Tremfya®
(guselkumab)

FÜR MICH EIN TRIUMPH.#

NON-STOP im Leben.

NEU PsA* ZULASSUNG

DIE TREMFYA® MORNING SHOW

Jetzt anschauen!

Bei Plaque-Psoriasis und Psoriasis-Arthritis*

* TREMFYA® ist indiziert: 1) für erwachsene Patienten mit mittelschwerer bis schwerer **Plaque-Psoriasis**, die für eine systemische Therapie in Frage kommen; 2) allein oder in Kombination mit MTX für die Behandlung der aktiven **Psoriasis-Arthritis** bei erwachsenen Patienten, wenn das Ansprechen auf eine vorherige nicht-biologische krankheitsmodifizierende antirheumatische (DMARD-)Therapie unzureichend gewesen ist oder nicht vertragen wurde.[1]

\# PASI 90: 84% (Wo 48; n=534) Non Responder Imputation (NRI)[2]; PASI 100: 52,7% (Wo 252; n=391) Treatment Failure Rules (TFR)[3]; Signifikante Überlegenheit vs. Placebo in Bezug auf ACR20 (64% vs. 33%, p<0.0001; NRI) nach 24 Wochen in der 8-Wochen-Dosierung (n=248) in bionaiven Patienten mit aktiver PsA.[4]

1. Aktuelle Fachinformation TREMFYA®.
2. Reich K et al. Lancet. 2019;394(10201):831-839.
3. Griffiths CEM et al. Poster Presentation Coastal Dermatology Symposium 2020, October 15-16th.
4. Mease P et al. The Lancet 2020; https://doi.org/10.1016/S0140-6736(20)30263-4 (Supplementary)

▼ Dieses Arzneimittel unterliegt einer zusätzlichen Überwachung. Daher ist es wichtig, jeden Verdacht auf Nebenwirkungen in Verbindung mit diesem Arzneimittel zu melden.

TREMFYA® 100 mg Injektionslösung in einer Fertigspritze/ in einem Fertigpen. Wirkstoff: Guselkumab. **Zusammensetz.:** Fertigspritze/Fertigpen enth. 100 mg Guselkumab. Sonst. Bestandt.: Histidin, Histidinmonohydrochlorid-Monohydrat, Polysorbat 80, Sucrose, Wasser f. Injektionszw.. **Anw.geb.:** Für d. Bhdlg. erw. Pat. m. mittelschwerer bis schwerer Plaque-Psoriasis indiziert, d. für e. syst. Therapie in Frage kommen. Als Monotherapie od. in Komb. m. Methotrexat für d. Bhdlg. erw. Pat. m. Psoriasis-Arthritis indiziert, d. auf e. vorherige nicht-biolog. kranheitsmodifiz. antirheumat. (DMARD)-Therapie unzureich. angesprochen od. diese nicht vertragen haben. **Gegenanz.:** Schwerwieg. Überempfindl. gg. Guselkumab od. e. d. sonst. Bestandt., klin. relev. aktive Infektionen (einschl. aktive Tuberkulose), Schwangersch., Stillzeit. **Bes. Warnhinw. u. Vorsichtsmaßn.:** Um d. Rückverfolgbark. b. biolog. Arzneim. zu verbessern, sollten Name u. Ch.-Bez. d. verabreich. Prod. deutl. protokoll. werden. Vors. b. Infektionen, Tuberkulose, Impfungen (vor Anw. v. Lebendimpfst. muss d. Bhdlg. m. Tremfya nach d. letzt. Gabe f. mind. 12 Wo. ausgesetzt werden). B. Erhöh. v. Leberenzymwerten (ALT/AST) u. Verdacht auf arzneimittelinduz. Leberschädig. sollte d. Bhdlg. vorüberg. unterbr. werden. B. schwerwieg. Überempfindl.reakt. sollte d. Anw. v. Tremfya unverzügl. abgebrochen u. e. geeign. Bhdlg. eingel. werden. Frauen im gebärfäh. Alter sollen währ. u. f. mind. 12 Wo. nach d. Bhdlg. e. zuverläss. Verhütgs.meth. anw.. Arzneim. f. Kdr. unzugängl. aufbewahren. **Nebenwirk.:** *Sehr häufig* (≥ 1/10), *Häufig* (≥ 1/100 bis < 1/10), *Gelegentlich* (≥ 1/1.000 bis < 1/100). *Sehr häufig:* Atemwegsinfekt.. *Häufig:* Kopfschm., Diarrhoe, Arthralgie, Reakt. a. d. Injektionsst., Transamin. erhöht. *Gelegentlich:* Herpes-simpl-Infekt., Tinea-Infekt., Gastroenteritis, Überempfindl.reakt., Anaphylaxie, Urtikaria, Hautausschlag, Neutrophilenzahl erniedr.. Verschreibungspflichtig. **Pharmazeut. Unternehmer:** JANSSEN-CILAG International NV, Turnhoutseweg 30, B-2340 Beerse, Belgien. **Örtl. Vertreter für Deutschland:** Janssen-Cilag GmbH, Johnson & Johnson Platz 1, D-41470 Neuss. **Stand d. Inform.:** 12/2020.

Janssen-Cilag GmbH
www.tremfya.de

Janssen Immunology
PHARMACEUTICAL COMPANIES OF Johnson & Johnson

Review

Submitted: 28.8.2020
Accepted: 1.12.2020

DOI: 10.1111/ddg.14388

Moisture-associated skin damage (MASD): A best practice recommendation from Wund-D.A.CH.

