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# UNDERSTANDING MOISTURE-ASSOCIATED SKIN DAMAGE

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ALISON PARNHAM

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UNDERSTANDING
MOISTURE-ASSOCIATED
SKIN DAMAGE

# Acknowledgements

This presentation will draw information primarily from the following documents to support the content.


Wounds UK

Moisture-associated skin damage made easy

Introduction

Terms such as moisture lesions, perineal dermatitis, diaper dermatitis or incontinence-associated dermatitis describe some of the conditions traditionally considered to be a specific problem of continence care. The term moisture-associated skin damage has been introduced to cover the range of skin problems that occur due to prolonged exposure to wound exudate, faecal and/or urinary incontinence and perspiration. It is important for clinicians to assess, correctly diagnose and to treat the cause of the skin damage locally, as well as promote appropriate skin care and continence regimens to keep the patient's skin clean and dry. This Made Easy will help clinicians identify the causes of skin damage and determine the appropriate treatment path.

Authors: Dowsett C, Allen L

EFFECTS OF MOISTURE ON THE SKIN

The harmful effects of excessive moisture on the skin are well documented. When exposed to excessive amounts of moisture, the skin will soften, swell, and become wrinkled, all of which make the skin more susceptible to damage. Although traditionally this has been considered as being a specific problem of continence care, it is a common problem encountered in many patient groups. As a consequence, the umbrella term moisture-associated skin damage (MASD) has been introduced to describe the spectrum of damage that occurs in response to the prolonged exposure of a patient's skin to perspiration, urine, faeces or wound exudate (Gray et al, 2011).

The skin performs a variety of important physiological roles, including protection from environmental exposure, preservation of internal homeostasis, thermoregulation, immune function, and vitamin D metabolism (Wounds UK, 2012). The moisture barrier of the skin is an essential element of this function. It contributes to the maintenance of internal homeostasis by slowing the movement of water from the body's interior, while protecting the body from excessive absorption of water and solutes from the environment. MASD occurs when moisture remains in constant contact with the body for prolonged periods of time, when the effluent contains irritating substances, when the effluent contains potential bacterial or fungal pathogens, and when moisture exposure increases friction at the skin surface.

CAUSES OF MOISTURE-ASSOCIATED SKIN DAMAGE

It is generally accepted that MASD consists of four distinct conditions, each having slightly different aetiologies, namely: incontinence-associated dermatitis; intertriginous dermatitis; perwound moisture-associated dermatitis and peristomal moisture-associated dermatitis. The conditions are outlined in Figure 1 (page 2). Identifying the cause through a detailed patient assessment can help distinguish between the four conditions and ensure appropriate prevention and management interventions are implemented.

Incontinence-associated dermatitis

Incontinence-associated dermatitis (IAD) is predominantly a chemical irritation that occurs when urine or stool comes into contact with the skin. Ammonia from urine and enzymes from stool can disrupt the acid mantle of the skin and eventually cause the skin to break down (Rees and Figueiredo, 2010). Maceration also plays a key role in the formation of IAD, and can make the skin more susceptible to friction damage (White and Cutting, 2003). Although urinary incontinence may lead to IAD, it is much more common in individuals with faecal incontinence or mixed urinary and faecal incontinence (Voegeli, 2012). The affected area will present with erythema, as well as maceration. The area may progress to painful partial-thickness erosions with weepy serous exudate. If left untreated, pressure and friction may increase stress on the affected area, leading to skin breakdown.

Intertriginous dermatitis

Intertriginous dermatitis (ITD), also referred to as intertrigo, occurs when sweat is trapped in skin folds with minimal air circulation. When the sweat cannot evaporate, the stratum corneum becomes overly hydrated and macerated, facilitating friction damage that is often mirrored on both sides of the fold. This in turn leads to inflammation and denudation of the skin, making the area more prone to infection (Black et al, 2011). Obese people are more at risk of ITD due to excessive skin folds, increased perspiration to regulate body temperature, and higher skin surface pH (which makes the acid mantle less effective as a natural barrier to infection).

Perwound moisture-associated dermatitis

The production of exudate is a normal response during the inflammatory stage of wound healing. Excessive amounts of wound exudate can cause the perwound (within 4cm of wound edge) skin to become macerated and even break down (White and Cutting, 2003). The presence of bacteria, specific proteins, or proteolytic enzymes, and the volume of wound exudate greatly reduce the skin barrier function and


Wounds UK

IAD made easy

Introduction

Incontinence-associated dermatitis (IAD) describes skin damage associated with exposure to urine or faeces. It causes patients significant discomfort and can be difficult and time-consuming to treat (Doughty, 2012). It is a significant health challenge and a well-documented risk factor for pressure ulcer development (Beeckman et al, 2014).

Authors: Ousey K, O'Connor L. Full author details are on page 6

The current lack of standard terminology and definitions is hampering clinicians as they attempt to deliver evidence-based practice. There are a number of definitions used to describe IAD, they include: perineal dermatitis, perineal rash, nappy rash/dermatitis, irritant dermatitis, moisture ulcers and moisture lesions. Establishing consistent terminology for IAD is crucial in facilitating research and improving education for healthcare professionals and standardising care.

OVERCOMING THE CHALLENGES

IAD presents a significant challenge to HCPs and patients. The exact size of the challenge is hard to define. This is due partly to inconsistencies in terminology, and difficulties in recognising the condition and distinguishing it from Category I/II pressure ulcers in diagnosis: all of which have subsequently resulted in less than robust data collection. This is compounded by the lack of a nationally recognised, validated and accepted method for IAD data collection, which adds to the wide variation in prevalence and incidence figures.

Studies have estimated prevalence of IAD at 5.6% to 50% (Bliss et al, 2006; Peterson et al, 2006; Junkin & Selekof, 2007; Gray et al, 2012; Campbell et al, 2014) while incidence is 3.4% to 25% (Bliss et al, 2007; Long et al, 2014; Borchert et al, 2010).

Patients with IAD may experience discomfort, pain, burning, itching and tingling in affected areas, even when the dermis is intact. In addition, patients may feel loss of independence, disruption to activities and/or sleep and reduced quality of life that becomes worse as the frequency and quantity of soiling increases. They may also feel/believe they are a burden on family and friends.

Cost concerns and constraints

*What is the cost of treating IAD?*

Accurate costs related to IAD are difficult to present, as there are little data that distinguishes these from pressure ulcer costs. However, Bale et al (2004) published economic considerations in terms of nursing time and consumables in relation to managing and treating IAD. Following the introduction of structured

Box 1. Classification

In the World Health Organization (WHO) International Classification of Diseases, which has been in use since 1994, there is no coding for IAD, although there is a code for nappy dermatitis.

skin care regimens in two nursing homes, the presence of IAD and Category I pressure damage after three months was reduced, with a reduction in time taken to deliver skin care, saving just over 34 minutes of staff time per patient per day.

The average saving per day per patient in staff costs was £8.83 (US $13.75) for qualified staff and £3.43 (US $5.33) for unqualified staff (based on 2004 costs). Guest et al (2011) evaluated the economics of four different skin care regimens in over 900 nursing home residents, it showed no significant difference in IAD rates between the four regimens, however the total cost (including product, labour and other supplies) per incontinence episode was significantly lower when a barrier film was used.

*What is the impact on outcomes and human cost of not managing and treating IAD effectively?*

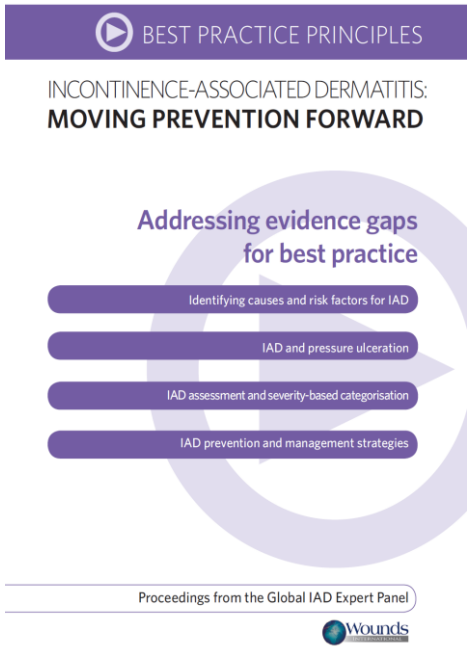
The impact of suffering with IAD on an individual can be undignified and painful. A number of patients who suffer from IAD tend to be vulnerable and reliant on others to help manage their continence issues. Unfortunately there is limited empirical evidence to support this. It can only be assumed from anecdotal evidence and working within clinical practice that the trauma experienced by individuals has a negative impact on their life. This is usually demonstrated by the pain and discomfort they express when they undergo treatment.

*What are the other associated costs — psychosocial, wider healthcare organisation costs?*

Clinicians are aware that IAD causes pain and discomfort to patients; a stance supported by research from Fader et al (2008). This highlights that both urinary and faecal incontinence have a profound and devastating effect on a person's social, physical and financial and psychological wellbeing. Yet patients still experience pain, discomfort and effects on their dignity because of the poor management of IAD.

Dorman et al (2004) reported that faecal incontinence in hospital patients is often overlooked with management of the problem being given low priority. At a time when the health service needs to be aware of expenditure, it is difficult to assess the expense of barrier products and continence aids.

Within the NHS, cost of products is often calculated by reviewing price per unit and amount of products purchased. However, these costs can be unreliable due to insufficient monitoring of incidence and prevalence of IAD making it difficult to understand fully the financial costs associated with this issue. Regular audit of practice, appropriate use of products and their effectiveness would allow for estimates of the true cost of managing IAD and the impact on the NHS.


