infectious organisms on their hands and become infected with them.

The next series of scenes demonstrate how BM leakage could contribute to the spread of disease-causing organisms in day care centers.

Here is a child on a riding toy that will be shared by other children. The artificial BM is leaking down the side of the toy as you will see under UV light.

Look at the condition of the toy when it was used by the other children. These kids had more than just the toy to share.

Watch the reaction of the child who finds the results of his leaky diaper on the floor in front of him....His hands are now contaminated.

Now look at the floor where he and other children have been playing, photographed under UV light. You can imagine how such contamination might lead to the spread of disease.

This child is having fun chewing on the toys he picks up off the floor. He i also nicely demonstrating how infectious organisms can be transferred from the environment to the mouth.

This is the area of the room where this child was sitting. Note the contamination on the floor in the foreground.

In this scene a child is playing on a riding toy. His diaper is leaking. Under UV light you can see the results. Now watch the children who play with the bike next. One puts the bike handle into his mouth and then thoroughly wipes his face after touching the seat of the bike. Another demonstration of hand to mouth transfer.

Next, watch the child on the right put the wooden block in his mouth. Under UV light we can see that the block was contaminated by artificial BM.

When Diaper A was used, the environment was heavily contaminated. Children playing in this room clearly had ample opportunity to pick up the contamination.

Now let's look at the difference that better containment makes. This is the simulated day care room after 12 children wearing Diaper B with artificial BM had played for 45 minutes. You can clearly see that this diaper leads to a cleaner environment. Less fluorescent material is present on the floors and toys as compared to what you saw before with Diaper A. A day care center environment with less contamination by fecal matter means there is less chance that children will pick up fecal bacteria on their hands or toys and become infected with disease-causing organisms. Better containment with Diaper B resulted in a cleaner day care environment.

In addition, children wearing Diaper B had cleaner hands. When children's hands were photographed under ultraviolet light, artificial BM was seen on the hands of 41% of the children wearing Diaper A, but only 6% of the children wearing Diaper B were contaminated. An example of hand contamination is shown here.

Contamination of Hands

Diaper A		Diaper B	
N	%	N	%
14/34	41	3/48	6

So, we have seen that with better containment, both the environment and hands were less contaminated.

This videotape has provided a visual demonstration of the value of containment when diapers are used in group child care. You have seen how a day care center environment can become contaminated by BM that leaks from diapers and how this contamination can infect children by the oral route. While the disposable diapers used in this study differ in containment performance, all modern disposables have vastly superior absorbency and fluid handling characteristics relative to cloth diapers, which are probably a poor choice for group care situations. The traditional public health approach to disease control in day care centers has involved three key elements: Good handwashing practices, good house-cleaning practices, and segregation or exclusion of sick children. These approaches can be effective, but they all require continuous, conscientious training and actions -

actions that are all to easy to neglect in the busy day care environment. Diapers with superior BM containment offer the potential for effective passive intervention, and thus represent an important new approach to promoting good health for children in group care settings.

R. W. Berg

9/21/89

THE FOLLOWING DOCUMENT HAS

NOT BEEN FILMED BUT IS

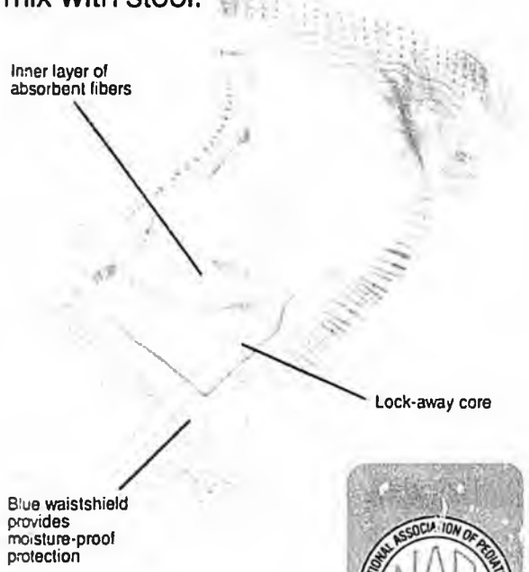
AVAILABLE IN THE ORIGINAL

FILE

Questions & Answers About Solid Waste

How Ultra Pampers® Plus helps control irritating wetness

Ultra Pampers Plus has an inner layer that contains unique absorbent material that combines with urine to form a gel in the diaper's core. The irritating wetness that is locked away can't be squeezed back against your baby's skin or mix with stool.



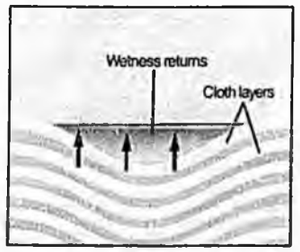
"Ultra Pampers Plus has been proven effective in keeping skin dry and controlling pH—important for maintaining healthy baby skin."

241-4358

Ultra Pampers® Plus versus other diapers

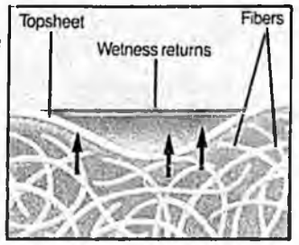
Cloth diapers hold wetness against skin

Cloth diapers' limited absorbency allows them to be readily saturated and hold urine against your baby's skin.



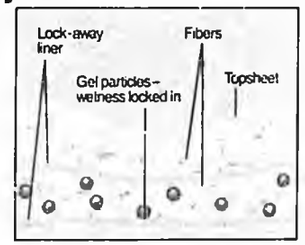
Conventional disposables let wetness squeeze back

Conventional disposables work like a sponge: Although urine is absorbed into the diaper, pressure from the baby's body can squeeze it back against skin and into contact with stool.