Joachim Dissemond[1], Bernd Assenheimer[2], Veronika Gerber[3], Marianne Hintner[4], Magareta Jukic Puntigam[5], Norbert Kolbig[6], Sonja Koller[7], Peter Kurz[8], Severin Läuchli[9], Sebastian Probst[10], Kerstin Protz[11], Alfred Steiniger[5], Robert Strohal[12], Jürg Traber[13], Jan Kottner[14]

(1) Department of Dermatology, Venereology and Allergology, University Hospital Essen, Germany
(2) Nursing School, University Hospital Tübingen, Germany
(3) Training and Consulting for Wound Management, Spelle, Germany
(4) Innsbruck, Austria
(5) Nursing Academy Barmherzige Brüder, Vienna, Austria
(6) Office for Wound Management, University Hospital Düsseldorf, Germany
(7) State Hospital, Melk, Austria
(8) WPM Wound Care Management, Bad Pirawarth, Austria
(9) Dermatology Department, University Hospital, Zurich, Switzerland
(10) HES-SO Technical College West Switzerland, Geneva, Switzerland
(11) Institute for Health Services Research in Dermatology and Nursing, CWC – Comprehensive Wound Center, University Hospital Hamburg, Germany
(12) Department of Dermatology and Venereology, State Hospital Feldkirch, Austria
(13) Surgery/Vascular Surgery FEBVS, Phlebology SGP, Vein Hospital Bellevue, Kreuzlingen, Switzerland
(14) Charité Centrum 1 for Human and Health Sciences, Charité –University Hospital Berlin, Germany

Summary

Wund-D.A.CH., as the umbrella organization of German-speaking wound treatment societies, has currently developed a best practice recommendation for skin damage caused by body fluids, which is known as moisture-associated skin damage (MASD) in English-speaking countries. In this expert consensus, the diseases incontinence-associated dermatitis (IAD), intertriginous dermatitis, including intertrigo, gram-negative bacterial toe web infection and toxic contact dermatitis, including periwound and peristomal dermatitis are presented in a differentiated manner. A common feature of these clinical diseases is a deterioration of skin integrity due to prolonged exposure to body fluids such as urine, stool, sweat or wound exudate with associated physical-irritative and/or chemical irritation. In addition, other comorbidities and cofactors play an important role.

The diagnosis of these interdisciplinary and interprofessionally relevant MASD is difficult in everyday clinical practice because there are currently no uniform definitions and many relevant differential diagnoses. Effective strategies for the prevention and therapy of these skin diseases are, for example, continence management, use of efficient, absorbent aids with good retention as well as consistent skin protection and adequate skin care. Another important aspect is the education of patients and relatives about the origin, treatment and prevention of MASD.

Introduction

Wund-D.A.CH. is the umbrella organization of German-speaking wound treatment societies. It was co-founded by the Initiative Chronische Wunden (ICW, Chronic wound initiative, Germany), the *Austrian Wound Association* (AWA, Austria) and the *Swiss Association for Wound Care* (SAfW, Switzerland). One central aim of Wund-D.A.CH. is to develop, initiate, and optimize projects for the day-to-day treatment of patients with chronic wounds. We review new and clinically relevant topics and develop *best practice* recommendations with expert consensus. Although it makes is no claim of being an evidence-based guideline, current evidence is of course incorporated in our recommendations. This publication covers skin damage caused by body fluids in direct contact with the skin. This group of diseases is commonly called *moisture-associated skin damage* (MASD) [1]. In the current version of ICD-11, this group of skin diseases is called *irritant contact dermatitis due to friction, sweating or contact with body fluids* (EK02.2). The group included intertriginous dermatitis (EK02.20) as well as contact dermatitis caused by saliva (EK02.21), incontinence (EK02.22), stoma and/or fistulas (EK02.23), prostheses or surgical aids (EK02.24). ICD-11 will become effective on 01.01.2022. There is currently no concrete date for its introduction in Germany, Austria, or Switzerland [2].

These Wund-D.A.CH. recommendations only cover dermatological diseases caused by contact with body fluids, which may also become relevant as complications or differential diagnoses in delayed wound healing. The common denominator in this group of diseases is deterioration of skin integrity due to prolonged exposure to body fluids such as urine, feces, sweat, or wound secretions. This will result in mechanical/irritative and/or chemical irritation. In most cases however, skin exposure to body fluids is not the sole cause of inflammatory reactions. The situation is compounded by other direct or indirect factors such as comorbidities, microbes, or mechanical stress [1, 3]. The initial clinical manifestation is inflammatory erythema or eczema. Concomitant maceration is also typical, and pruritus may result in excoriation. In severe cases, painful erosions or ulcers may develop over time (Table 1).

There are currently no reliable and generalizable data on the incidence and prevalence of MASD. These diseases are documented using varying descriptions, patients often

Table 1 Comparison of the different classifications of moisture-associated skin damage.

Moisture-Associated Skin Damage (MASD, [1])	ICD-11 classification (irritant contact dermatitis due to friction, sweating, or contact with body fluids [EK02.2])	Flüssigkeits-assoziierte Hautschäden (MASD, Wund-D.A.CH. Best practice recommendation for moisture-associated skin damage)
Incontinence-associated dermatitis (IAD)	Incontinence-associated dermatitis (EK02.22)	Incontinence-associated dermatitis (IAD)
Intertriginous dermatitis (Intertrigo)	Intertrigo (EK02.20)	Intertriginous dermatitis, including intertrigo, gram-negative bacterial toe web infection
Periwound dermatitis	–	Toxic contact dermatitis, including periwound dermatitis, peristomal dermatitis
Peristomal dermatitis	Dermatitis around stoma or fistulas (EK02.23)	see above
–	Contac dermatitis due to saliva (EK02.21)	–
–	Dermatitis due to contact with prostheses (EK02.24)	–

treat them on their own without consulting a health care professional, or they remain untreated altogether. They are considered 'secondary diagnoses' and often not documented. Tables 2 to 5 show the results of studies on the prevalence and incidence of selected MASD. It is assumed that the number of patients affected by MASD increases with age and comorbidities [4].

Classification

Wund-D.A.CH. has developed a new classification (Table 6) of incontinence-associated dermatitis (IAD) based on the internationally established Ghent-Global-IAD categorization tool (GLOBIAD, www.UCVVGent.be) [5]. According to the TILI score developed by ICW e.V., localized wound infection can be diagnosed for skin wounds if at least five out of six facultative signs are present (Table 7). In cases of eczema, this score is limited by the fact that the parameter 'increase or change of coloring or smell or exsudation' cannot occur.