BEST PRACTICE PRINCIPLES

INCONTINENCE-ASSOCIATED DERMATITIS:
MOVING PREVENTION FORWARD

Addressing evidence gaps for best practice

- Identifying causes and risk factors for IAD
- IAD and pressure ulceration
- IAD assessment and severity-based categorisation
- IAD prevention and management strategies

Proceedings from the Global IAD Expert Panel

Wounds


PRACTICE DEVELOPMENT

Back to basics: understanding moisture-associated skin damage

KEY WORDS

- Moisture-associated skin damage (MASD)
- Incontinence-associated dermatitis
- Intertriginous dermatitis
- Perwound MASD
- Peristomal MASD

This article discusses the aetiology and clinical presentations of the four conditions collectively known as moisture-associated skin damage (MASD). It explores the normal status of the skin and how this is altered in the presence of excessive and prolonged moisture. In all manifestations the barrier property of the skin is impaired, allowing irritants to penetrate the epidermis. Moisture damage disrupts the lipid matrix surrounding the cells in the stratum corneum and effectively dissolves the physical barrier of the skin. The pH of the skin also increases, resulting in an alkaline environment conducive to bacterial proliferation and infection. Urine and faeces are the offending contaminants in incontinence-associated dermatitis, whereas perspiration is the primary cause of intertriginous dermatitis. Effluent from the ostomy causes peristomal damage and wound exudate instigates moisture damage to the perwound skin. The clinical picture of MASD ranges from mild erythema to extensive and painful skin breakdown often complicated by bacterial and fungal infection. A structured skin-care regimen that involves cleansing, protecting and restoring the barrier properties of the skin will assist in the prevention and management of all MASD.

Moisture-associated skin damage (MASD) is the umbrella term for four clinical manifestations, namely incontinence-associated dermatitis (IAD), intertriginous dermatitis (ITD), perwound moisture-associated dermatitis and peristomal moisture-associated dermatitis. Excess moisture and the associated chemical irritants cause MASD. The difference between the four conditions is the type of moisture that induces the skin damage. Urine and faeces cause IAD, ITD is caused by perspiration, peristomal damage is due to effluent from the stoma coming into contact with the skin, and perwound moisture-associated dermatitis is a result of wound exudate being present on the skin surrounding the wound (Gray et al, 2011; Beeckman et al, 2017).

The global prevalence of MASD is not accurately known, with figures varying greatly between clinical settings and geographical locations (Gray et al 2011; 2013; Kottner et al, 2014; Beeckman et al, 2017). A recent national audit in Wales in which the skin of 8,365 hospital inpatients was inspected identified IAD in 4.3% of the cohort (Clark et al, 2017).

The lack of global prevalence data is not helped by the lack of consensus on the terminology to describe the injured tissue and lack of validated and accepted data collection method (Beeckman et al, 2015). The heterogeneity and variation of reported outcomes in research studies on IAD was highlighted in a recent Cochrane review on the subject (Beeckman et al, 2016). Misdiagnosis, especially in relation to IAD and category II pressure ulceration, hinders the accuracy of data collected. Clinicians are faced with confusion and uncertainty when trying to diagnose superficial damage on the sacrum, which could be due to pressure damage, IAD or a combination of both (National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance, 2014).

The recent publication of the Ghent Global IAD (GLOBIAD) categorisation tool has created an

TILDIE YOUNG
*Director of Education and Training, Welsh Wound Innovation Centre, Tyrosmardy, Rhondda Cynon Taff, Wales*

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# Learning objectives

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- To revisit the structure and function of the skin
- To describe the potential implications that excessive moisture can have on the skin
- To explain how moisture-associated skin damage (MASD) may occur

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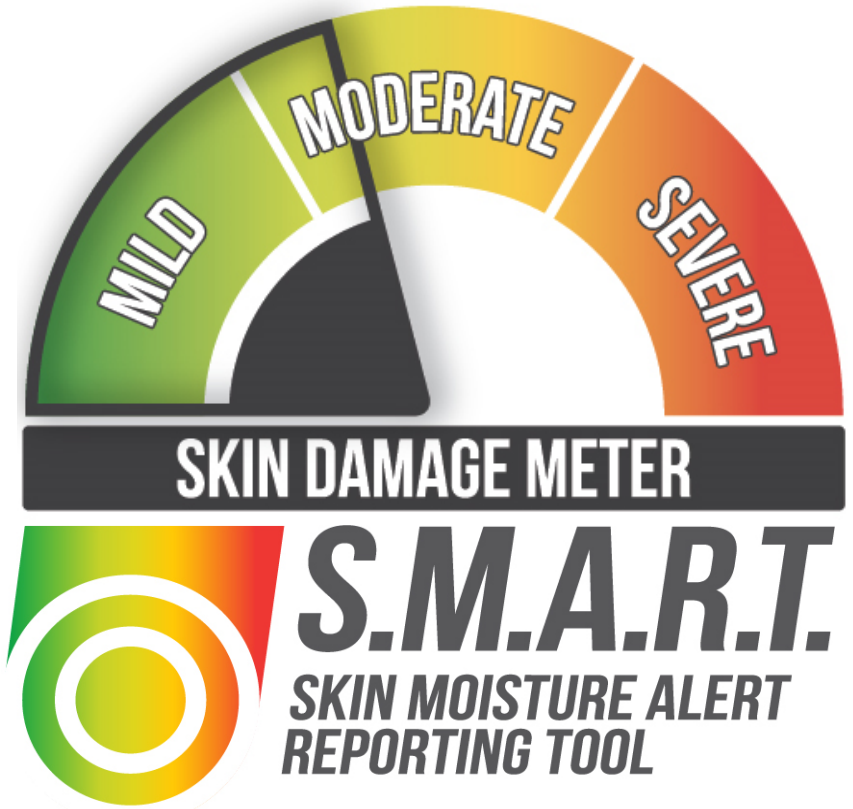
# Learning objectives




- To outline the importance of assessment/classification of MASD
- To introduce the National Institute for Health and Care Excellence (NICE) endorsed Skin Moisture Alert Reporting Tool (S.M.A.R.T.) resource[5]
- To explain how a structured approach can effectively manage problems associated with MASD

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# The skin

- The largest and one of the most important organs of the body
- It has a surface area of approximately 1.8 m2 and weighs around 4 kilograms (15–20% of TBW)
- Receives 8–10% of total blood flow (in an adult)
- Its appearance and condition reflects our general health

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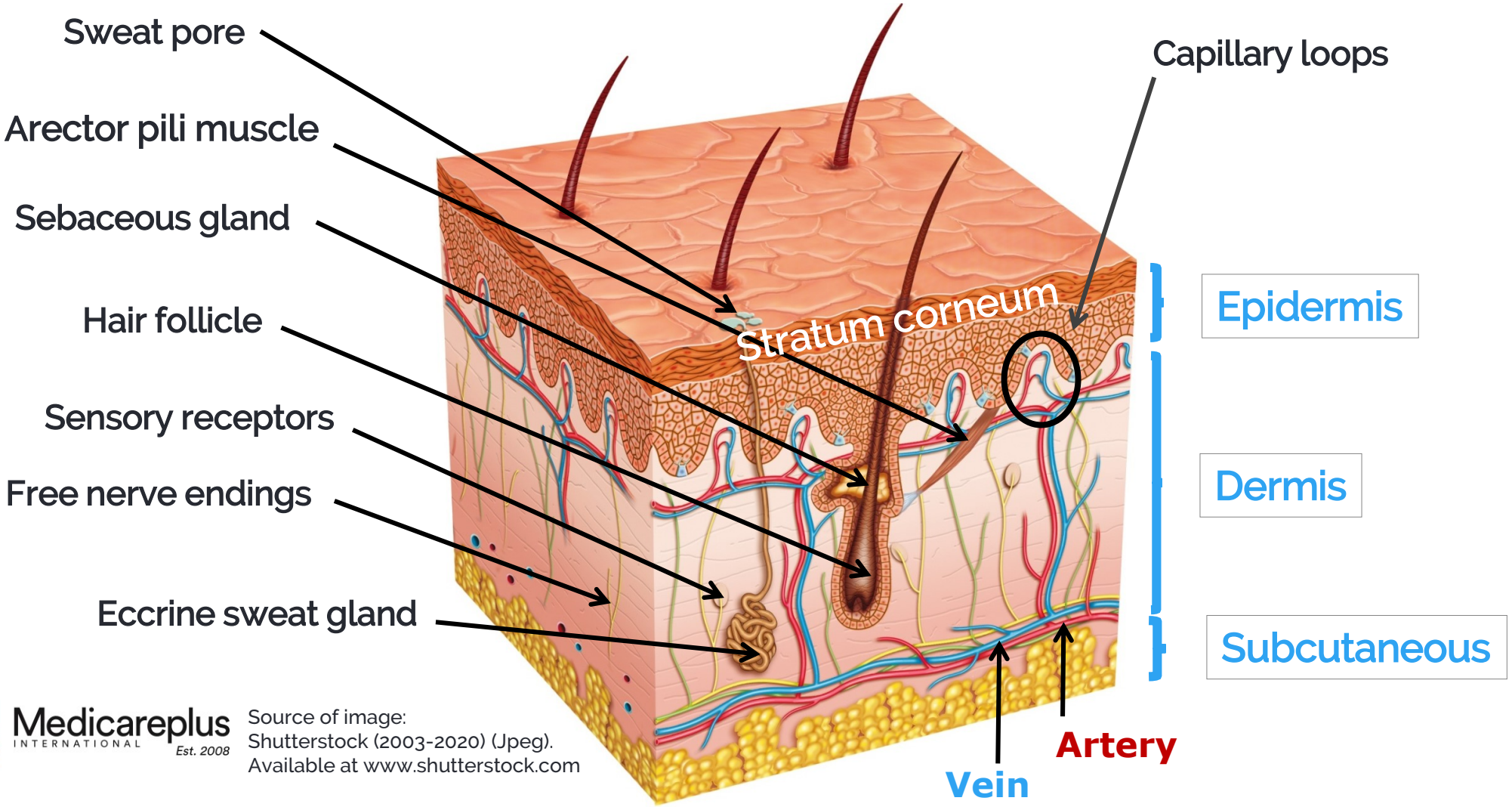
# On closer inspection

