

# Understanding Moisture-associated Skin Damage and Best Practice Recommendations

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## ABSTRACT

Moisture-associated skin damage (MASD) is caused by prolonged exposure of the skin to moisture and can be 1 of the following 4 types: (1) incontinence-associated dermatitis (IAD), (2) intertriginous dermatitis, (3) peristomal MASD, and (4) periwound MASD. This classification is based on the type of offending contaminant. Prolonged exposure of the skin to excessive moisture makes the skin overhydrated and prone to maceration. This moisture damages the protective functions of the skin and causes the skin to become susceptible to penetration by microorganisms as well as mechanical damage from shear and friction. All of these have a significant impact on the patient's quality of life. Additionally, the harmful effects of MASD often occur with incontinence. It can be difficult to distinguish between IAD and pressure injuries. However, it is critically important to be able to distinguish between the various types of MASD to provide an accurate diagnosis and care plan. Nurses and health care professionals should focus on identifying high-risk patients, offer preventative plans, and use the appropriate product with proven efficacy.

**KEYWORDS:** incontinence, maceration, moisture, moisture-associated skin damage, pressure injury, skin function, intertrigo

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The term *moisture-associated skin damage* (MASD) refers to skin damage resulting from long-term exposure of the skin to moisture. Specifically, MASD is defined as inflammation and erosion of the skin caused by prolonged exposure to moisture and its contents, including urine, stool, perspiration, wound exudate, mucus, or saliva.<sup>1</sup> Moisture-associated skin damage is a significant issue in which individuals with MASD experience pain, discomfort, and a decreased quality of life. Clinical experience suggests moisture alone may not be sufficient to cause MASD. Additional factors that play a role include extended or continued contact of the skin with moisture; chemical irritants such as digestive enzymes, friction, and mechanical forces; and microorganisms.<sup>2</sup>

The skin is the largest organ in the human body and provides a protective barrier preventing the entry of pathogenic

microorganisms.<sup>3</sup> The skin also protects internal tissues and organs from harmful ultraviolet radiation, chemical irritants, temperature, toxins, and mechanical injuries.<sup>3</sup> The skin is composed of the following 3 main layers: epidermis, dermis, and subcutaneous layer.<sup>3</sup> Skin integrity is critical for the protective functions of the skin.<sup>3,4</sup> The epidermis adapts to the external environment and traps moisture, thereby preventing the skin from drying out.<sup>3,4</sup> Specifically, the stratum corneum, the outermost layer of the epidermis, provides the main protective barrier and allows epidermal permeability.<sup>4</sup>

The skin's protective functions depend on its flexibility and elasticity, which, in turn, depend on the amount of water in the stratum corneum. This optimum amount of water is maintained by regulation of the inflow and outflow of water from the stratum corneum.

This process of regulating water movement within the epidermis is known as transepidermal water loss (TEWL).<sup>3</sup> A low TEWL indicates intact or recovered skin whereas a high TEWL indicates skin barrier dysfunction. Thus, TEWL is an indicator of the moisture barrier function. Healthy skin has a pH of about 5.5 (slightly acidic), and under normal conditions, dehydration and overhydration are prevented. The acid mantle of the skin (thin protective layer on the stratum corneum) and acidic environment support commensal bacteria on the skin while diminishing infection by pathogens. Healthy skin is colonized by a diverse microbiota.<sup>5</sup>

When the skin is exposed to too much moisture, it is prone to maceration and breakdown, which leads to a higher TEWL. Breaks in the skin can lead to fluid loss, infection, and pain. Patients with

## UNDERSTANDING MASD AND BEST PRACTICES

MASD report pain, itching, or burning around affected areas—which remains a significant health concern.

### RISK FACTORS FOR IMPAIRED SKIN INTEGRITY

As humans age, the skin becomes more fragile, thus susceptible to injury. Risk factors for impaired skin integrity entail both intrinsic (patient-specific) and extrinsic factors. Major risk factors include urinary or fecal incontinence, profuse sweating, excessive wound exudate, leaking stoma effluent, and use of alkaline soaps, antibacterial skin cleansers, and pad-blocking barrier creams.<sup>3</sup> Additional risk factors include obesity, limited mobility, pain, fever, cognitive impairment, use of antibiotics and immunosuppressants, poor skin hygiene, use of inappropriate continence devices, and drying skin with abrasive cloths.