Ultra Pampers Plus helps lock wetness away from skin

The unique core of Ultra Pampers Plus has absorbent gelling material that combines with urine to help lock wetness away from the skin and stool.



What Ultra Pampers® Plus means for you and your baby

- New lock-away core for less leakage.
- Helps control wetness and skin pH, two factors important for maintaining healthy infant skin.
- Super-thin diaper snuggles up to your baby for comfort without bulk.
- Sure-fit tapes and special taping panel allow for easy refastening so that you can check your baby again and again.
- Dry Bear design provides an easy guide for an even fit.
- Blue waistshield helps stop leaking at the waist—even when baby is lying down.

PAQ-285

What every parent should know about DIAPER RASH

- **Who gets it?**
- **What causes it?**
- **What you as a parent can do about it.**

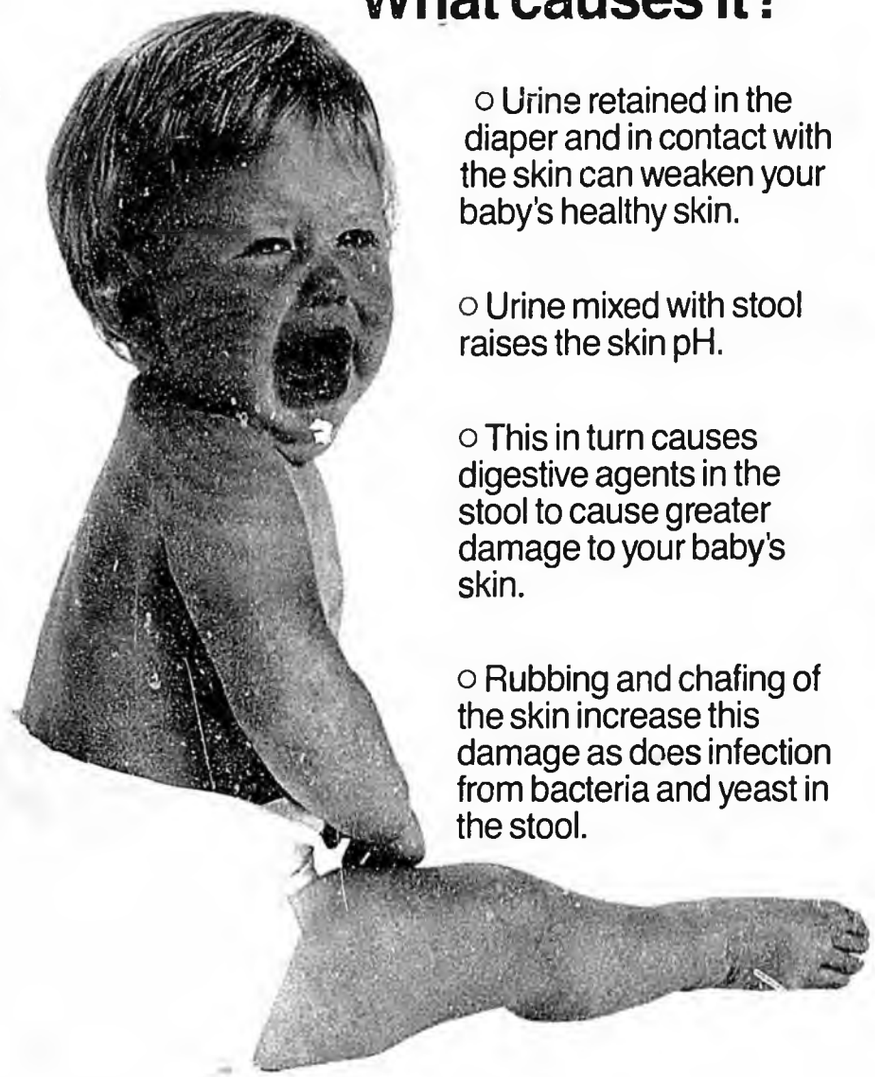
Provided in the interest of better infant care by

Ultra Pampers® Plus

DIAPER RASH

Who gets it?

- Approximately 30% of all babies have diaper rash at any given time.
- Babies between 8 and 10 months of age have the highest rate of diaper rash.
- Breastfed babies' stool is less irritating. Therefore, they have a lower incidence of diaper rash than bottlefed babies.
- Babies who have diarrhea experience more rash.
- Babies on certain antibiotics may experience more rash.



What causes it?

- Urine retained in the diaper and in contact with the skin can weaken your baby's healthy skin.
- Urine mixed with stool raises the skin pH.
- This in turn causes digestive agents in the stool to cause greater damage to your baby's skin.
- Rubbing and chafing of the skin increase this damage as does infection from bacteria and yeast in the stool.

Diaper rash rarely causes serious health consequences, but it may be uncomfortable for your baby and distressing for you as a parent.

New research confirms that the causes of diaper rash are complex.

How parents can help maintain healthy infant skin

- Keep your baby's skin clean and dry.
- Gently clean diaper area with water and cotton during changes, especially after a bowel movement.
- Don't allow your baby to stay in a wet or soiled diaper.
- Change diaper immediately after a bowel movement to avoid the mixing of urine and stool.
- Use a diaper with absorbent gelling material that helps lock wetness away from your baby's skin.
- If diaper rash develops and persists more than 48 to 72 hours, contact your health care professional.