Feces contain a large amount of bacteria and fungi [6], and if the skin barrier is compromised, skin contact may result in frequent bacterial and/or fungal superinfections. This should be differentiated from primary infections such as tinea corporis, erythrasma, or impetigo contagiosa. Diagnosis can

Table 2 Studies on the prevalence of incontinence-associated dermatitis.

Authors	Country, institution	Prevalence of incontinence	IAD Definition	IAD Prevalence
Zimmaro Bliss et al. 2006 [46]	USA, Nursing home	1213/1918 (63.2 %)	Mild (mild erythema, intact skin) to severe (severe erythema, eczema, erosions, blisters, pain)	68/1213 (5.6 %)
Junkin, Selekof 2007 [47]	USA, Hospital	120/608 (19.7 %)	Erythema with and/or without oozing or blisters in areas that have come into contact with urine or feces	51/120 (42.5 %)
Palese, Carniel 2011 [48]	Italy, Nursing home	63/79 (79.8 %)	Not specified	63/63 (100 %)
Long et al. 2012 [49]	USA, Long term care facility	Not specified	Skin inflammation in the genital region, the buttocks or thighs associated with incontinence	39/171 (22.8 %) (all patients at admission)
Campbell et al. 2014 [50]	Australia, Acute nursing care	91/376 (24.2)	Skin erythema with or without erosions caused by contact with urine and/or feces (not by other sources of moisture) in the region of the buttocks, tail bone, rectal area, scrotum, vulva, lower abdomen, thighs, gluteal furrow, or inguinal folds	38/91 (41.8 %)
Kottner et al. 2014 [51]	Netherlands, Nursing home	2138/3979 (55.1 %)	According to EPUAP	139/2138 (6.5 %)
Kottner et al. 2014 [51]	Austria, Nursing home	583/696 (83.8 %)	According to EPUAP	18/583 (3.1 %)
Kottner et al. 2014 [51]	Austria, Geriatric hospital	58/93 (62.4 %)	According to EPUAP	0/58 (0.0 %)
Lahmann 2015 [52]	Germany, Nursing home	689/994 (69.3 %)	German translation of the IADIT tool	77/689 (11.2 %)
Lahmann 2015 [52]	Germany, Hospital	324/1133 (28.6 %)	German translation of the IADIT tool	57/324 (17.8 %)
Gray, Giuliano 2018 [53]	USA, Hospital	2492/5342 (46.6 %)	Not specified	1140/2492 (45.7 %)

Abbr.: IADIT, incontinence-associated dermatitis intervention tool; EPUAP, European Pressure Ulcer Advisory Panel.

Table 3 Studies on the incidence of incontinence-associated dermatitis.

Authors	Country, institution	IAD Definition	Numerator	Denominator	Time frame	IAD incidence
Zimmaro Bliss et al. 2006 [46]	USA, Nursing home	Mild (mild erythema, intact skin) to severe (severe erythema, eczema, erosions, blisters, pain)	33	981 (incontinent patients)	6 weeks	3.4 %
Long et al. 2012 [49]	USA, Long term care facility	Skin inflammation in the genital region, the buttocks or thighs associated with incontinence	10 (Patients without IAD at admission)	131 (All residents)	Not specified	7.6 %
Wei et al. 2019 [54]	China, Intensive care unit	Not specified	174 (with IAD at initiation of study)	266 (Patients with fecal incontinence without IAD at initiation of study)	7 to 94 days	65.4 %

usually be achieved by swab testing for bacteria and fast-growing fungi (yeasts). Dermatophytes can be detected by culturing skin scales. As an alternative or addition, a Wood lamp with UV-A light or similar fluorescent imaging can be used [7]. Healthy skin has a pH of about 4.1–5.8 [8], the so-called protective acid mantle. If skin comes into contact with urine, urea will be broken down into ammonia and carbon dioxide. The resulting increase in pH on the skin surface weakens the coherence of the corneal layer and allows bacteria to multiply [9]. Occlusion by materials used in wound dressings or incontinence care, long periods of sitting or lying on non-breathable materials, or severe sweating can all create a warm and humid environment and thus alter the skin's microclimate. Hyperhydration increases skin permeability. Fluids can penetrate the intercellular spaces of the epidermis and increase its thickness five-fold, weakening the skin's barrier function. Increased skin temperature also promotes infection. Atopic diathesis is another important factor since this is associated with transepidermal water loss and reduced ceramide content.

Table 4 Studies on the prevalence of intertrigo.

Authors	Country, institution	Intertrigo Definition	Numerator	Denominator	Prevalence
Arnold-Long, 2019 [55]	USA, Hospital	Not specified	164	417 (Referrals to WOCN)	40 %
Gabriel et al. 2019 [18]	Germany, Nursing home	Accordin to ICD-10	36	223 (representative sample in Berlin)	16.1 % (95 %-CI 11.6 % to 21.1 %)
Werth, Justice 2019 [56]	USA, Hospital	Mild (mild erythema, intact skin) to severe (severe erythema, eczema, erosions, blisters, pain)	38	1427 (all patients in the hospital)	2.7 %
Kottner et al. 2020 [57]	Netherlands, Nursing home	Skin inflammation in the skin folds	1666	24,987	6.7 %
Kottner et al. 2020 [57]	Netherlands, Hospital	Skin inflammation in the skin folds	230	11,353	2.0 %
Kottner et al. 2020 [57]	Niederlande, out-patient care	Skin inflammation in the skin folds	326	3410	9.6 %

Abbr.: WOCN, Wound, Ostomy and Continence Nursing; CI, confidence interval.

Table 5 Studies on the prevalence of peristomalic dermatitis.

Authors	Country, Institution	Definition	Numerator	Denominator	Prevalence	Remarks
Ratliff et al. 2005 [58]	USA, Hospital	Not specified	35	220	16 %	Ileostoma and Colostoma
Werth, Justice 2019 [56]	USA, Hospital	Not specified	2	1427	0.1 %	Tracheostoma

Table 6 Wund-D.A.CH. classification of moisture-associated skin damages.