### CAUSES AND PATHOPHYSIOLOGY OF MASD

Skin pH can become alkaline not only due to prolonged exposure to urine and feces, but also to various other bodily fluids such as perspiration, saliva, wound exudate, and intestinal fluids. The chemical composition of these bodily fluids also plays a role in causing MASD. Furthermore, mechanical trauma (eg, friction, shear, and pressure can cause skin damage and lead to MASD). Overhydration of the skin impairs its barrier function, leading to skin damage.<sup>6</sup> Specifically, overhydration affects the lipid matrix in the stratum corneum, which increases skin friction while decreasing the flexibility and elasticity of the skin. The pressure and shearing forces cause an increased risk of pressure injuries (PIs) developing as well as stripping of the stratum corneum.<sup>7</sup>

The increased pH disrupts the intercellular lipids and the corneocytes in the stratum corneum. This increases the skin permeability and decreases the barrier function facilitating microbial proliferation and penetration. This initiates the release of pro-inflammatory cytokines and inflammatory mediators that, in turn, trigger an inflammatory response referred to as MASD. Factors contributing to MASD development include the length



of time the skin is exposed to moisture, previous skin injury, and the composition of the offending irritant. Moisture-associated skin damage severely affects the skin microbiome, and secondary infections are painful and challenging to treat.<sup>5</sup>

### TYPES OF MASD

The following are 4 specific types of MASD: incontinence-associated dermatitis (IAD), intertriginous dermatitis (intertrigo), peristomal MASD, and periwound MASD. This classification is based on the type of offending contaminant.

#### INCONTINENCE-ASSOCIATED DERMATITIS

Approximately 14 million adults in England live with incontinence, and this population is susceptible to IAD.<sup>3</sup> Terms that also refer to IAD include *diaper dermatitis*, *diaper rash*, *perineal dermatitis*, and *moisture lesions*. Specifically, IAD is caused by extended exposure of the skin to urine, feces, and liquid feces. Dual incontinence where the skin is exposed to both urine and feces can also occur. Incontinence-associated dermatitis occurs in the perianal area, scrotum, groin, buttocks, gluteal cleft, and inner and posterior thighs, and symptoms can be mild, moderate, or severe. Incontinence-associated dermatitis affects 3.4% to 50% of patients, and it is characterized by erythema and inflammation of the skin along with denudation and erosion caused due to exposure of the skin to urine or feces.<sup>8</sup> Urea in the urine is

converted to ammonia, which causes the pH of the skin to become alkaline. Alkaline pH is conducive to bacterial proliferation and infection.<sup>1</sup> The alkaline environment also can be caused by protein and lipid digestive enzymes present in liquid feces. These proteases and lipases disrupt the acid mantle of the skin, allowing irritants to penetrate and microbes to multiply, triggering an inflammatory response.<sup>9</sup>

In 2017, a Global IAD Categorization tool was developed internationally to assess damaged skin to determine the presence of persistent redness or skin loss.<sup>10</sup> Incontinence-associated dermatitis is classified into the following 4 categories: persistent redness without clinical signs of infection, persistent redness with clinical signs of infection, skin loss without clinical signs of infection, and skin loss with clinical signs of infection.

It is important to understand the distinction between MASD and a PI because there is often confusion with the terminology. Treatment of IAD should focus on both IAD management and pressure injury prevention. A PI is caused by pressure or a combination of pressure and shear.<sup>7,10</sup> Pressure injuries typically occur over bony surfaces.<sup>11</sup> An association between IAD and PI development may exist. It is crucial for health care practitioners to be able to recognize and differentiate between different skin injuries because the causes, management, and prevention differ. Identifying causative factors of incontinence is also important.



**INTERTRIGINOUS DERMATITIS (INTERTRIGO)**

In contrast to IAD, intertriginous dermatitis (ITD) or intertrigo is caused by perspiration and affects areas typically not affected by incontinence. Although ITD can occur in any skin fold, it is typically located in the axilla, under pendulous breasts, abdominal pannus, in inframammary and inguinal folds, pubic panniculus, between toes and in areas prone to harbor moisture.<sup>5</sup> Intertriginous dermatitis begins as mild erythema and can progress to severe swelling with maceration, denudation, weeping, and crusting with potential secondary infection (particularly fungal infection). Typical symptoms include itching, burning, pain, and odor. Risk factors for ITD include high body mass index, lymphedema, multiple skin folds, and pendulous breasts. To minimize the risks of IAD, it is important to keep the skin dry and clean.

**PERISTOMAL MASD**

Peristomal MASD results from moisture that begins at the stoma or skin junction leading to inflammation and skin erosion. The offending contaminant is the effluent from the stoma. Approximately 1 million Americans live with an ostomy.<sup>6,12,13</sup> Peristomal MASD originates at the stoma-skin junction and may extend outward by up to 10 cm around the stoma. This includes urinary and fecal diversions, tracheostomies, and other stomas. Health care professionals are advised to look for erythema and inflammation of the peristomal skin with or without skin breakdown.

