

Update on Prevention and Treatment of Diaper Dermatitis

One of the most common cutaneous skin complaints in infancy can be avoided with old or new interventions.

By Joseph Bikowski, MD

Given that pediatricians treat approximately three-quarters of all children who see a physician for diaper dermatitis and that diaper dermatitis is considered the most common dermatologic disorder of infancy,¹ it is practically guaranteed that you treat several cases per week. Precisely because diaper dermatitis is such a common condition and often distressing for infants and parents, a review of treatment and prevention options is appropriate.

Incidence and Causes

The most comprehensive analysis of diaper dermatitis trends is now several years old,¹ but it offers a snapshot of the disease, which was found to account for 4.8 million outpatient visits in the eight-year period from 1990-97. Based on the survey, infants are estimated to have a one-in-four chance of developing diaper dermatitis. Most patients (75 percent) presented to a pediatrician for management.

Factors that contribute to the development of diaper dermatitis are moisture, friction, excrement, and in some cases microorganisms.² The peak for incidence of diaper dermatitis is in the second half of the individual's first year through about 18 months of age. Increased mobility of the child accounts for the friction that contributes to diaper dermatitis.³ It is also assumed that changes in diet through the second half of the child's first year may also modulate

fecal pH, thus influencing the contribution of fecal skin exposure to the formation of dermatitis. It has been shown that exclusively breast-fed infants had lower rates of diaper dermatitis compared to formula-fed infants. Breast milk consumption is associated with higher fecal pH, further suggesting an influence of diet on fecal pH and diaper dermatitis risk.⁴

The role of urine in causing diaper dermatitis is not simply the contribution of moisture. In the presence of fecal urease, urea is broken down, producing an increase in pH that encourages activation of fecal proteases and lipases that damage the skin.⁵

Basic Prevention and Treatment

Practical strategies used to combat diaper dermatitis include changing soiled diapers as quickly as possible and using disposable diapers, which have been engineered to absorb moisture into the diaper and reduce moisture against the skin.³ Newer disposable diapers engineered with absorbent gelling materials (AGM) and microbreathable materials appear to be associated with a decrease in diaper dermatitis (See sidebar).^{6,7} There is limited data comparing cloth diapers to older cellulose core disposable diapers and modern AGM disposable diapers, but overall trends favor the new disposable diapers.⁸ Though they may be associated with potential messes, "air baths" (i.e., leaving the infant undiapered for periods of time to forego occlusion and allow the diaper area to dry)



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remain a worthwhile adjunct to other treatment approaches.

As pediatricians well know, a whole market of “barrier creams” is available over-the-counter for the treatment and prevention of diaper dermatitis. These various ointments and pastes are formulated with ingredients such as petrolatum or zinc oxide that are intended to form a film to protect the skin from exposure to moisture. It should be noted that “barrier repair creams,” discussed below, are also now on the market and are engineered differently from these diaper creams.

Curiously, there has been little controlled study of over-the-counter diaper dermatitis preparations. A 2005 Cochrane review found no conclusive evidence that vitamin A ointments helped to prevent or treat diaper dermatitis, though there was no evidence of harm.⁹ A recent survey of the literature found no controlled studies of zinc oxide pastes in infant diaper dermatitis. A small study of adult diaper dermatitis demonstrated that application of an anhydrous zinc paste reduced transepidermal water loss (TEWL), a sign of barrier dysfunction, and improved stratum corneum hydration.¹⁰ (See sidebar.) Coupled with the use of recommended diapering practices, the evidence and experience suggest that these ointments and pastes may successfully

Recommending Disposable Diapers

Absorbent gelling material (AGM), which is used in many disposable diapers for absorbency, consists of cross-linked sodium polyacrylates that bind water in a gel matrix. The AGM has buffering capacity to control pH, and its rapid absorption rate helps to separate urine from feces.

Diapers containing AGM are labeled as “super absorbent,” and are available from major manufacturers (such as Pampers, Procter and Gamble or Huggies, Kimberly-Clark), as well as many store-brand versions of these products. Most also contain breathable fabric liners that further reduce contact between the skin and moisture.

—http://www.medscape.com/viewarticle/545552_5
—*J Am Acad Dermatol.* 1987 Dec;17(6):978-87.

manage minor cases of diaper dermatitis and prevent worsening.

Treatment of Moderate to Severe Diaper Dermatitis

Moderate to severe diaper dermatitis confirmed or suspected to be *Candida* infected requires targeted treatment. Topical corticosteroids are still recognized as a treatment option for diaper dermatitis, though their use for this indication is increasingly discouraged. The incidence of adverse events associated with the use of topical corticosteroids increases

Diaper Dermatitis

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relative to the potency of the agent applied,¹¹ and occlusion—as from a diaper—is shown to increase corticosteroid potency. The risk for adverse events also increases when topical corticosteroids are applied to thinner skin, as in the diaper area. Therefore, low potency topical corticosteroids should be reserved only for very inflamed dermatitis that does not respond to other appropriate treatments, and the course of therapy should be brief.