Category	1 – Erythema/ eczema without erosion/ulceration	2 – Erythema/eczema with erosion/ ulceration
A	Without clinical signs of local infection	Without clinical signs of local infection
B	With clinical signs of local infection	With clinical signs of local infection

In cases of suspected infection, topical antimicrobial agents such as polihexanide (PHMB) are recommended. Additional indications for antimicrobial wound care according to the TILI score include detection of pathogenic bacteria, septic surgical wounds, or pus [10].

Predisposing factors

Various pathophysiologically relevant factors may be obligatory for and/or promote MASD [1, 11]. In everyday clinical practice, there are usually several simultaneous and often synergistic factors [12].

Table 7 TILI score for the diagnosis of local wound infections [6].

- Erythema to surrounding skin
- Heat
- Oedema, induration or swelling
- Spontaneous pain or pressure pain*
- Stalled wound healing
- Increase and/or change of colour or smell of exudate

*Note: caution in patients with polyneuropathy or when using painillers.

Direct risk factors

Body fluids
- Direct skin contact with urine and/or (liquid) feces,
- Sweat on the skin surface,
- (Increased) wound secretions on the skin surface,
- Other body fluids such as mucus, (tracheal) secretions, or saliva on the skin surface

Skin cleansing procedures and products
- Repeated or excessive skin cleansing, strong friction or abrasive drying procedures, use of rough materials such as coarse towels,
- Repeated use of harsh skin cleansers,
- Ingredients in skin cleansers such as anionic tensides, fragrances, alcohol, preservatives, essential oils.

Mechanical factors
- Mechanical irritation (friction) from clothing or in skin folds
- Occlusion, for example due to long periods of lying on non-breathable materials, wearing non-breathable clothing, incontinence pads
- Pressure or shear forces
- Skin damage from adhesive products, such as removal of skin layers (tape stripping) when removing band-aids.

Indirect risk factors

- Old age,
- Care dependency,
- Immobility,
- Malnutrition,
- Obesity,
- Atopic diathesis,
- Microangiopathy and/or macroangiopathy,
- Reduced sensory functions such as blindness, polyneuropathy, dementia,
- Immunosuppression.

Table 8 Selection of different types of eczema.

- Asteatotic eczema (exsiccation dermatosis)
- Atopic eczema (Neurodermitis)
- Contact eczema:
  - allergic contact eczema
  - irritative contact eczema
  - toxic contact eczema
- Phototoxic/photoallergic eczema
- Seborrhoic eczema
- Stasis dermatitis

Toxic contact dermatitis

Contact eczema is caused by contact with exogenous substances. Eczema is a non-infectious skin inflammation. We can differentiate between acute and chronic eczema, as well as between various causal agents and morphologies [13] (Table 8). Acute eczema starts with erythema (erythematous stage, stadium erythematosum), followed by blisters (vesicular stage, stadium vesiculosum). Once the blisters burst, small, exsudative erosions occur (exsudative stage, stadium madidans). The erosions then dry up and crusts appear (crusted stage, stadium crustosum). Healing eczema will start to scale off (scaling stage, stadium squamosum). Chronic eczema will result in coarsened skin, called lichenification. As regards skin damage due to body fluids, the various forms of toxic contact dermatitis are very important. The following toxic agents may be relevant in this regard: Urine, feces, sweat, or wound secretions. Toxic contact eczema will appear as a clearly circumscribed lesion in the area which came into direct contact with the body fluid.

In all cases of eczema, allergic contact eczema is the most common differential diagnosis and must be considered/excluded. Allergic contact eczema is usually less clearly circumscribed and shows a scattered distribution with skin lesions exceeding the contact area. Due to the impaired skin barrier and long-term use of various topical agents such as creams or ointments, contact sensitization is found in up to two-thirds of patients with chronic wounds [14]. If allergic contact eczema is suspected, epicutaneous testing should be performed including the suspected allergens [15].

Stasis dermatitis is another important differential diagnosis. This occurs in patients with edema, particularly of the lower limbs [16]. Stasis dermatitis may occur in patients with chronic venous insufficiency (CVI), but also in patients with heart failure, protein deficiency edema or lymphedema.

Periwound dermatitis

Skin surrounding a wound may develop either toxic or allergic contact eczema, called periwound dermatitis (Figure 1).

Figure 1 Clinical example of toxic periwound dermatitis.

Periwound dermatitis can also occur under wound dressings, due to insufficient management of exsudation and long-term contact with the wound secretions [17]. This eczema is limited to the areas that come into contact with moisture.

Peristomal dermatitis

Peristomal dermatitis is a (usually toxic) eczema around the site of a colostomy (stoma). This occurs in 30–67 % of all stoma patients [18]. Peristomal dermatitis may be caused by various factors [19]. Various fluids from the stoma such as feces, urine, or mucus may come into contact with the skin around the stoma and cause toxic contact dermatitis. Occlusion due to incorrectly affixed skin barriers may promote skin damage. The skin barriers are adhesive and must be attached to the skin: repeated removal may result in clearly circumscribed 'tape stripping' damage around the stoma. This is called MARSI (medical adhesive related skin injury) and is not caused by contact with body fluids [20]. Contact sensitization to stoma care materials has also been reported, so allergic contact eczema is a possible differential diagnosis [21, 22].

Incontinence-associated dermatitis

Incontinence-associated dermatitis (IAD) is a skin inflammation after contact with urine and/or feces [23] (Figure 2).

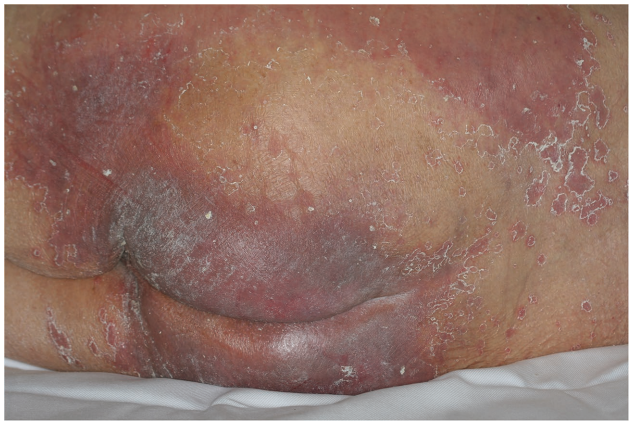

Figure 2 Clinical example of incontinence-associated dermatitis.

