



Diaper Dermatitis

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Diaper dermatitis, commonly referred to as diaper rash, is a frequent diagnosis in the pediatric setting, causing distress in both infants and parents because of its often persistent nature despite diligent care around diaper changes. Although diaper dermatitis can be seen in any patient wearing diapers, it typically peaks between 9 and 12 months. Many underlying etiologies should be considered when evaluating a patient with diaper dermatitis. A thorough evaluation involves the patient's underlying medical and family history, characterization of the rash distribution and morphology, and any contributing factors, such as topical products, foods, or other exposures.

The most common cause of diaper dermatitis is irritant contact dermatitis. In irritant diaper dermatitis the integrity and barrier function of the skin is compromised by 2 major factors: increased moisture caused by the occlusive environment of the diaper combined with urine and fecal waste and a higher pH environment due to increases in protease and lipase activity. The dermatologic findings include erythema, papules, and scaling of the skin in direct contact with the diaper, including the convex skin areas: the buttocks, inner thighs, and genitalia. The goal of treatment of irritant dermatitis is to create conditions that allow diapered skin to maintain its physiologic pH and limit exposure to irritants that promote skin breakdown as much as possible.

There are a variety of approaches to achieve this goal, but the straightforward mnemonic of ABCDE (air, barrier, cleansing, diaper, and education) may be easiest to recall and explain to families.

- A: Air time, or being diaper free, can be challenging for families to incorporate into their daily routine for extended periods. However, open air time is one of the most economical, safe, and efficacious treatments for diaper dermatitis. It increases air circulation and drying of the area while decreasing friction from the diaper and prevents the irritant components of urine and feces from attaching to the skin. Short periods of open air time can be done after diaper changes or bath time to allow for the area to become fully dry before replacing with a diaper. Diaper-free naps done with a towel or 2 underneath the infant can allow for longer periods of open air time, although this approach may be more successful with girls.
- B: Barrier creams are often a first-line treatment, and parents will frequently have tried one of a multitude of options. The most common and effective topical creams include zinc oxide, petroleum, or vitamin A&D ointment. Appropriate use involves applying a thick barrier layer with each diaper change and avoiding complete removal between applications so as to prevent unnecessary irritation from the friction of rubbing.
- C: Cleansing of the diaper area should involve a product with a near physiologic pH value and a gentle touch. For skin that is raw or broken down, a damp cloth with water can be used.

AUTHOR DISCLOSURE Drs Helms and Burrows have disclosed no financial relationships relevant to this article. This commentary does not contain discussion of an unapproved/investigative use of a commercial product/device.

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D: Diaper changes should be frequent, up to every 2 hours at times, to reduce exposure of the irritant to the skin and to keep the skin as dry as possible. Parents may have heard anecdotally that cloth diapers have a benefit over disposable diapers, and this could be a fruitful topic of discussion. The modern disposable diaper has super-absorbent gels, breathable outer layers, and a thinner overall design that contours to the child's body, all of which have led to an overall decrease in the frequency of diaper dermatitis in developed countries. There is no current evidence that cloth diapers offer a significant benefit over disposable diapers for skin protection, rash prevention, or environmental impact.

E: Education for caregivers determines how consistently the treatment plan is followed and is time well spent during a visit to prevent recurrent rashes or persistent skin issues. This discussion should also include avoiding potentially harmful products. For example, cornstarch and talc powders may relieve moisture and friction in the diaper area but can become aerosolized during application and cause respiratory disease. Antifungal medication or corticosteroid creams applied without health-care provider input may confuse the diagnosis and contribute to chemical skin irritation. Topical corticosteroid creams can exacerbate any existing fungal process by weakening the skin's natural defenses, thus causing further spread of the rash. It is also important to educate families on how to safely apply any topical corticosteroid creams in the perineal area such that long-term skin changes, such as thinning or pigment changes, can be avoided.

Although irritant diaper dermatitis is the most common, there are other intrinsic skin issues to consider when evaluating diaper rashes. The rash distribution and appearance can help differentiate among the following inflammatory skin processes. Allergic contact dermatitis, or reactions associated with preservatives, fragrances, or adhesives in the diaper, are less commonly seen in the modern era due to the use of biologically inert polymers in diaper construction. However, reactions still occur and are characterized by erythema, papules, and scaling in the skin contacting the diaper. Involvement of the folds of the skin can help distinguish it from irritant contact dermatitis. Infantile eczema is less common in the diaper area because the occlusive nature of diapers increases moisture of the skin, but it can be seen in infants with more widespread eczema. These infants will have patches on their body consistent with typical eczema on the face, scalp, and extremities, often with overlying excoriations. Infantile psoriasis should also be considered when evaluating an irritant diaper rash. Infantile psoriasis

can be triggered by group A β -hemolytic streptococcal pharyngitis or perianal infections and is characterized by well-demarcated erythematous plaques with involvement of the skinfolds. The mechanism of this association is postulated to be related to a T-cell activation response caused by exposure to the streptococcal M protein. Other common sites for psoriatic lesions should be examined, including the scalp, the external ear canals, and the perianal fold to make this diagnosis.