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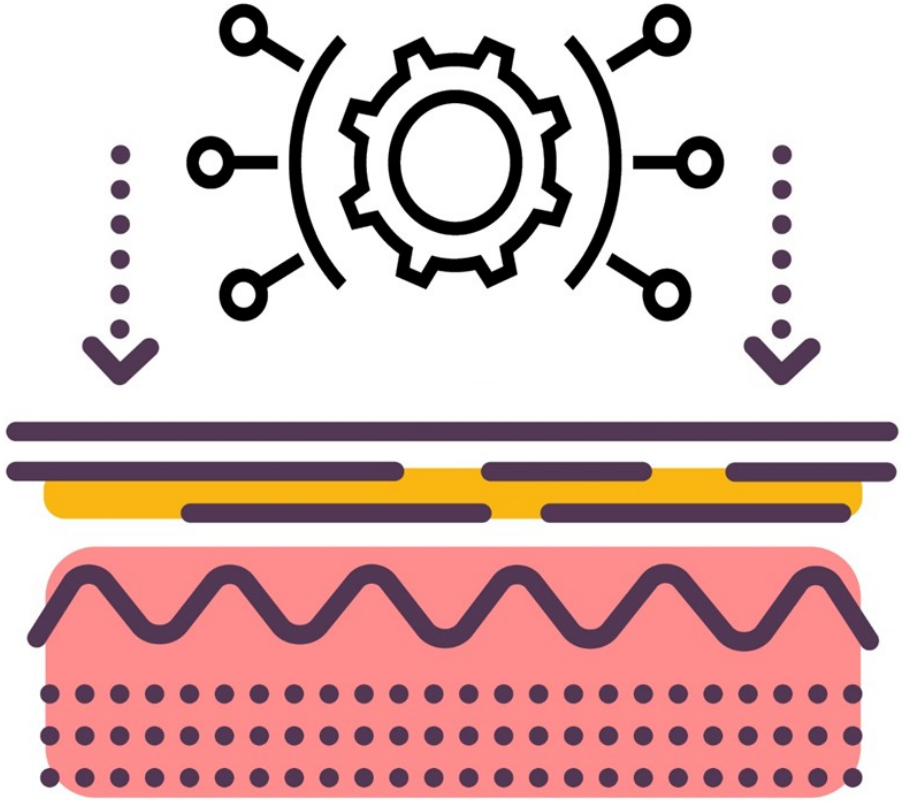
# Functions of the skin



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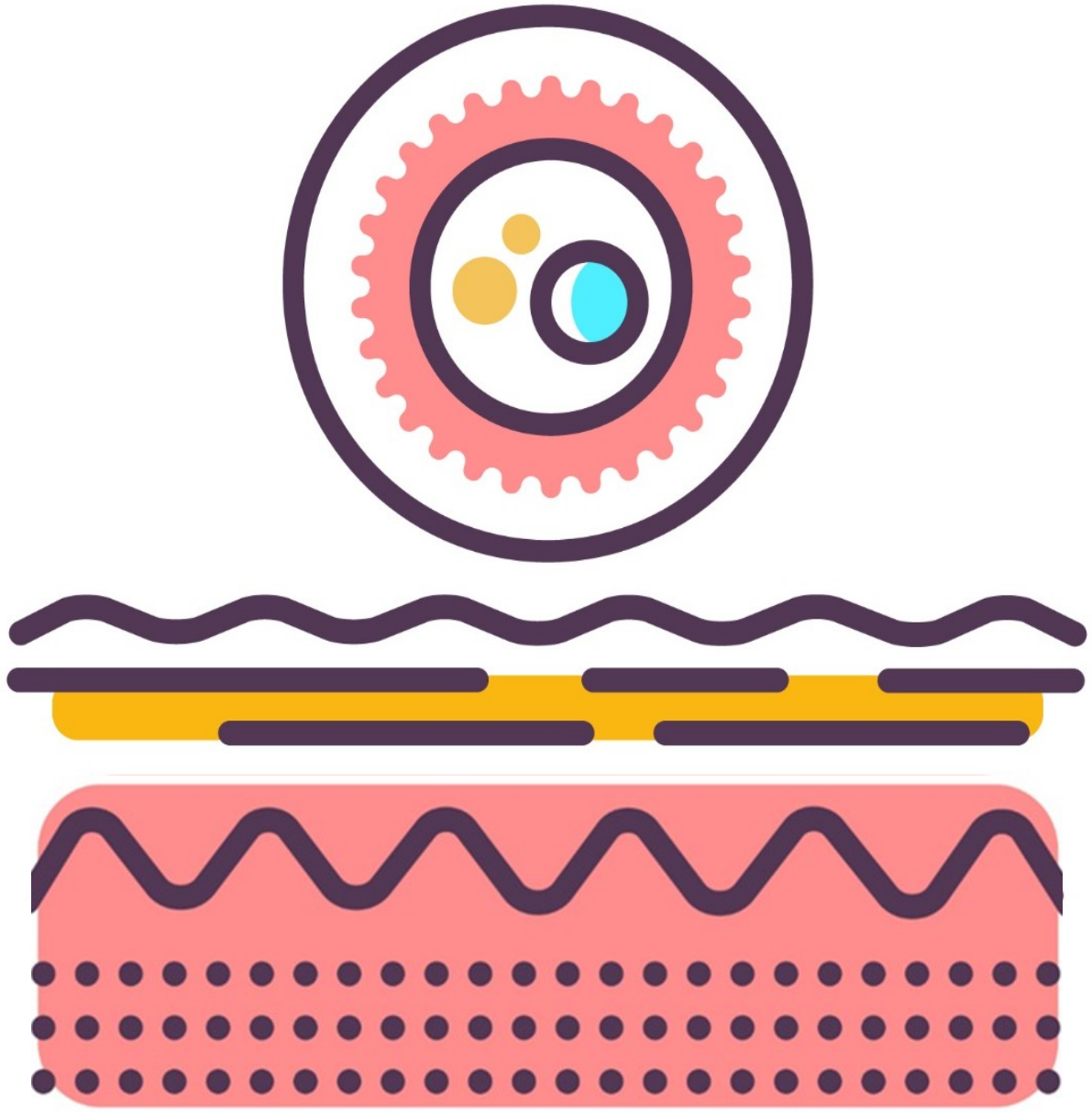
# Functions of the skin

## Protection[5] — barrier to infection

- Physical barrier of intact skin
- Skin flora
- Sebum
- Acidic mantle

## Protection[5] — barrier to insult

- Keratin
- Collagen
- Elastin
- Adipose
- Sensory receptors



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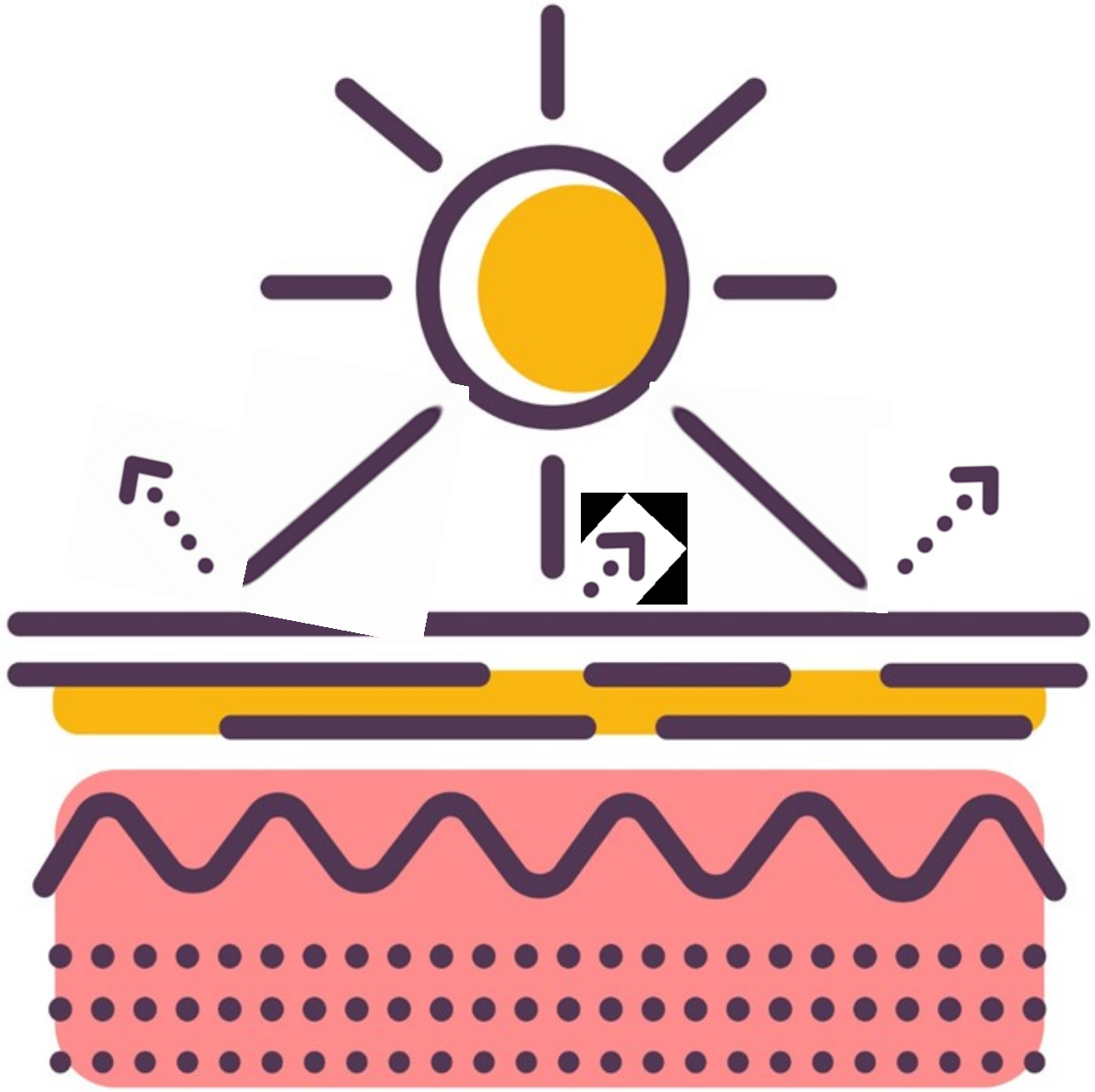
# Functions of the skin