IAD can only occur in areas where the skin has direct contact with urine and/or feces. In most cases, other chemical or mechanical factors promote inflammation, such as friction, inappropriate cleansing with harsh materials and/or irritating agents, or occlusion. The Ghent Global IAD Categorization Tool (GLOBIAD) [5] offers a simple and widely used classification. IAD may occur at any age, even though according to a ICW recommendation, irritant napkin dermatitis (diaper rash, nappy rash) in children should be considered a separate entity. The argument was that the term "nappy rash" or "diaper rash" is firmly established in pediatrics and is contained in both the current and the new ICD coding (EH40.10 *primary irritant napkin dermatitis*). However, the term is considered stigmatizing and negative when used for adolescents or adults [24]. The anatomical predilection sites of IAD are perineal, perianal, buttocks, and the insides of the thighs. Depending on the position of the body, the convex areas are most frequently affected. The clinical appearance of IAD is characterized by clearly circumscribed erythemas, sometimes accompanied by swelling and blisters. At first, the epidermis will remain intact. Once the condition progresses, the skin profile disappears, the epidermis is destroyed, and eczemas with mostly superficial, oozing or bleeding wounds occur. This may develop into extensive erosions. Pronounced pruritus is a frequent problem, and scratching will lead to excoriations and further deterioration. Other unpleasant sensations such as burning, tingling, or pain may also occur, especially after manipulation or a change of position. Due to the skin barrier defect, Iocalized infections and fungal infestation may ensue.

Intertriginous dermatitis

Diseases caused by sweat, occlusion, or friction in body areas where skin meets skin (intertrigines) are called intertriginous dermatitis. The predilection sites thus include the armpits, inguinal area, rima ani, submammary area, and between the toes.

Intertrigo

Intertrigo is an irritant contact dermatitis in skin folds. For German-speking countries, the ICW has recommended that the traditionally used synonym "*Hautwolf*" (skin wolf) no longer be used. The latin word for wolf, *lupus*, is a medical term for conditions that destroy skin and leave scars [24]. Patients with obesity, hyperhidrosis, diabetes mellitus, or hygienic deficiencies are more frequently affected by intertrigo [25]. Especially in obese patients, intertrigo may also appear in transverse skin folds. If sweat and water molecules from transepidermal diffusion cannot evaporate, the corneal layer is excessively hydrated and will start to macerate. The clinical appearance of intertrigo is characterized by maceration, erythema, and sometimes erosions, leading to burning, pruritus and even pain as well as fungal infestation. The lesion often appears symmetrical on both sides of the fold. A sweetish fetor is also common. Damage to the epidermal layers often results in secondary infection with microbes. The most clinically relevant of these is fungal infection with yeasts (candidiasis), resulting in pustulas in the margin area of the erythemas (Figure 3). Microbiological analysis is therefore obligatory. Inverse psoriasis is a differential dfiagnosis and must be excluded.

Gram-negative bacterial toe web infection (GNBTWI)

A highly exsudative infection of the skin between the toes caused by gram-negative bacteria or by mixed infections including these bacteria [26] is called 'gram-negative bacterial toe web infection' (GNBTWI) oder 'toe web intertrigo' [27]. The lesions usually start between the toes and spread in a

Figure 3 Clinical example of an intertrigo.

proximal direction [28]. Frequently, patients report a history of tinea pedis between the toes that has been treated with topical antimycotics for a prolonged period. These medications are also effective against a number of gram-positive bacteria. Skin maceration due to the mycosis and eradication of gram-positive bacteria promotes the growth of gram-negative bacteria such as *pseudomonas aeruginosa* [27]. Other promoting factors for GNBTWI include non-breathable shoes or stockings, plantar hyperhidrosis, diabetes mellitus, and peripheral arterial occlusive disease [27]. Men are affected much more frequently than women, with a ratio of 4 : 1 [29]. The erosions are often very painful and may develop into ulcerations. The leading clinical feature is a distinctive sweetish-putrid odor of gram-negative bacteria. The disease frequently affects both feet, though the extent may vary. Complications include severe local infections that may even proceed to sepsis. Bacteriologocal and mycological diagnostcs are obligatory. In severe cases, vital parameters as well as serological parameters of inflammation such as blood count, ESR, and CRP should be determined to decide if therapy with systemic antibiotics is indicated.

Decubitus

It is essential to differentiate MASD from category I and II decubitus in areas under pressure, such as the sacral area. Decubitus should only be diagnosed if there is a high probability that the skin damage has been caused by long-term pressure, or pressure in combination with shear forces [30]. Decubitus is usually cleary circumscribed and located on typical predilection sites such as bone protuberances. Differentiation between decubitus and MASD may be difficult in some cases because both conditions will initially show clearly circumscribed erythema. MASD and decubitus may also occur simultaneously, or they may promote one another.

Prevention and treatment

Patients with risk factors for MASD should be identified as early as possible, and preventative measures initiated. Causal treatment is much more conducive to long-term therapeutic success than simple topical treatment (Table 9). Topical treatment depends on the clinical appearance and needs to be adapted individually. Large quantities of body fluids should be removed or kept away from the skin with appropriate aids. Incontinence products should consist of effective absorbents with high retention. The quality and efficacy of absorbent products are affected by their design, absorbency, retention, and breathability. Occlusive devices promote MASD and are contraindicated. There are some exceptions in stoma care or adhesive collecting devices for diarrhea, since complete sealing, which is the goal here, is necessary for skin protection

Table 9 Principles of causal therapy of moisture-associated skin damage.

- Causal treatment at the source of the body fluids, such as support of continence, reduction of salivation, avoidance of occlusion and friction in intertriginous areas
- Reduction of skin exposure to body fluids via draining and/or absorbent methods, such as rectal tubes for diarrhea, well-fitting skin barriers and pouches for stoma patients, very absorbent and breathable pads for incontinence, absorbent dressings for severely oozing wounds.
- Reduction of skin exposure to body fluids via protective skin care products, such as pastes and skin barriers for stoma patients, protective skin care products for incontinence.

