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Skin eruptions and infectious rash diseases in children in the practice of a primary care physician

Wykwity skórne i zakaźne choroby wysypkowe u dzieci w praktyce lekarza podstawowej opieki zdrowotnej

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Abstract

Skin eruptions sometimes appear as the first signs of disease in children, allowing for early diagnosis and treatment. Examination of the child's skin is a routine element of the physical examination, which provides valuable information facilitating the correct diagnosis. Distinguishing individual skin eruptions that make up the overall picture of the disease often causes diagnostic difficulties in the context of rash diseases in children in the practice of a primary care physician. These diseases include viral, bacterial, and parasitic infections as well as those of ambiguous aetiology, such as Kawasaki disease. In this paper, individual primary and secondary skin eruptions are characterised. Primary eruptions are typically a direct result of the development of the disease process in the skin; secondary eruptions, in turn, usually develop from primary eruptions, as consequences thereof. A rash is a lesion that affects the appearance and texture of the skin surface. This paper discusses the most common infectious diseases with a rash in the clinical picture. In addition, when differentiating infectious rash diseases in children, attention was paid to other – non-infectious – skin diseases, such as atopic dermatitis, seborrhoeic dermatitis, and psoriasis. These are disease entities characterised by a diverse clinical picture depending on the stage of the disease and the age of the child. When diagnosing a high-fever child, life-threatening conditions such as meningococcal sepsis, with petechiae that do not disappear under pressure, should always be considered. Prolonged fever, especially lasting more than 5 days, should prompt the physician to conduct diagnostics towards Kawasaki syndrome – a disease of ambiguous aetiology.

Keywords: rash, eruption, children, rash diseases, infectious diseases

Streszczenie

Wykwity skórne mogą stanowić pierwsze objawy choroby u dzieci, dzięki czemu możliwe jest jej wczesne rozpoznanie i leczenie. Badanie skóry dziecka to rutynowy element badania przedmiotowego, który dostarcza wielu cennych informacji ułatwiających prawidłowe rozpoznanie jednostki chorobowej. Rozróżnienie poszczególnych wykwitów skórnych, składających się na cały obraz choroby, często sprawia trudności diagnostyczne w kontekście chorób wysypkowych u dzieci w praktyce lekarza podstawowej opieki zdrowotnej. Do chorób tych należy zaliczyć infekcje wirusowe, bakteryjne, pasożytnicze oraz te o niejednoznacznej etiologii, np. chorobę Kawasakiego. W niniejszej pracy opisano poszczególne wykwity skórne pierwotne i wtórne. Wykwity pierwotne zazwyczaj są bezpośrednim wynikiem rozwoju procesu chorobowego w skórze, wykwity wtórne natomiast zwykle rozwijają się z wykwitów pierwotnych, stanowiąc ich następstwo. Wysypka to zmiana wpływająca na wygląd oraz strukturę powierzchni skóry. W niniejszej pracy omówiono najczęściej spotykane choroby zakaźne z wysypką w obrazie klinicznym. Ponadto podczas różnicowania zakaźnych chorób wysypkowych u dzieci zwrócono uwagę na inne – niezakaźne – choroby skóry, takie jak atopowe zapalenie skóry, łojotokowe zapalenie skóry i łuszczyca. Są to jednostki chorobowe cechujące się różnorodnym obrazem klinicznym w zależności od fazy choroby oraz wieku dziecka. Podczas diagnostyki wysoko gorączkującego dziecka zawsze należy wziąć pod uwagę stany zagrożenia życia, takie jak sepsa meningokowa, z wybroczynami nieulegającymi zanikowi pod wpływem ucisku. Natomiast przedłużająca się gorączka, szczególnie trwająca powyżej 5 dni, powinna skłonić lekarza do przeprowadzenia diagnostyki w kierunku choroby o niejednoznacznej etiologii, jaką jest zespół Kawasakiego.