## Protection[5]

- Prevents damage from ultraviolet (UV) radiation
- Production of melanin



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# Functions of the skin

## Protection[5]

- Prevents water loss
- Promotes hydration

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# Functions of the skin

## Absorption[5]

- Emollients for rehydration
- Lipid soluble chemicals
- Medicinal patches
- Medicinal ointments/creams
- Harmful chemical substances

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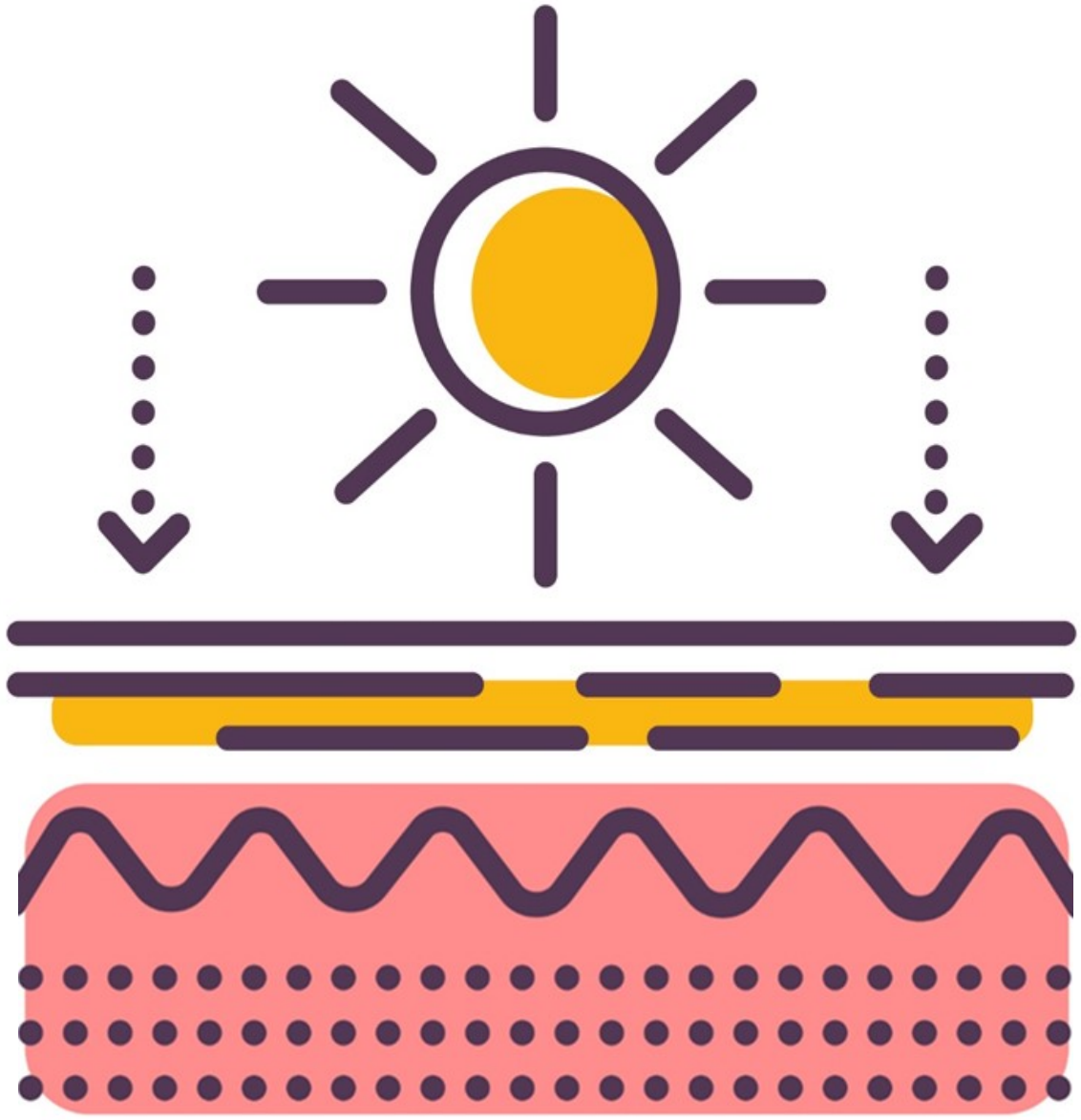
# Functions of the skin

## Synthesis of vitamin D[5]

- In response to sunlight
- Vitamin D is metabolised from dehydrocholesterol
- Bone development and calcium absorption



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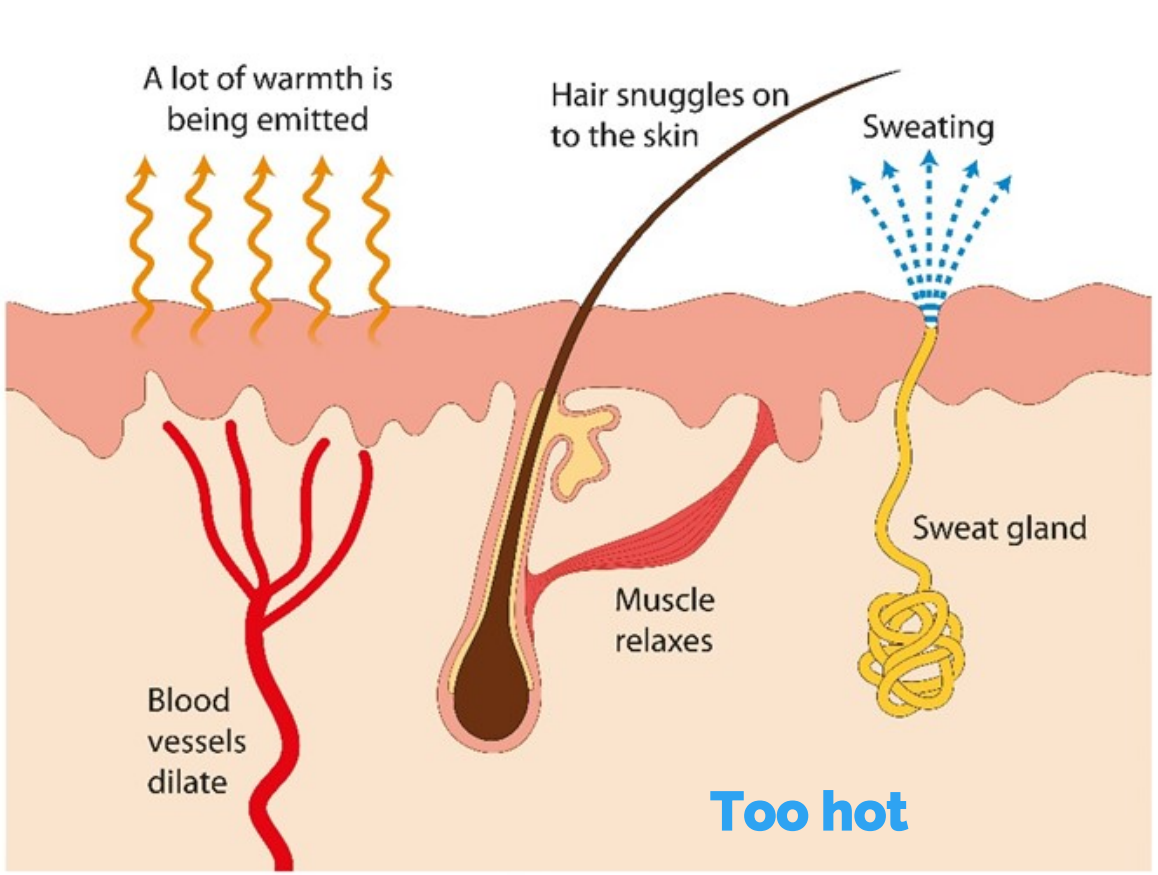
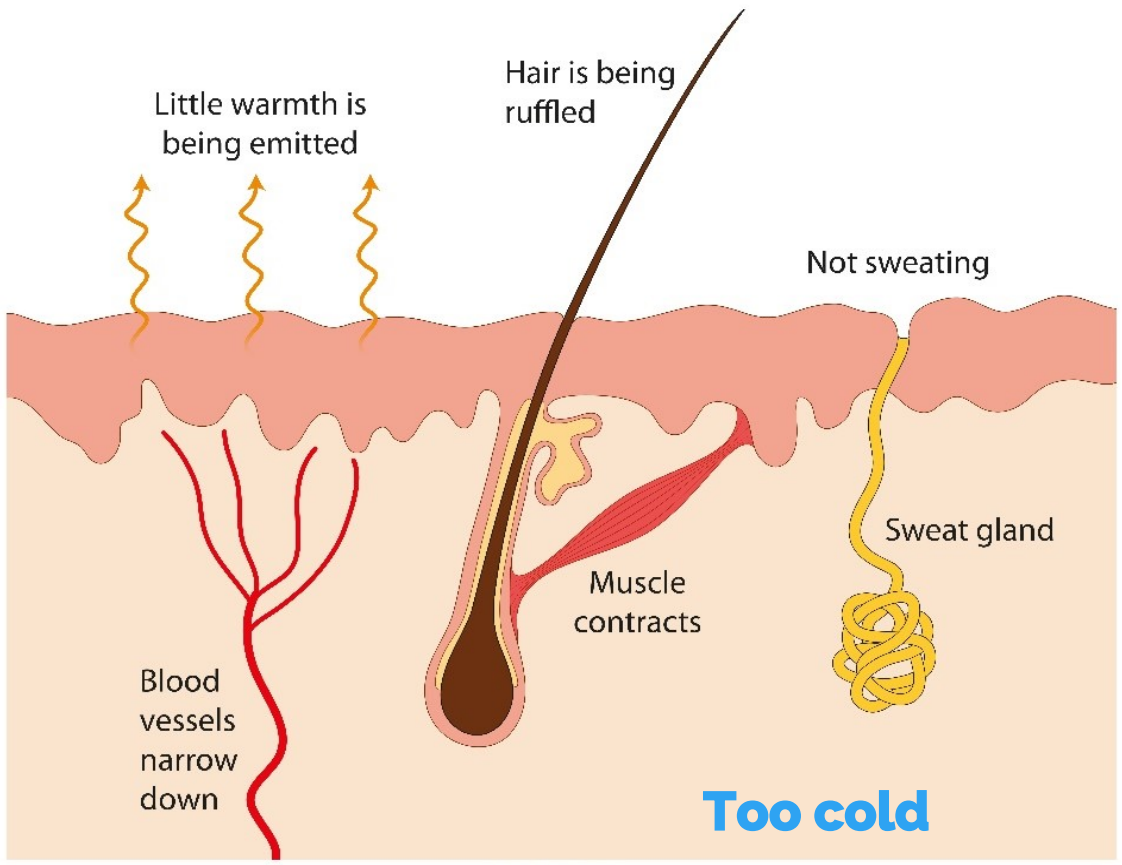
# Functions of the skin – thermoregulation[5]