[31]. The exposed skin as well as the lesions should be cleaned gently with hypoallergenic, non-irritating products. Any products containing preservatives, quinoline, PVP iodine, or natural ingredients such as tea tree oil should be avoided. Even water for cleaning must be used only sparingly, since it may further damage the already damaged skin. If water is used, it needs to be tepid. The skin should only be cleaned with products that do not need to be rinsed. Alkaline soaps or anionic tensides are not recommended. Powders should also be avoided. Special pre-moistended cleansing wipes or disposable cleansing systems are recommended, especially 'no-rinse' products that can be used without added water [32]. After cleaning, the skin must be gently dried but never rubbed or blow-dried. Short-term use of topical glucocorticoids may be useful in cases of severe eczema if monitored by a dermatologist. In cases of localized infection or high risk, antimicrobial or antifungal treatments may be indicated after appropriate diagnostics [6]. Although moist wound healing is preferred in many other cases [33], it is important for MASD patients to eliminate any excessively moist, pathophysiologically relevant (wound) conditions. For MASD patients, wound dressings are usually unnecessary and often contraindicated. In cases of severely exsudative wounds, temporary use of superabsorbers or localized negative-pressure systems (vacuum treatment) may be indicated for exsudate management [34, 35]. Erosions or ulcerations should be covered with products that can be removed without trauma. Especially in intertriginous dermatitis, non-irritating textiles may be used to prevent 'humidity chambers'. These textiles are also available equipped with antimicrobial silver [36]. Superinfection requires antimicrobial treatment, such as antiseptics with low toxicity (polyhexanide), or antimycotics for fungal infections [37]. Patients, and where appropriate also their caregivers, need to understand how MASD develops, how it can be treated and prevented. Education of patients and caregivers is essential to ensure long-term therapeutic success [38].

Skin care and skin protection

A clear differentiation between skin care products and skin protection products is more or less impossible since their ingredients and effects are usually similar. Many skin care products also have protective effects. The products used for skin care and skin protection are either cosmetics or medical products. As opposed to medicines/drugs, these products do not require registration after independent assessment of their efficacy [39]. Skin care products can help to improve or restore the skin's barrier function. They should be used for dry skin and should contain 4–10 % urea and/or 5 % glycerol. 'Natural' ingredients such as tea tree oil or marigold extracts should be avoided since they may cause contact sensitization. Emulsifiers, preservatives, and fragrances are also possible causes of contact sensitization and should thus be critically scrutinized.

Skin protection products help to prevent or minimize direct contact between the skin and body fluids. They usually contain viscous, lipophilic ingredients such as petrolatum or paraffin, or film formers such as silicones (dimethicone) and acrylates [9, 40]. Most products contain a combination of these ingredients. Apart from protecting the skin, they can also aid skin regeneration after irritation. Cloths or sprays can be used for application. Re-epithelization can be promoted by using skin protection products with cyanoacrylates [41]. Zinc (oxide) ointments are also suitable for skin protection. It should however be noted that many topical zinc products, in particular viscous zinc pastes, may be difficult to remove and make assessment of the wounds more difficult. Soft zinc creams, on the other hand, are a feasible alternative since they can be applied in a thin and transparent layer. They do not obscure the skin and can be removed more easily than zinc pastes. Zinc products are relatively cheap. Skin protection products must be used in appropriate amounts and frequencies accoding to the manufacturer's instructions. Adhesive films made from polyurethane can also be used for skin protection if they are dedicated for skin protection and can be removed atraumatically and without residues.

Incontinence management

Skin damage may develop in any incontinent patient, so preventive and if necessary therapeutic measures are indicated for all affected patients [42]. Urine and/or feces must be removed from the skin quickly, thoroughly, and gently. Feces should be removed with synthetic detergents (syndets) with a skin-friendly pH. Especially after episodes of fecal incontinence, absorbent devices must be changed immediately since reflux may ensue once the absorbent capacity is exhausted. There are a number of conservative methods to promote or retain continence, such as pelvic floor training or bladder retraining, but surgery may be required in individual cases [43]. This type of causal therapy is very effective but may be difficult to implement in everyday clinical practice in many medical or care environments. Incontinence is not an obligatory indication for drainage systems such as condom urinals, transurethral vesical catheters, or fecal collectors [44]. Drainage systems may however be used for short periods of time in some specific situations, for example in patients with treatment-refractive moisture-associated skin damage, or in cases of massive involuntary loss of liquid feces. Fecal drainage systems have proven very useful for massive diarrhea. For urinary incontinence, some products offer not only absorption but also pH neutralization. This is a distinct benefit. Physical measures and behavior modifications are further cornerstones in the treatment of urinary incontinence [45].

Conclusions for practical use

This Wund-D.A.CH. Best Practice recommendation for MASD covers the entities incontinence-associated dermatitis (IAD), intertriginous dermatitis (including intertrigo), gram-negative bacterial toe web infection, and toxic contact dermatitis including periwound dermatitis and peristomal dermatitis. Diagnosing these skin conditions is quite difficult in everyday clinical practice since there are many differential diagnoses that may also occur in combination with MASD. Effective strategies for prevention and treatment of MASD include continence management, use of effective absorbent devices with good retention, as well as consistent skin protection and appropriate skin care. Successful treatment requires good treatment adherence, thus educating patients and their caregivers on the development, treatment, and prevention of MASD is essential.

Acknowledgement

We would like to thank Mr. Stefan Krasnik for the excellent co-ordination of this interdisciplinary and interprofessional consensus procedure.

Open access funding enabled and organized by Projekt DEAL.

Conflict of interest

Joachim Dissemond has received fees for lectures, consulting, or studies from the following companies: 4M, Acelity, Beiersdorf, Coloplast, Convatec, Draco, Engelhardt, Hartmann, Infectopharm, Lohmann & Rauscher, Mölnlycke, SastoMed, Urgo, Uluru.