Infections and infestations should also be in the differential diagnosis, although they typically have a characteristically different appearance than the previous conditions. Scabies is classically described by polymorphic erythematous papules, pustules, and scales in the diaper area as well as on the face and palms and soles of the feet. The lesions are pruritic owing to an immune response to *Sarcoptes scabiei* mites, their eggs, and their feces after they burrow into the skin. Therapy is 5% permethrin. Candidiasis is the other common infection characterized by papules and pustules in the diaper area. Candidal diaper dermatitis can be seen by itself or with a concomitant irritant diaper dermatitis. The rash appears as dry erythematous plaques involving the thigh folds, often accompanied by papules and "satellite" pustules that expand beyond the immediate area of rash. If there is confusion regarding the diagnosis, a potassium hydroxide (KOH) preparation can confirm the presence of *Candida* and guide therapy. Nystatin cream or clotrimazole are first-line topical treatments. Perianal streptococcal dermatitis is localized around the anus, separating it from most other diaper dermatitis. This *Streptococcus pyogenes* infection is often linked to tonsillitis in the patient or other family members. The rash appears as a well-demarcated, brightly erythematous rash circumscribing the anus with associated itching and burning. Oral amoxicillin, 40 to 50 mg/kg per day for 10 days, is the treatment for children, often with topical 2% mupirocin. Also consider perianal staphylococcal dermatitis when seeing this distinct rash because it can look nearly identical to perianal streptococcal infections and should be treated with systemic antibiotics.

Diaper dermatitis can also provide clues to systemic processes. Acrodermatitis enteropathica, an autosomal recessive disorder causing only partial zinc absorption due to a mutation in the *SLC39A4* gene that encodes a zinc transporter protein, has a distinct diaper rash pattern. A few weeks after weaning from human milk, affected infants develop diarrhea, alopecia, and characteristic skin lesions. Exudative periorificial and acral lesions with a psoriasiform quality are first noted and then progress to vesicles, pustules, erosions, or hyperkeratotic areas. Zinc replacement resolves the symptoms and is taken lifelong. Infantile Langerhans cell

histiocytosis is a rare disease found in children 3 years or younger caused by proliferation of Langerhans cells in a variety of organs. The rash can vary depending on the location: impetigo-like lesions in the thigh folds, exudative papules around the anus, scalp lesions consistent with seborrheic dermatitis, and clusters of reddish-brown papules on the trunk, often with hemorrhagic crusts. Biopsy of the skin lesions shows CD1a- and S-100-positive cells with characteristic racket-shaped bodies (Birbeck granules) in the cytoplasm. Treatment is managed by pediatric oncologists and is dependent on specific organ involvement. Lichen sclerosis, an autoimmune disease of unknown cause, is predisposed to the anogenital area and causes sharply demarcated erythematous areas that progress into white, pearly, and often atrophic patches. The therapy of choice for lichen sclerosis is topical corticosteroids and calcineuron inhibitors. Specific food allergies may present with persistent diaper dermatitis similar to irritant dermatitis but do not respond to topical treatment. Consider this specifically when the rash covers the entire perineum and if there are other symptoms, such as diarrhea, rash outside the diaper area, or other stigmata of food allergy. Elimination of the causative food results in resolution of the dermatitis.

Although most diaper dermatitis is due to irritants, recall that the decrease in skin integrity with irritant dermatitis can contribute to infections, such as candidiasis, or exacerbate existing underlying skin conditions. Consideration also needs to be given to less commonly seen inflammatory or systemic diagnoses that benefit from timely diagnosis and treatment.

COMMENTS: A wise mentor of mine commented on the confusing nature of the term *diaper dermatitis* because this implies causation from the diapers rather than the

anatomical distribution. Hence, a more precise term would be *perineal rash*. However, over the decades, the term *diaper dermatitis* continues to be used. As a general pediatrician, I really appreciate when research and evidence-based medicine is used for common pediatric entities. This *In Brief* provides us with that evidence. Much research has been conducted for this common entity, which some estimates suggest affects 25% of infants and most children by 2 years of age. Because of its frequency, it is critical to understand the anxiety that this can cause to parents. The rash can, at times, cause discomfort to the infant, resulting in increased crying, agitation, and trouble sleeping, which suggests emotional and physical distress. And this can lead to guilt on behalf of the parents. Much research and many technological advancements have improved disposable diapers, both to minimize the skin contact with irritants but also in minimizing the environmental impact. In thinking about social determinants of health, I have found that many low-income families struggle to find the money to buy disposable diapers. Although frequent diaper changes make sense in increasing air time and decreasing time of contact of the skin with urine and stool irritants, this may not always be feasible for families on a tight budget. This *In Brief* also reinforces the importance of diagnostic decision making. Although irritant dermatitis is by far the most common reason for a diaper dermatitis, follow-up is key if the dermatitis does not improve with suggested therapy or over time. It is important to educate ourselves as health-care providers to be alert to the potential other causes that may be more serious and need specific treatments. Time and critical reasoning are always on the side of the reflective and thoughtful pediatrician.

–Janet R. Serwint, MD
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Pediatrics in Review 2021;42;48
DOI: 10.1542/pir.2020-0128

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