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# Functions of the skin

## Communication[5]

- Facial expression
- Touch
- Physical appearance
- Physical wellbeing
- Secretion of pheromones

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# Prolonged/continuous exposure of the skin to moisture

## 1. Loss of barrier/protective function

- Over hydration of the skin disrupts the barrier properties of the stratum corneum and allows irritants to penetrate the epidermis
- Once the skin is over-hydrated, it is more prone to physical damage including friction and shear


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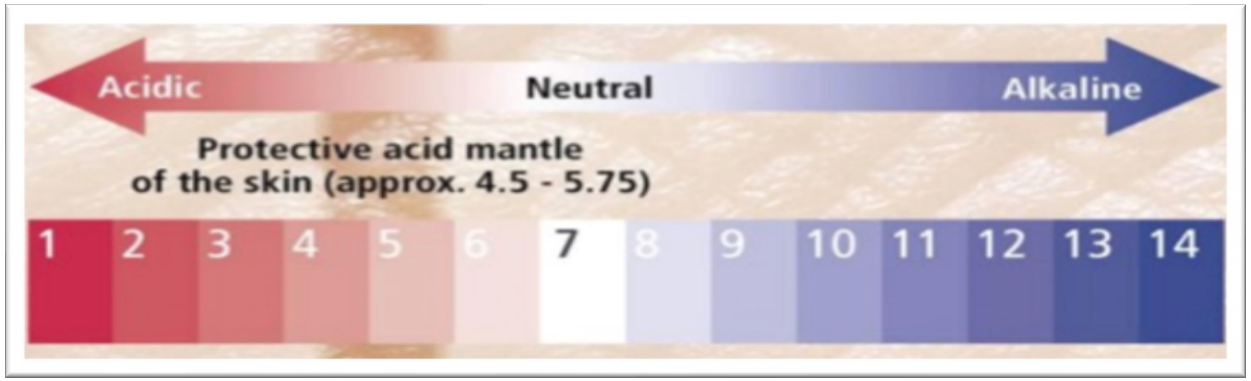
# Prolonged/continuous exposure of the skin to moisture

## 2. Changes in the 'acid-mantle'

- The pH of healthy skin is between 4 and 6, providing an acidic environment that supports the resident, commensal bacteria on the surface of the skin.




- In overhydration, the pH of the skin increases, resulting in an alkaline environment that is conducive to bacterial proliferation and infection.

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# Moisture-associated skin damage


**Incontinence-associated dermatitis**

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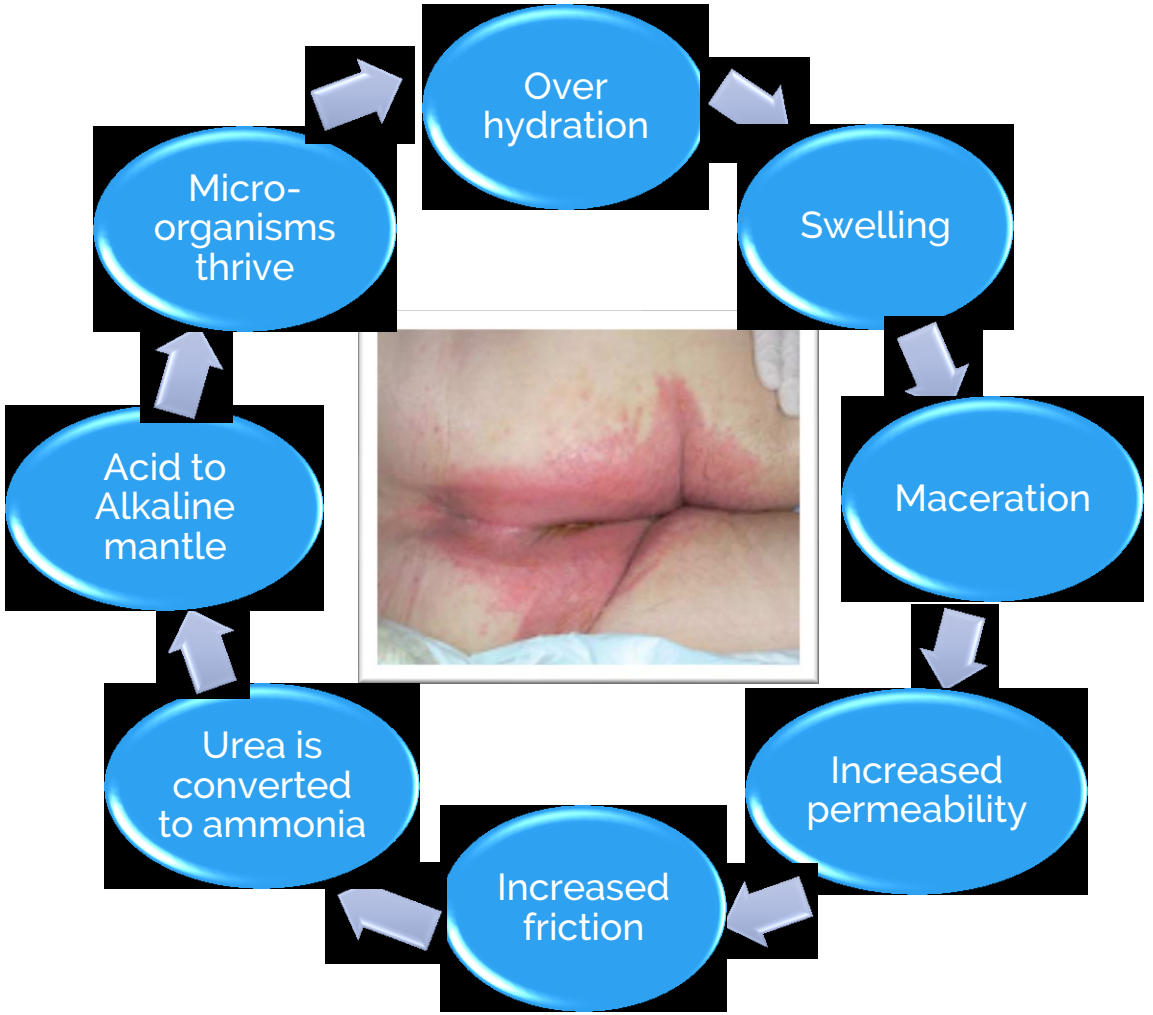
# Incontinence-associated dermatitis — urine[3]

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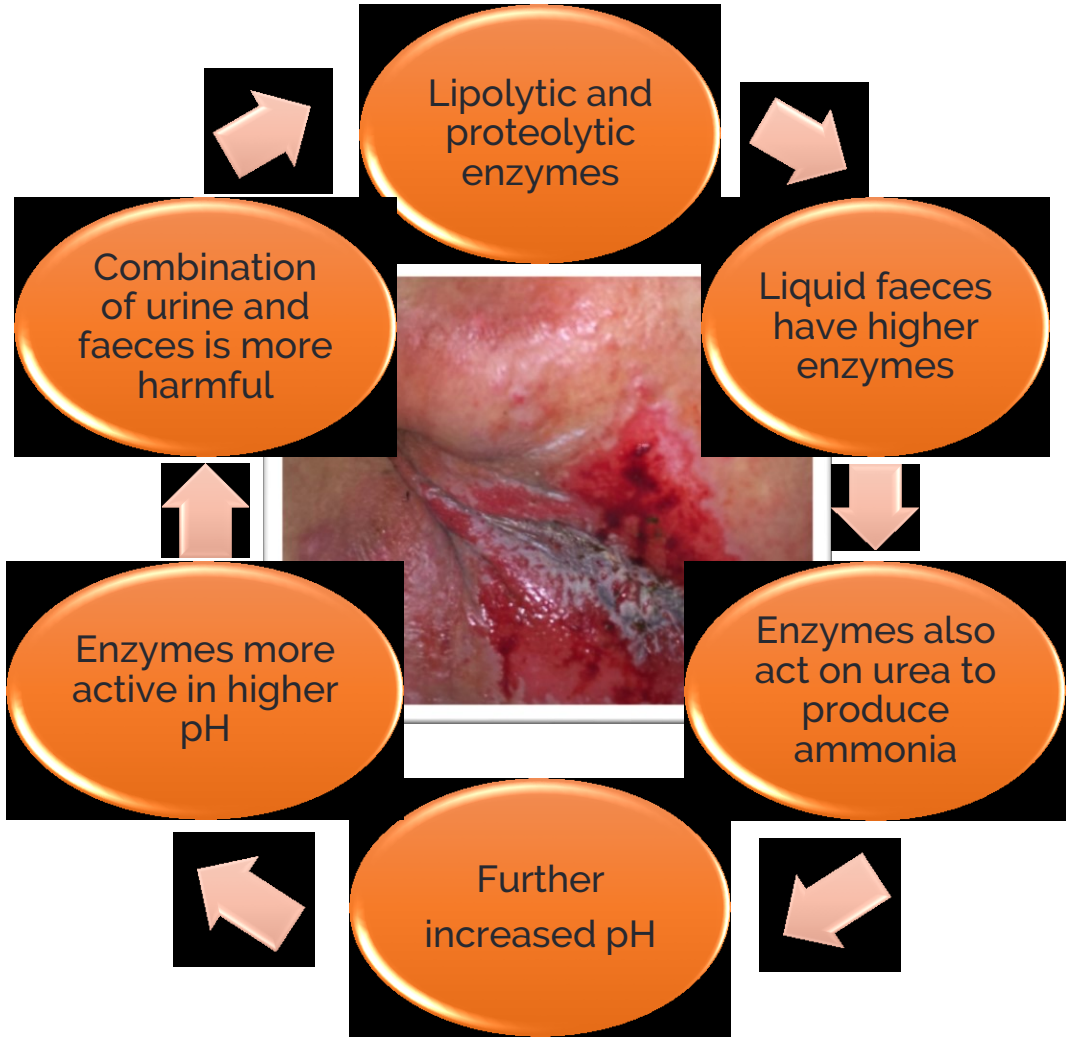
# Incontinence-associated dermatitis — faeces[3]