Słowa kluczowe: wysypka, wykwity, dzieci, choroby wysypkowe, choroby zakaźne

INTRODUCTION

Examination of the child's skin is a routine element of the physical examination, which provides valuable information facilitating the correct diagnosis. The skin is the largest organ of the human body. It is adapted to perform a variety of functions, e.g. acting as a barrier to physical, chemical and mechanical factors, protecting the body against the loss of body fluids, receiving external stimuli, or being the site of numerous reactions of the immune system. The skin consists of the epidermis, dermis and hypodermis, as well as skin appendages (glands, hair, nails). Rash is one of the most common clinical symptoms in the paediatric population. It occurs in infectious diseases, allergic reactions, genetic and metabolic diseases, autoimmune and drug-induced reactions, after insect bites, or after the action of irritants. Evaluation of skin eruptions is the basis of the physical examination and an essential element in the diagnosis of skin diseases. Distinguishing individual skin eruptions that make up the overall picture of the disease often causes diagnostic difficulties in the context of rash diseases in children. Skin eruptions can be divided into primary and secondary eruptions. Primary eruptions are typically a direct result of the development of the disease process in the skin, while secondary eruptions usually develop from primary eruptions, as consequences thereof (Tab. 1)[1,2].

SKIN ERUPTIONS

Primary and secondary eruptions are distinguished; both types are characterised below (Tab. 1).

Primary eruptions

Discolouration

Discolouration manifests itself as a flat, demarcated, skin-level lesion that is impalpable. It involves a change in the colour of the skin. Depending on the diameter, it may be referred to as a spot (less than 1 cm) or patch (over 1 cm). According to their nature, discolouration spots/patches are also divided into: pigment spots/patches, e.g. birthmarks, freckles; depigmentation spots/patches, e.g. vitiligo; inflammatory spots/patches, e.g. erythema; vascular spots/patches, e.g. extravasations, telangiectasias, haemangiomas[1–5] (Fig. 1).

Primary eruptions	Secondary eruptions
Nodule	Erosion
Papule	Excoriation
Discolouration	Fissure
Blister	Rhagade
Vesicle	Scaly skin
Pustule	Scab
Wheal	Ulceration
	Scar

Tab. 1. Division of skin eruptions (original work)

Fig. 1. Primary eruption: discolouration (from the authors' own collections)

Fig. 2. Urticarial wheal in the course of allergic urticaria (from the authors' own collections)

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Fig. 3. Papules (from the authors' own collections)

Wheal

A wheal is a sharply defined, raised and dense lesion, characterised by a porcelain white or pink colour. It is a temporary lesion that results from the escape of fluid from the blood vessels, causing local swelling. It usually lasts more than 24 hours. During this time, individual lesions appear and disappear. Examples of conditions associated with the presence of wheals are nettle burn and urticarial diseases. Quincke's disease is similar to urticaria but arises in the subcutaneous tissue. A massive swelling is formed. As a rule, the lesions are absorbed spontaneously[1–5] (Fig. 2).

Papule

A papule is an eruption raised above the surface of the skin and demarcated from its surroundings, which resolves without leaving a scar. Its diameter is less than 1 cm. Common examples of a papule include viral wart, psoriasis, or lichen planus[1–5] (Fig. 3).

Nodule

A nodule is an eruption raised above the surface of the skin, well demarcated from its surroundings, up to 1 cm in diameter. It leaves scarring after it resolves. This type of skin lesion affects the connective tissue of the dermis. It often tends to break down and form ulcerative lesions. The nodule occurs in diseases such as tuberculosis, sarcoidosis, syphilis, xanthomas, neoplastic growth, etc.[1–5] (Fig. 4).

Tumour

A tumour is an eruption that affects the dermis and subcutaneous tissue. Its diameter is more than 1 cm. It leaves scarring after it resolves, it also may disintegrate and leave ulceration. Examples of these types of lesions are benign fibromas and boils[1–5] (Fig. 5).

Fig. 4. Nodule – fibroma (from the authors' own collections)

Fig. 5. Tumour – post-traumatic (from the authors' own collections)

Vesicle

A vesicle is a small eruption with a diameter of less than 0.5–1 cm (the limit varies depending on the source), elevated above the surface of the skin, filled with fluid. Specific diseases that are accompanied by the appearance of vesicles are herpes and shingles[1–5] (Fig. 6).