Uncomplicated diaper dermatitis typically involves the concave surfaces of the diaper region primarily. Involvement of the skin folds tends to indicate a *Candida* and/or less commonly bacterial infection. Beefy red plaques form with satellite papules and pustules.¹² Lack of improvement with first-line diaper dermatitis therapies is another indication of infection of secondary yeast infection. *Candida* species appear to be the most frequent contributors to moderate to severe diaper dermatitis.¹³

Severe variants of diaper dermatitis include granuloma gluteale infantum, a rare condition of unclear etiology characterized by asymptomatic cherry red nodules against the setting of primary irritant contact dermatitis.¹⁴ An even rarer variant

is Jacquet erosive diaper dermatitis, characterized by punched out ulcers or erosions with elevated margins.¹² The differential diagnosis of diaper dermatitis may include seborrheic dermatitis, psoriasis, bacterial infection (characterized by honey-colored crusts and superficial erosions), and contact dermatitis (CD), either allergic or irritant, to a component of the diaper or the skin care regimen.

Commonly used topical antifungals for the management of diaper dermatitis include nystatin, clotrimazole, and miconazole. In a

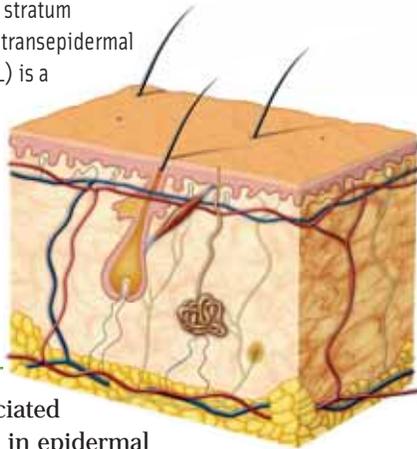
head-to-head trial, clotrimazole was found to be superior to nystatin in terms of reduction in symptom score and Investigator Global Assessment, but both agents achieved 100 percent microbiological cure.¹⁵ In a controlled trial of miconazole nitrate 0.25% ointment, the rate of microbiological cure was 50 percent for active treatment compared to 23 percent for control.¹⁶ An alternative treatment option is topical mupirocin, which was found to eradicate *Candida* as well as nystatin did in a head-to-head trial but with more rapid clinical improvement.¹⁷ It should be applied three to four times per day or at each diaper change.

Recurrence Prevention

Regular use of OTC diaper ointments or pastes and frequent diaper changes are required for any patient with a history of diaper dermatitis. The growing field of epidermal barrier repair devices may provide an alternative approach to maintenance of infant skin health and prevention of diaper dermatitis. Physical degradation of the epidermal barrier caused by exposure to excrement, moisture, and friction directly contributes to diaper dermatitis. Furthermore, reduced

What is TEWL?

The structure of the stratum corneum has been described as a bricks-and-mortar structure. The "bricks" are covalently bonded corneocytes arranged in compact, overlapping layers to hold moisture in while keeping allergens, pathogens, and environmental toxins (such as UV radiation) out. The "mortar" consists of ceramides, cholesterol, and lipids. This extracellular matrix provides necessary permeability of moisture to the stratum corneum. Some degree of water evaporation through the stratum corneum is normal, however, passage of excessive amounts of water through the stratum corneum (termed transepidermal water loss or TEWL) is a sign of impaired epidermal barrier function. Increased TEWL is a characteristic of barrier defect diseases, like atopic dermatitis.



skin pH is associated with a decrease in epidermal barrier integrity, reduced antimicrobial defenses, and increased inflammation.¹⁸

Epidermal barrier repair devices, formulated with ceramides and/or essential fatty acids, have been developed with the goal of supporting proper epidermal barrier function and repair, which would thereby be expected to reduce TEWL, maintain skin pH, and improve antimicrobial defenses. Therefore, these agents, while not studied specifically for the management of diaper dermatitis, may be beneficial for use in infants with a history of diaper dermatitis, specially those with recurrent presentations. Epidermal barrier repair creams are available over-the-counter (CeraVe, Coria Laboratories; Restoraderm, Galderma) and by prescription (Atopiclair, Graceway; Eleton, Ferndale Labs; EpiCeram, Promius Pharma; Hylatopic Plus, Onset Dermatologics; Mimyx, Stiefel).

Wrapping Up

Diaper dermatitis can be distressing for affected

infants and their caregivers. Incidence of the condition is high, and a given infant has a relatively high risk of developing a diaper rash. Frequent diaper changes and use of newer disposable diapers may reduce the risk of diaper dermatitis. Use of over-the-counter diaper ointments or pastes or alternatively the use of epidermal barrier repair devices may also be useful. Moderate-to-severe diaper dermatitis almost always requires topical anti-*Candida* therapy and rarely topical corticosteroids. Clinicians should be aware of rare variants of diaper dermatitis and mimics. ■

Dr. Bikowski has served on the advisory board, served as a consultant, received honoraria, and/or served on the speaker's bureau for Allergan, Barrier, CollaGenex, Coria, Galderma, Intendis, Medicis, Onset Dermatologics, OrthoNeutrogena, PharmaDerm, Quinnova, Ranbaxy, Sanofi-Aventis, SkinMedica, Stiefel, UCB, and Warner Chilcott.



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