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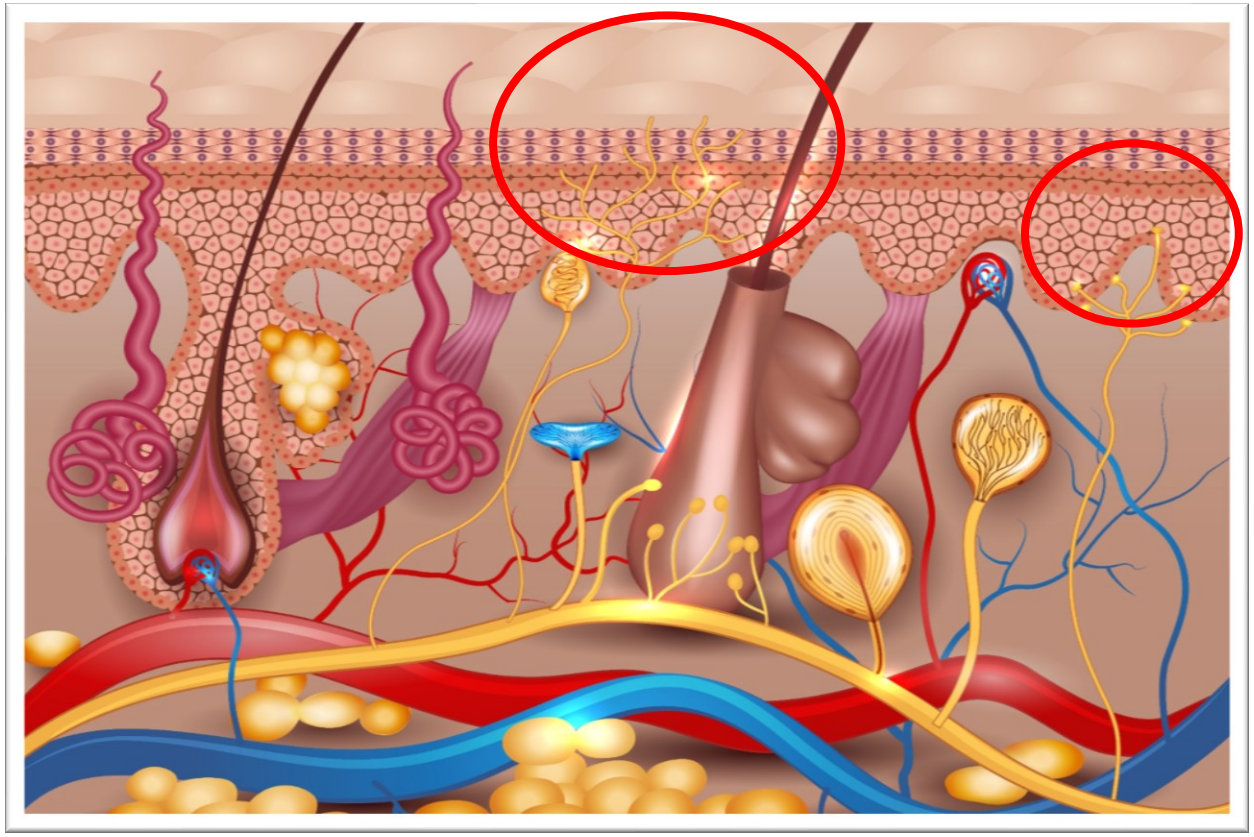
# Clinical characteristics of IAD

- Widespread diffuse blotchy erythema
- Indistinct margins
- Maceration
- Patches of denudement or partial thickness erosions
- Damage may be linear in skin folds
- Leakage of serous exudate or possible bleeding
- May be over a bony prominence,
  in skin folds, anal cleft, or as peri-anal irritation with irregular shaped edges.



# Clinical characteristics of IAD



IAD can cause considerable pain (often burning in nature) and suffering for the individual, especially following each episode of incontinence.

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# IAD and pressure ulceration


Skin damage that is established to be as a result of incontinence, **should not** be recorded as a pressure ulcer, but should be referred to as **MASD** to distinguish it and should be documented and reported separately[7].

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# IAD and pressure ulceration


Where there is **necrotic tissue** within the IAD, this will be due to a **combination** of both pressure and moisture damage and **should be** reported as a pressure ulcer[7].

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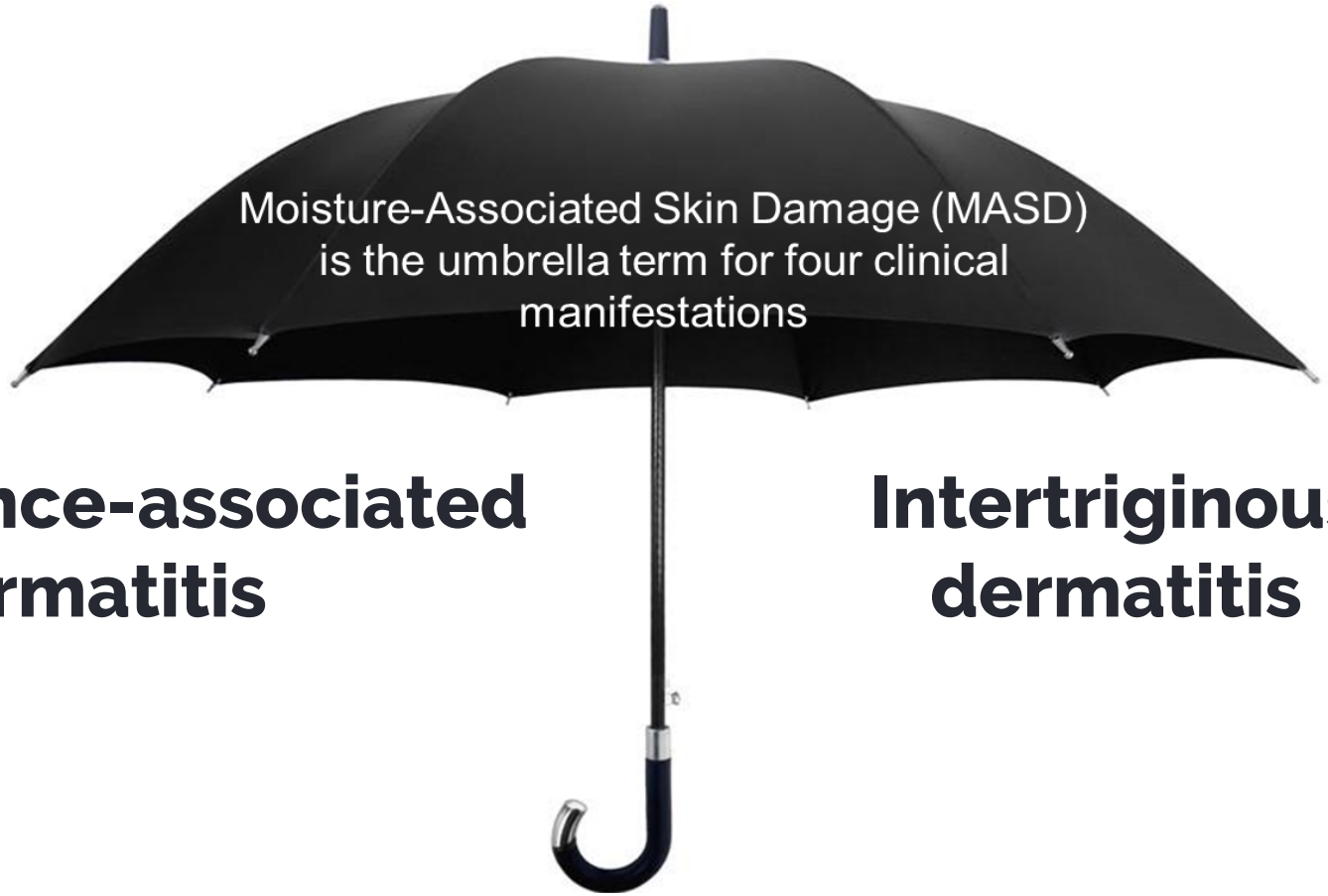
# Moisture-associated skin damage




**Incontinence-associated dermatitis**

**Intertriginous dermatitis**

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# Intertriginous dermatitis

- Intertriginous dermatitis (ITD), also referred to as intertrigo, occurs when sweat is trapped in skin folds with minimal air circulation.
- When the sweat cannot evaporate, the stratum corneum becomes overly hydrated and macerated, facilitating friction damage that is often mirrored on both sides of the fold.


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# Intertriginous dermatitis


Obese people are more at risk of ITD due to:

- Excessive skin folds
- Increased perspiration to regulate body temperature
- Higher skin surface pH (which makes the acid mantle less effective as a natural barrier).

This in turn leads to inflammation and denudation of the skin, making the area more prone to infection (bacterial/fungal).

It can be difficult to distinguish IAD from ITD in skin folds exposed to urine and faeces.