Norbert Kolbig has received fees for lectures, consulting, or studies from the following companies: 3M, Mölnlycke.

Kerstin Protz has received fees for lectures, consulting, or studies from the following companies: Bauerfeind, Bösl Medizintechnik. BSN medical/Essity, Coloplast, Convatec, DAK, GlaxoSmithKline, Hartmann, Lohmann & Rauscher, medi, Mölnlycke, Sanafactur, Schülke & Mayr, Uluru, URGO.

Jan Kottner has received fees for lectures or consulting from the following companies: 3M, Abbott, Arjo, Mölnlycke, S-Biomedic.

The other authors did not report any conflicts of interest.

Correspondence to

Prof. Dr. med. Joachim Dissemond
Department of Dermatology, Venereology and Allergology
University Hospital Essen
Hufelandstraße 55

45122 Essen
Germany

E-mail: joachim.dissemond@uk-essen.de

References

1 Gray M, Black JM, Baharestani MM et al. Moisture-associated skin damage: overview and pathophysiology. J Wound Ostomy Continence Nurs 2011; 38: 233–41.
2 Jakob R. ICD-11 – Anpassung der ICD an das 21. Jahrhundert. Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz 2018; 61: 771–7.
3 Voegeli D. Prevention and management of moisture-associated skin damage. Nurs Stand 2019; 34: 77–82.
4 Lichterfeld-Kottner A, El Genedy M, Lahmann N et al. Maintaining skin integrity in the aged: A systematic review. Int J Nurs Stud 2020; 103: 103509.
5 Beeckman D, van den Bussche K, Alves P et al. Towards an international language for incontinence-associated dermatitis (IAD): design and evaluation of psychometric properties of the Ghent Global IAD Categorization Tool (GLOBIAD) in 30 countries. Br J Dermatol 2018; 178: 1331–40.
6 Dissemond J, Strohal R, Mastronicola D et al. Therapeutic Index for Local Infections score validity: a retrospective European analysis. J Wound Care 2020; 29(12): 726–34.
7 Campbell JL, Coyer FM, Mudge AM et al. Candida albicans colonisation, continence status and incontinence-associated dermatitis in the acute care setting: a pilot study. Int Wound J 2017; 14: 488–95.
8 Moelleken M, Jockenhöfer F, Benson S, Dissemond J. Prospective clinical study on the effecacy of bacterial removal with mechanical debridement in and around chronic venous leg ulcers assessed with fluorescence imaging. Int Wound J 2020; 17: 1011–8.
9 Proksch E. pH in nature, humans and skin. J Dermatol 2018; 45: 1044–52.
10 Rippke F, Berardesca E, Weber TM. pH and microbial infections. Curr Probl Dermatol 2018; 54: 87–94.
11 Lumbers M. Moisture-associated skin damage: cause, risk and management. Br J Nurs 2018; 27(Suppl. 12): 6–14.
12 Mitchell A, Hill B. Moisture-associated skin damage: an overview of its diagnosis and management. Br J Community Nurs 2020; 25: 12–8.
13 Woo TE, Somayaji R, Haber RM, Parsons L. Scratching the surface: A review of dermatitis. Adv Skin Wound Care 2019; 32: 542–9.
14 Weidner T, Tittelbach J, Illing T, Elsner P. Gram-negative bacterial toe web infection – a systematic review. J Eur Acad Dermatol Venereol 2018; 32: 39–47.
15 Janniger CK, Schwartz RA, Szepietowski JC, Reich A. Intertrigo and common secondary skin infections. Am Fam Physician 2005; 72: 833–8.
16 Aste N, Atzori L, Zucca M et al. Gram-negative bacterial toe web infection: a survey of 123 cases from the district of Cagliari, Italy. J Am Acad Dermatol 2001; 45: 537–41.
17 Dini V, Janowska A, Oranges T et al. Surrounding skin management in venous leg ulcers: A systematic review. J Tissue Viability 2020; 29: 169–75.
18 Almutairi D, LeBlanc K, Alavi A. Peristomal skin complications: what dermatologists need to know. Int J Dermatol 2018; 57: 257–64.
19 Colwell JC, Ratliff CR, Goldberg M et al. MASD part 3: peristomal moisture- associated dermatitis and periwound moisture-associated dermatitis: a consensus. J Wound Ostomy Continence Nurs 2011; 38: 541–53.
20 LeBlanc K, Whiteley I, McNichol L et al. Peristomal medical adhesive-related skin injury: results of an international consensus meeting. J Wound Ostomy Continence Nurs 2019; 46: 125–36.
21 Cressey BD, Belum VR, Scheinman P et al. Stoma care products represent a common and previously underreported source of peristomal contact dermatitis. Contact Dermatitis 2017; 76: 27–33.
22 Landis MN, Keeling JH, Yiannias JA et al. Results of patch testing in 10 patients with peristomal dermatitis. J Am Acad Dermatol 2012; 67: 91–104.
23 Beele H, Smet S, Van Damme N, Beeckman D. Incontinence-associated dermatitis: pathogenesis, contributing factors, prevention and management options. Drugs Aging 2018; 35: 1–10.
24 Dissemond J, Bültemann A, Gerber V et al. Weitere Definitionen und Schreibweisen für die Wundbehandlung. Hautarzt 2017; 68: 415–7.
25 Gabriel S, Hahnel E, Blume-Peytavi U, Kottner J. Prevalence and associated factors of intertrigo in aged nursing home residents: a multi-center cross-sectional prevalence study. BMC Geriatr 2019; 19: 105.
26 Kalra MG, Higgins KE, Kinney BS. Intertrigo and secondary skin infections. Am Fam Physician 2014; 89: 569–73.
27 Kottner J, Kröger K, Gerber V et al. Dekubitus erkennen und richtig klassifizieren: Ein Positionspapier. Hautarzt 2018; 69: 839–47.
28 Raudonis T, Vankeviciute RA, Lideikaite A et al. Contact sensitization in patients with chronic leg ulcers: Results of a

