



Perspective

The ABC of prevention and treatment of diaper dermatitis

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ABSTRACT

Diaper dermatitis (DD) is a common disease in the first two years of life, although incontinence DD is seen in all ages including the elderly. Its pathogenesis is not uniform since irritant, allergic, and infectious factors can be involved. Diagnosis is visual except for atypical cases. After birth, the skin adapts from aquatic to terrestrial life. The skin-gut microbiome develops. The focus of the prevention of DD lies in the stabilization of epidermal barrier function and a healthy microbiome. Treatment depends on DD etiology. It includes skincare, hygienic measures, and medical therapy.

Keywords: Diaper rash, Irritants, Microbiome, Skincare, Infants

DIAPER DERMATITIS

The term diaper dermatitis (DD) was coined for inflammatory cutaneous reactions in the diaper area, in particular but not exclusively, in newborns, toddlers, and infants. In adult life, incontinence is a major factor for DD. Several factors contribute to its development including irritation by activation of fecal enzymes on the skin, an increase of skin pH, prolonged exposure to moisture in diapers, and mechanical factors. Much less common are contact allergies to skincare products or diapers. Infection by yeasts (mostly *Candida albicans*) and bacteria (*Staphylococcus aureus* or *Streptococcus pyogenes*) can occur primarily or after irritant or allergic contact dermatitis.^[1] The peak incidence of DD is between 9 and 12 months with a prevalence between 17% and 50% in infants.^[2,3]

WHAT IS KNOWN ABOUT PREDISPOSING FACTORS?

After birth, the newborn skin adopts from pure aquatic life *in utero* to a terrestrial life. In newborns aged <1 week, buttock skin is colonized by *Bifidobacteria*, *Bacteroides*, *Enterobacteria*, *Eubacteria*, and *Lactobacilli*.

Although stratum corneum is well defined at birth, skin barrier function and skin-associated immune system need further gradual maturation. Transepidermal water loss is higher than in adult skin and the acid mantle has not yet developed. Cleansing and skincare expose the skin to surfactants and emulsifiers that are capable of reducing the lipid content of the skin.

The frequency of diaper changes and cleansing of the diaper area is crucial. Diet, urinary, and gastrointestinal infections can contribute to DD.^[1] Similar features are noticed in incontinence-associated DD in adults.

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CLINICAL SYMPTOMS

During the first year of life dermatitis of the convexities or dermatitis type W is the major subtype of DD. The inflammatory lesions affect the convexities and are absent from the folds. Irritant factors and maceration are driving the process. In case of chronic diarrhea, DD can become erosive.

There are some uncommon subtypes of the irritant DD spectrum. Perianal pseudoverrucous papules and nodules have originally been described as a symptom of congenital digestive tract malformations in children. Erosive papulosis (Jacquet's erosive DD) is a variant of the classic form of irritant dermatitis with punch-out ulcerative lesions and erosions on erythematous ground. It is often associated with poor hygiene. Infantile gluteal granuloma is characterized by the appearance of erythematopurpuric, asymptomatic nodules. Infantile granular parakeratosis is a histologically confirmed diagnosis with hyperkeratotic, erythematopigmented papules or plaques, often arranged unilaterally.

Candida DD (Y-shaped DD) is the most common infectious DD type. Affected patients present fissured inguinal intertrigo with small papules or pustules distant from the initial lesion (satellite lesions). These lesions are seen in the folds.^[1]

PREVENTIVE MEASURES – ABCDE APPROACH

Vernix caseosa of the newborn provides a temporary epidermal barrier function and should be left 6–24 hours after birth. During diaper changes and cleansing, the skin needs to be examined carefully by the caregiver to recognize early signs of inflammation. Streak structures are visible before the clinical appearance of DD.^[2,3]

Breastfeeding stimulates intestinal growth of *Bifidobacteria*, *Bacteroides*, and *Lactobacilli* – the bacteria that contribute to the newborn skin microbiome of the gluteal area. Colonization by *Finegoldia* has been identified as a contributing factor to DD development. A change in skin microbiome is promoted by alkaline pH under occlusive diapers.^[4]

Daily bathing and skincare routines are fundamental aspects of nursing infants. The diaper area needs to be protected against superhydration by regular diaper changes. Superabsorber is helpful. With a diaper change, skin should be cleansed, and a skin barrier cream should be applied. There is a lack of evidence that a certain ingredient of such products is superior to others.^[5] Exposure to many different skincare products bears a risk of irritation and sensitization. Petrolatum-based emollients in contrast to oil-based emollients bear a higher risk for coagulase-negative *Staphylococcus* infections.

Clear water is better than regular use of baby wipes that contain fragrances, preservatives, and surfactants. A recent

trial demonstrated that diaper-free times significantly reduced the occurrence of DD and led to a more regular defecation frequency in toddlers. Cloth diaper usage increased the frequency of diaper changes compared to superabsorber diapers [Table 1].^[6]

The treatment of incontinence-associated DD is comparable. The main subtypes are irritant-contact dermatitis and *Candida*-associated DD.

TREATMENT

The treatment depends on the etiology of DD. The most common type of DD is the irritant or W type on the convexities of the diaper region. For mild DD intensified topical skincare is sufficient. Widely used ingredients are listed in Table 2. Most evidence is available for dexpanthenol.

Herbal compounds such as *Aloe vera*, marigold, and olive oil have been used in folk medicine for centuries. There is no substantial evidence for oral use of probiotics to treat DD.

In case of highly inflamed skin, temporary use of class I corticosteroids is justified. Antifungal and antibiotic treatment is necessary for *Candida* DD or bacterial infections. Topical miconazole nitrate, ciclopirox, and itraconazole are useful. Terbinafine is not effective against yeasts.

Potent topical steroids must be avoided since they bear a risk for skin atrophy and iatrogenic Cushing syndrome.^[1]

Table 1: The ABCDE approach in the prevention of DD.

| | |
|---|--|
| A | Air means exposure of diaper skin as often as possible to air, which minimizes friction and superhydration |
| B | Barrier creams on a regular basis on clean diaper skin reduce friction and improve barrier function |
| C | Cleansing with gentle cleansers to remove irritants and ensure an acidic pH |
| D | Dry diaper. Diaper changes should be done as often as necessary, on an average every 2 hours to avoid superhydration and reduce contact time with irritants |
| E | Education for caregivers to avoid contamination. Early recognition of clinical symptoms of DD and barrier-free opportunity to consult healthcare professionals |

DD: Diaper dermatitis

Table 2: Widely used ingredients of topical skincare products for diaper dermatitis.

| Substance | Actions |
|--------------|--|
| Zinc oxide | Anti-inflammatory and moisturizing effects; reduces bacterial contamination |
| Taurine | Anti-oxidant and anti-inflammatory activity |
| Dexpanthenol | Supports barrier function via synthesis of lipid components; anti-oxidative, hydrating, and anti-inflammatory activity |

Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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Conflicts of interest

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Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The author confirms that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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