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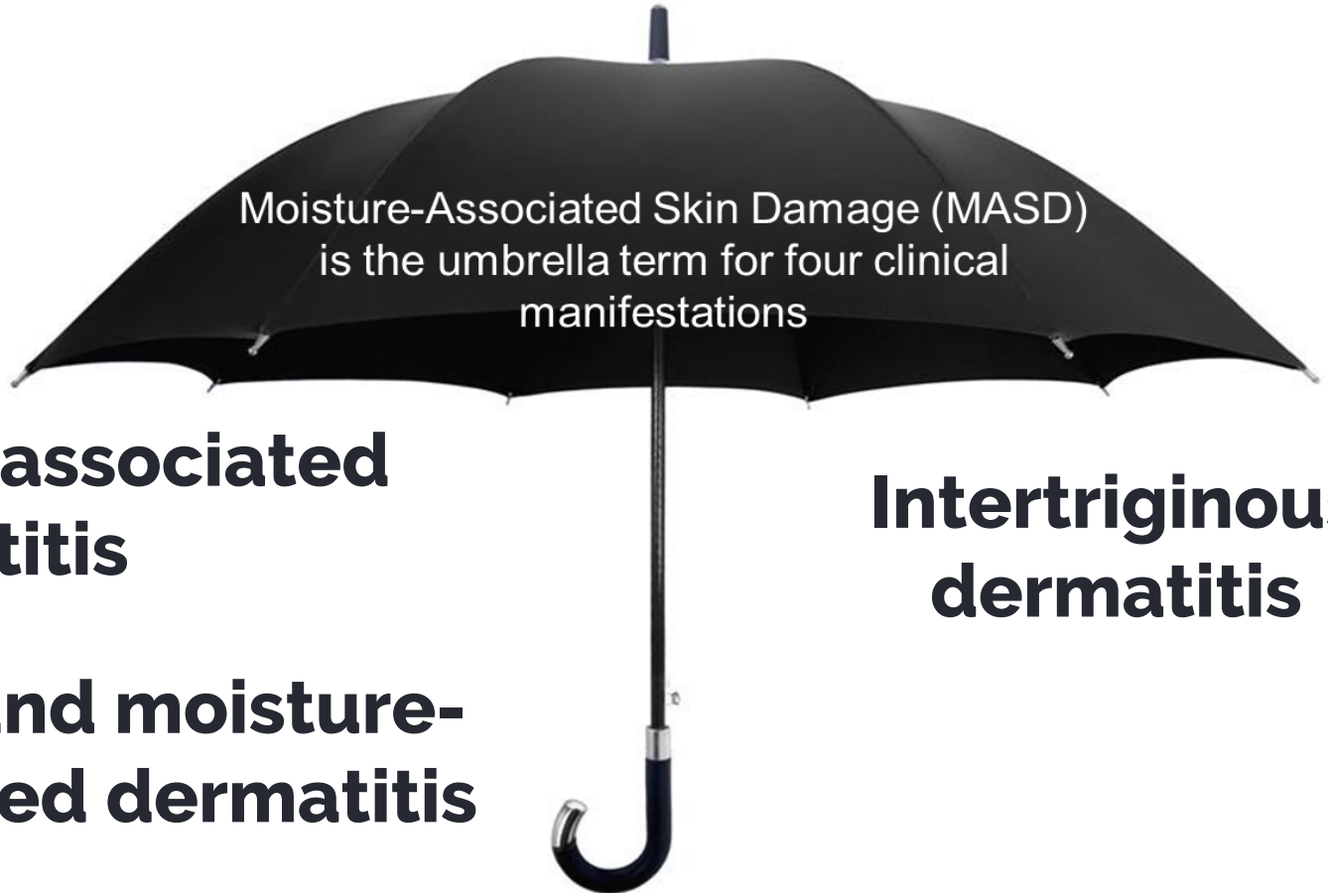
# Moisture-associated skin damage




**Incontinence-associated dermatitis**

**Intertriginous dermatitis**

**Periwound moisture-associated dermatitis**

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# Periwound moisture-associated dermatitis

The production of exudate is a normal response during the inflammatory stage of wound healing.

However, excessive volume of wound exudate can cause the periwound (within 4cm of wound edge) skin to become macerated.

Image courtesy of A. Parnham TVN

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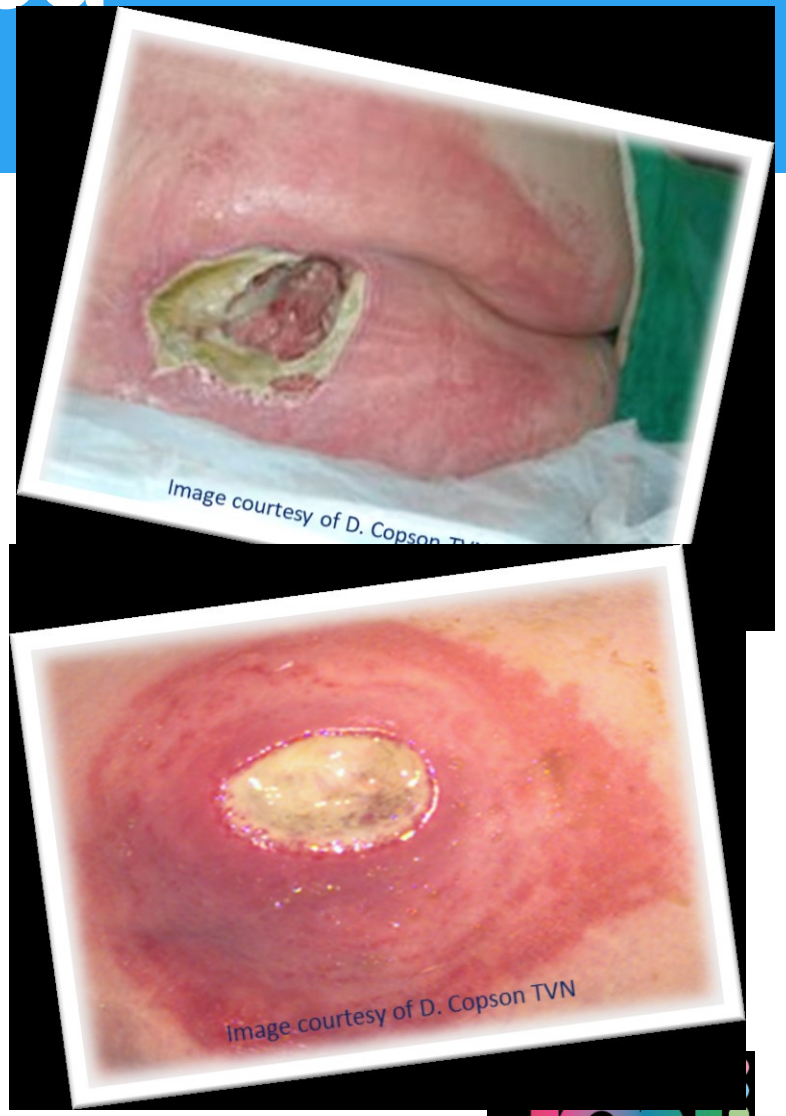
# Periwound moisture-associated dermatitis

Exudate from chronic wounds is known to be more destructive than acute wound exudate.

Contains increased levels of proteolytic enzymes (MMPs), which can delay keratinocyte migration and corrode the skin.

We should also consider the absorption and retention capacity of foam dressings (if they are being used).

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# Periwound moisture-associated dermatitis

Another factor affecting the occurrence of periwound maceration is damage to skin caused by aggressive removal of adhesive wound dressings, which affects the integrity of the skin barrier by stripping away parts of the epidermis.



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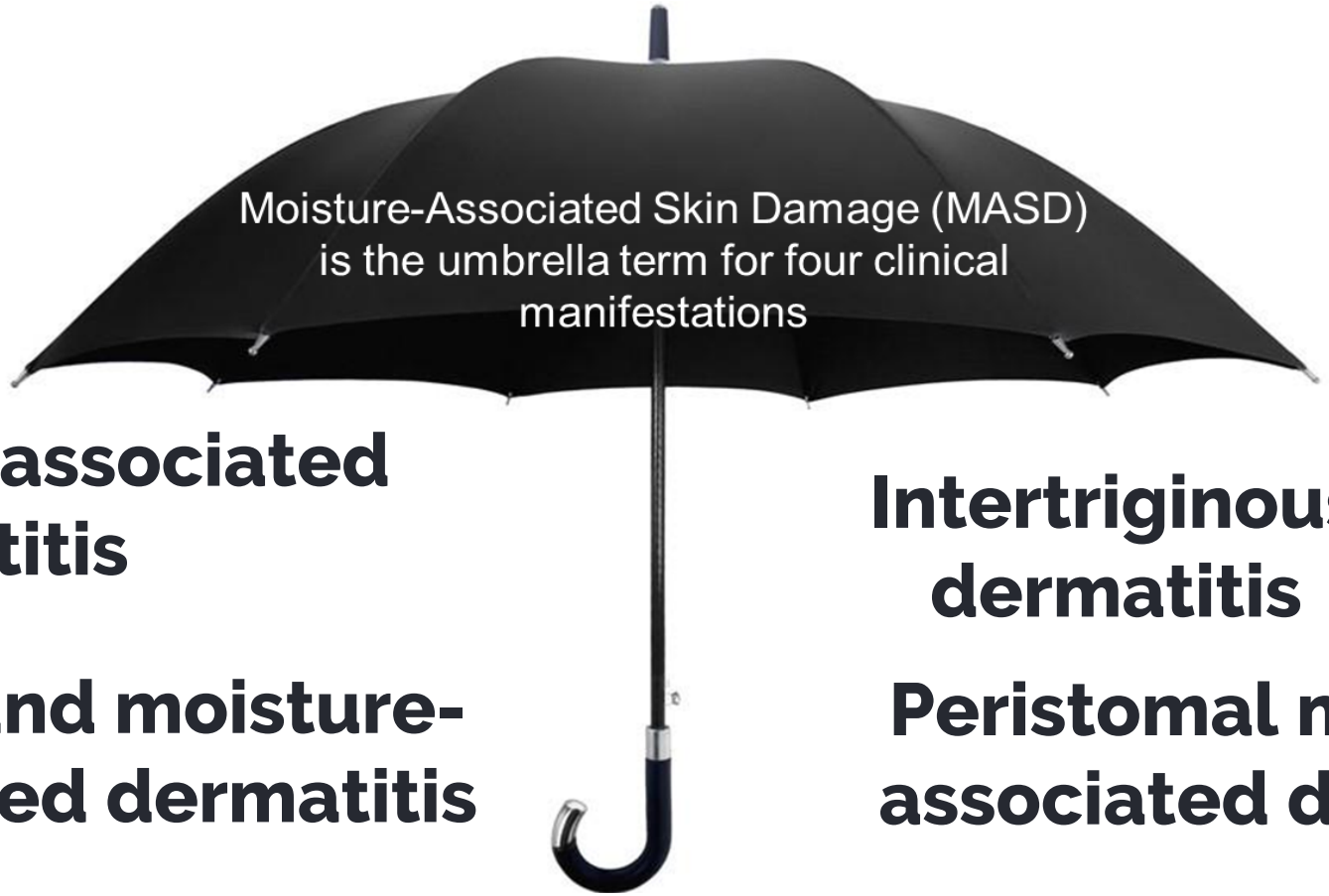
# Moisture-associated skin damage