5-year retrospective analysis. Adv Skin Wound Care 2019; 32: 558–62.
29 D'Erme AM, Iannone M, Dini V, Romanelli M. Contact dermatitis in patients with chronic leg ulcers: a common and neglected problem: a review 2000–2015. J Wound Care 2016; 25 (Suppl. 9): 23–9.
30 Sundaresan S, Migden MR, Silapunt S. Stasis dermatitis: pathophysiology, evaluation, and management. Am J Clin Dermatol 2017; 18: 383–90.
31 Beeckman D, van Damme N, Schoonhoven L et al. Interventions for preventing and treating incontinence-associated dermatitis in adults. Cochrane Database Syst Rev 2016; 11: CD011627.
32 Harries FJ, Begg PA. Non-rinse skin cleansers: the way forward in preventing incontinence related moisture lesions? J Wound Care 2016; 25: 268–76.
33 Dissemond J, Augustin M, Eming S et al. Moderne Wundtherapie – praktische Aspekte der lokalen, nicht-interventionellen Behandlung chronischer Wunden. J Dtsch Dermatol Ges 2014; 12: 541–54.
34 Bender JK, Faergemann J, Sköld M. Skin health connected to the use of absorbent hygiene products: A review. Dermatol Ther 2017; 7: 319–30.
35 Peinemann F, Labeit A. Negative pressure wound therapy: A systematic review of randomized controlled trials from 2000 to 2017. J Evid Based Med 2019; 12: 125–32.
36 Montpetit C, Singh-Carlson S. Engaging patients with radiation related skin discomfort in self-care. Can Oncol Nurs J 2018; 28: 191–200.
37 Kramer A, Dissemond J, Willy C et al. Auswahl von Wundantiseptika: Aktualisierung des Expertenkonsensus 2018. Wundmanagement 2019; 13(Suppl.): 3–23.
38 Howell RS, Gorenstein S, Gillette BM et al. A framework to assist providers in the management of patients with chronic, nonhealing wounds. Adv Skin Wound Care 2018; 31: 491–501.
39 Fartasch M, Diepgen TL, Drexler H et al. S1-Leitlinie „Berufliche Hautmittel: Hautschutz, Hautpflege und Hautreinigung" (ICD 10: L23, L24) – Kurzversion. J Dtsch Dermatol Ges 2015; 13: 594–607.
40 Acton C, Ivins N, Bainbridge P, Browning P. Management of incontinence-associated dermatitis patients using a skin protectant in acute care: a case series. J Wound Care 2020; 29: 18–26.
41 Been RA, Bernatchez SF, Conrad-Vlasak DM et al. In vivo methods to evaluate a new skin protectant for loss of skin integrity. Wound Repair Regen 2016; 24: 851–9.
42 Woo KY, Beeckman D, Chakravarthy D. Management of moisture-associated skin damage: A scoping review. Adv Skin Wound Care 2017; 30: 494–501.
43 Flanagan L, Roe B, Jack B et al. Factors with the management of incontinence and promotion of continence in older people in care homes. J Adv Nurs 2014; 70: 476–96.
44 Scardillo J, Aronovitch SA. Successfully managing incontinence-related irritant dermatitis across the lifespan. Ostomy Wound Manage 1999; 45: 36–44.
45 Goepel M, Kirschner-Hermanns R, Welz-Barth A et al. Urinary incontinence in the elderly: part 3 of a series of articles on incontinence. Dtsch Arztebl Int 2010; 107: 531–6.
46 Zimmaro Bliss D, Zehrer C, Savik K et al. Incontinence-associated skin damage in nursing home residents: a secondary analysis of a prospective, multicenter study. Ostomy Wound Manage 2006; 52: 46–55.
47 Junkin J, Selekof JL. Prevalence of incontinence and associated skin injury in the acute care inpatient. J Wound Ostomy Continence Nurs 2007; 34: 260–9.
48 Palese A, Carniel G. The effects of a multi-intervention incontinence care program on clinical, economic, and environmental outcomes. J Wound Ostomy Continence Nurs 2011; 38: 177–83.
49 Long MA, Reed LA, Dunning K, Ying J. Incontinence-associated dermatitis in a long-term acute care facility. J Wound Ostomy Continence Nurs 2012; 39: 318–27.
50 Campbell JL, Coyer FM, Osborne SR. Incontinence-associated dermatitis: a cross-sectional prevalence study in the Australian acute care hospital setting. Int Wound J 2016; 13(3): 403–11.
51 Kottner J, Blume-Peytavi U, Lohrmann C et al. Associations between individual characteristics and incontinence-associated dermatitis: a secondary data analysis of a multi-centre prevalence study. Int J Nurs Stud 2014; 51(10): 1373–80.
52 Lahmann NA, Tannen A, Kuntz S et al. Mobility is the key! Trends and associations of common care problems in German long-term care facilities from 2008 to 2012. Int J Nurs Stud 2015; 52(1): 167–74.
53 Gray M, Giuliano KK. Incontinence-Associated Dermatitis, characteristics and relationship to pressure injury: A multisite epidemiologic analysis. J Wound Ostomy Continence Nurs 2018; 45: 63–7.
54 Wei L, Bao Y, Chai Q et al. Determining risk factors to develop a predictive model of incontinence-associated dermatitis among critically ill patients with fecal incontinence: A prospective, quantitative study. Wound Manag Prev 2019; 65: 24–33.
55 Arnold-Long M, Johnson E. Epidemiology of incontinence-associated dermatitis and intertriginous dermatitis (intertrigo) in an acute care facility. J Wound Ostomy Continence Nurs 2019; 46: 201–6.
56 Werth SL, Justice R. Prevalence of moisture-associated skin damage in an acute care setting: Outcomes from a quality improvement project. J Wound Ostomy Continence Nurs 2019; 46: 51–4.
57 Kottner J, Everink I, van Haastregt J et al. Prevalence of intertrigo and associated factors: A secondary data analysis of four annual multicentre prevalence studies in the Netherlands. Int J Nurs Stud 2020; 104: 103437.
58 Ratliff CR, Scarano KA, Donovan AM, Colwell JC. Descriptive study of peristomal complications. J Wound Ostomy Continence Nurs 2005; 32: 33–7.