**PERIWOUND MASD**

Peri wound is defined as the area around the wound that may be affected by wound-related factors and/or underlying pathologies.<sup>13</sup> Peri wound MASD is caused by prolonged exposure to wound exudate. Clinical features include erythema, erosion, and a white margin around the wound. This is due to the trapped moisture that causes the skin to soften and wrinkle. This increases the risk of infection, friction damage, and skin breakdown as well as delays wound healing.<sup>14</sup> Occlusive wound care dressings or products can increase the level of moisture to an excessive amount. Peri wound MASD occurs if the excessive amounts of exudate are not managed effectively, and the volume of the exudate exceeds the fluid handling capacity of the dressing.

Clinicians and health care professionals should consider the moisture vapor transmission rate, interface of the dressing to lock fluid in, and time between dressing changes. It is also important that an absorbent dressing is used. Management of wound exudate and protection of the skin around the wound are key to avoiding peri wound MASD.<sup>14</sup> Notably, peri wound MASD also increases the risk of amputation in diabetic foot wounds. In venous leg ulcers, which have elevated levels of wound exudate, peri wound MASD increases pain, wound size, and time to heal. Preventing peri wound MASD may help to avoid stalled wound healing. Individuals at higher risk include those who are of an advanced

age, are immunosuppressed, or have previous environmental skin damage (radiation, sun exposure) or skin disorders (eczema, psoriasis).<sup>13</sup> Other risk factors include underlying pathology and congenital disorders (epidermolysis bullosa).<sup>13</sup>

**MASD MANAGEMENT**

Protecting the skin against MASD is a critical component of skin and wound care. Moist skin is more susceptible to damage by pathogens, and a structured skin care regimen is necessary for both MASD prevention and management.<sup>5</sup> In general, to manage MASD, a 3-step approach is recommended:

- **Step 1:** The first step is to assess the patient’s risk.<sup>13</sup> Nurses and health care professionals must understand the anatomy and physiology of the skin. This helps to identify abnormal skin, determine the patient’s level of risk, identify the type of MASD, and determine whether the care provided is appropriate and adequate.
- **Step 2:** The acronym CPR is known for *cleanse, protect, and restore*.<sup>1</sup> The natural acid mantle of the skin can be disrupted by alkaline soaps, which can cause skin damage. Therefore, cleansing with a pH-balanced product is critical. Protection involves creating a barrier between the cleansed skin and the offending contaminants in the urine or feces, for example. This is accomplished with the use of appropriate continence care wipes. It is important to minimize the exposure the patient has to the offending irritant. The last step in CPR is restoration.<sup>1</sup> This entails adding moisturizing ingredients so the skin’s acid mantle can repair itself and restore the natural barrier function of the skin.
- **Step 3:** The third step is treatment and management of MASD. If the skin is damaged because of MASD, appropriate steps need to be taken to treat the affected areas.<sup>13</sup> Cost-effective and evidence-based practices should be used to help prevent and manage MASD. Skin cleansing agents, incontinence products, pH-balanced continence care wipes



and skin barrier applications should be used to provide care to the patient.

Educating the patient and/or the caregiver is also particularly important so that they can make informed decisions. Quite often the caregiver is not a licensed health care clinician, and hence it is imperative that they are educated and trained about the basics of skin and wound care and treatment strategies for MASD.

Categorization and assessment tools are available for the various MASD types. The Ghent Global IAD Categorisation Tool is a validated assessment tool for IAD<sup>15</sup> whereas ITD does not currently have a validated tool. For peristomal MASD, the ostomy skin tool is validated.<sup>16</sup> Lastly, the Harikrishna tool is validated but on a small sample.<sup>17</sup>

### CONCLUSION

Although the different types of MASD have distinct clinical manifestations and offending contaminants, they have a common etiology and pathophysiology. A common factor in all the different MASD types is prolonged exposure of the skin to moisture. Furthermore, moisture alone is not sufficient to cause MASD. Additional factors such as the chemical composition of the moisture source, mechanical forces, and presence of microbial pathogens play a significant role. The prevention of MASD is always preferable to MASD management. Precautions should be taken by implementing a skin care regimen to prevent and alleviate the symptoms and complications associated with MASD. Health care practitioners need to recognize MASD risk factors, raise awareness about this critical condition, and follow appropriate skin and wound care regimens to prevent and treat MASD.

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For additional information on MASD, including causes, assessment, and management, watch the On-Demand Webinar presented by Elizabeth Faust (US/Canada), Siobhan McCoullough (UK), and Trish Idensohn (South Africa). This event is brought to you by Wound Care Today and HMP Global with financial support from 3M. <https://www.woundcare-today.com/global/understanding-moisture-associated-skin-damage-masd>