**Incontinence-associated dermatitis**

**Intertriginous dermatitis**

**Periwound moisture-associated dermatitis**

**Peristomal moisture-associated dermatitis**

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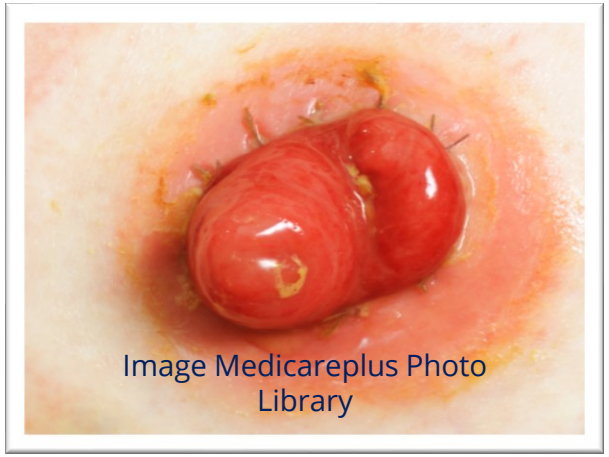
# Peristomal moisture-associated dermatitis

The damage occurs when the surrounding skin encounters effluent from the stoma.

May occur soon after the initial surgery and reduces as the individual becomes more competent at caring for the stoma.

Alternatively, it may develop later as the body shape changes. Management depends upon the correct choice and application of the containment device and a structured skin care routine.


# Management strategies

# Optimising prevention and management[1]

- The approach to care will be similar in the first instance for all four types of moisture-associated skin damage and should focus on:
- A thorough assessment of the patient and their skin (excluding pressure as a possible cause)
- Identifying the underlying cause of moisture damage
- Determining and classifying the extent of damage
- Managing excessive moisture
- Implementing a structured skin care regime
- Using products to effectively treat the moisture damage and protect the skin
- Treating any secondary infection.

# Classification and management

- Evidence relating to MASD classification is limited
- One resource utilises numbers and letters to categorise the extent of skin damage
- However, it is specific to one type of MASD (incontinence-associated skin damage)
- It's similarity to the current EPUAP may cause confusion.

# Classification and management

S.M.A.R.T.
SKIN MOISTURE ALERT REPORTING TOOL

| CATEGORISATION[1] | DESCRIPTION[1] | TREATMENT | INCONTINENCE-ASSOCIATED DERMATITIS* | INTERTRIGO** | PERIWOUND DERMATITIS*** | PERISTOMAL DERMATITIS | OTHER CAUSES OF MASD |
|---|---|---|---|---|---|---|---|
| MILD SKIN DAMAGE | • Erythema (redness) of skin only<br>• Dry and intact but irritated and at risk of breakdown | Apply barrier cream every third wash/twice a day |  | Barrier cream not indicated for use | Barrier cream not indicated for use | Barrier cream not indicated for use | **Skin Care**<br>Use pH balanced cleanser or emollient<br>Pat dry |
| MODERATE SKIN DAMAGE | • Erythema with less than 50% damaged skin<br>• Oozing and/or bleeding may be present | Apply barrier film once a day |  |  |  |  | • Tracheostomy<br>• PEG sites<br>• Vascular Access sites<br>• Hypersalivation |
| SEVERE SKIN DAMAGE | • Erythema with more than 50% damaged skin<br>• Oozing and/or bleeding usually present | Use pH balanced skin cleanser to cleanse, pat dry and apply barrier ointment at every cleanse |  |  <br>*If using anti-fungal cream for infected area, wait for cream to dry and apply barrier ointment | NOT INDICATED FOR USE<br>Exclude wound infection<br>If a limb, support and elevate | NOT INDICATED FOR USE | **Infection**<br>Barrier products are not indicated if infection is present Except for Intertrigo*<br>Treat infection as per guidance before commencing use of barrier product |

The S.M.A.R.T. summarises all four types of MASD, classifies the extent of damage as mild, moderate and severe and offers a general management plan[5].

# NICE Statement of Endorsement

S.M.A.R.T.
SKIN MOISTURE ALERT REPORTING TOOL

| CATEGORISATION[1] | DESCRIPTION[1] | TREATMENT | INCONTINENCE-ASSOCIATED DERMATITIS* | INTERTRIGO** | PERIWOUND DERMATITIS*** | PERISTOMAL DERMATITIS | OTHER CAUSES OF MASD |
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National Institute for Health and Care Excellence December 2019

**This resource supports the implementation of recommendations in the NICE guidelines on:**

Pressure ulcers: prevention and management (CG179)

Urinary incontinence and pelvic floor organ prolapse in women: management (NG123)

Faecal incontinence in adults: management (CG39)

# Extent of the damage

Image courtesy of Sheffield Teaching Hospitals NHS Trust

Erythema (redness) of skin only. Dry/intact but irritated and at risk of further breakdown[7]

Moderate erythema, less than 50% damaged skin. Oozing and/or bleeding may occur[7]




Large area of erythema, more than 50% damaged skin. Oozing and/or bleeding may be present[7]

S.M.A.R.T.
SKIN MOISTURE ALERT REPORTING TOOL

# Skin cleansing

The most common method of cleansing the skin is with soap, warm water, flannel or soft wipe and a towel to dry

# Skin cleansing

The most common method of cleansing the skin is with soap, warm water, flannel or soft wipe and a towel to dry

## What are the implications?

# Traditional soaps[3]

- Are alkaline and can disturb the 'acid mantle'
- Increased pH damages the skin barrier
- Frequent washing decreases natural sebum and bacterial flora
- Sebum has acidic properties
- Perfumed soaps may cause irritation

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# Alternatives to traditional soaps


- Using a non-scented mild pH-balanced soap with dry, disposable wipes and water
- Avoid cleansers with alcohol and preservatives
- Consider an emollient as a soap substitute
- Pat skin dry

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# Or a foam and spray cleanser…


- pH-balanced
- Preservative and alcohol free
- No-rinse, moisturising cleanser suitable for use on moderate to severely damaged skin from moisture-associated skin damage
- Can be used in foam or spray mode, depending on the area of use



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# Provide an effective barrier against moisture

## Avoid traditional barrier creams[6]

- Contain perfume (alcohol)
- Contain preservatives
- May interfere with pad absorbency
- Can cause irritation
- Increase pain

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# Provide an effective barrier against moisture



## Modern barrier creams

Protects intact skin or mild skin damage for up to three washes

Are alcohol and preservative free

Contain silicone as a water repellent

Skin should be completely dry before application

Should be allowed to dry before dressings applied

Do not affect pad absorbency

Can prevent periwound maceration and MARSI



# Barrier films

- Alcohol free – non sting
- Indicated for mild to moderate skin damage
- Preservative free
- Do not affect pad absorbency (if used for IAD)
- Lasts up to 72 hours
- Can prevent periwound maceration and medical adhesive-related skin injuries (MARSI)


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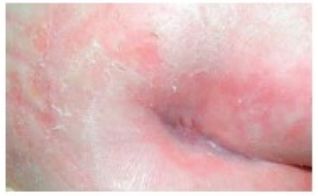
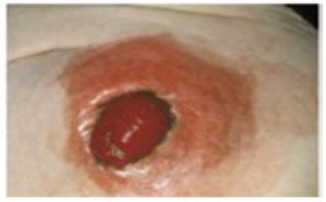
# MASD summary

## The collective term for four types of moisture damage to the skin[1]

| Types of MASD |  |  |  |  |
|---|---|---|---|---|
| **Diagnosis** | **Incontinence-associated dermatitis** | **Intertriginous dermatitis** | **Periwound moisture-associated dermatitis** | **Peristomal irritant contact dermatitis** |
| **Source** | Urine<br>Liquid stool | Perspiration | Exudate | Urine or faecal effluent |
| **Description** | Erythema and inflammation of the skin, sometimes with erosion or denudation | Erythema and inflammation of the skin inside and adjacent to skin folds, sometimes accompanied by erosions or denudation | Erythema and inflammation of the skin within 4cm of the wound edge, sometimes accompanied by erosions or denudation | Erythema and inflammation of the skin around the stoma, at times accompanied by denudation |

This damage is caused by chemical irritants, proteolytic and lipolytic enzymes, or an alteration in the skin pH, all of which can contribute to the destruction of the skin's barrier function and be further complicated by bacterial and fungal infections.

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# Take away message

A focused intervention approach will be required based on knowledge and understanding  of the underlying causes of MASD.

A structured skin care routine that involves **cleansing, protecting and restoring** damaged skin will help with prevention and management.

***…always work to local guidance***

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# Sign up for a free S.M.A.R.T. card


- The S.M.A.R.T. card is a convenient, wearable version of the S.M.A.R.T. resource
- Sign up to receive a free S.M.A.R.T. card here:
- Medicareplus.co.uk/smartcard

# References


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