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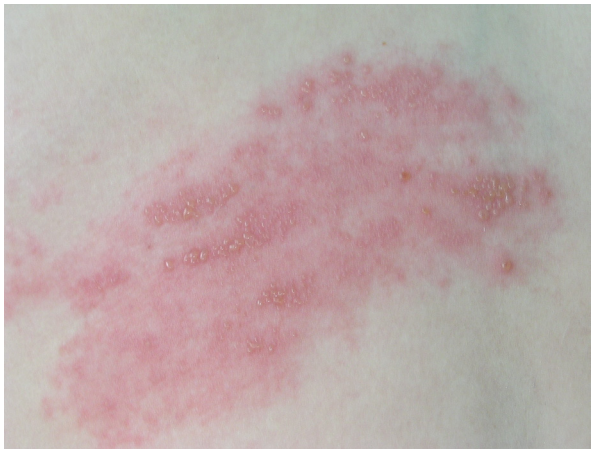

Fig. 6. Vesicles in shingles (from the authors' own collections)

Fig. 7. Primary eruption – blister (from the authors' own collections)

Fig. 8. Pustules in juvenile acne (from the authors' own collections)

Fig. 9. Erosion in the diaper area (from the authors' own collections)

Blister

A blister, unlike a vesicle, is an eruption raised above the surface of the skin with a diameter of more than 1 cm, containing fluid. The blister is an eruption typical of impetigo and pemphigus[1–5] (Fig. 7).

Pustule

A pustule is a small eruption, elevated above the surface of the skin, filled with pus. This eruption occurs in, inter alia, psoriasis and acne[1–5] (Fig. 8).

Secondary eruptions

Erosion

An erosion is a superficial loss of the epidermis that resolves without leaving scarring. Typically, it forms in the locations of primary eruptions such as: vesicle, blister, pustule, or oozing papules[1–5] (Fig. 9).

Excoriation

An excoriation is a linear loss of the epidermis resulting from scratching. It occurs in unchanged skin, due to mechanical injuries. Excoriation is an eruption typical of scabies and head lice[1–5] (Fig. 10).

Fissure

A fissure is a shallow linear loss of the epidermis or dermis in inflamed, hyperkeratotic, or stretched areas[1–5] (Fig. 11).

Rhagade

A rhagade is a scarring deep linear loss in the epidermis and dermis, most often around the anus, heel, or corner of the mouth[1–5] (Fig. 12).

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Fig. 10. Excoriation in an itchy rash (from the authors' own collections)

Fig. 11. Fissure in the elbow area (from the authors' own collections)

Fig. 12. Rhagade in the heel area (from the authors' own collections)

Scaly skin

Scaly skin manifests itself as exfoliating stratum corneum of the epidermis. Due to the size of the scales, the following are distinguished: bran exfoliation – occurring in scalp dandruff and measles, and lobar exfoliation – characteristic of scarlet fever and Kawasaki disease[1–5] (Fig. 13).

Scab

A scab is an eruption formed as a result of the drying of serous, purulent or serous-bloody fluid on the surface of the skin with the remains of broken cells, blood cells and bacteria. Scabs over erosions result in temporary discolouration, and scabs over ulcers – in scarring. Scabs may differ from each other depending on the type of fluid. The drying of the serum leads to the formation of transparent scabs, as is the case with superficial erosions. Blood gives the scab a dark red to black colour in, inter alia, erythema multiforme. The presence of pus causes yellow or honey-coloured scabs, e.g. in impetigo[1–5] (Fig. 14).

Ulceration

An ulceration is a loss of the epidermis and dermis that leaves a scar after it resolves. There are many possible causes of ulceration. Usually, they develop from nodules, tumours or pustules, sometimes under the influence of external factors (frostbite, burns, chemical injuries), as a result of deep infections (ecthyma), or as a result of arterial or venous vascular lesions, pressure (bedsores), necrotic and neoplastic lesions[1–5] (Fig. 15).

Scar

Scarring is formed as a result of the process of renewal of a loss in the connective tissue part of the dermis and its

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Fig. 13. Scaly skin in exacerbation of atopic dermatitis (from the authors' own collections)

replacement with fibrous connective tissue. It is most often the descent of ulcerations, it can also form from non-disintegrating nodules. In children, scars occur e.g. after burns, sarcoidosis, or tuberculosis[1–5] (Fig. 16).

INFECTIOUS RASH DISEASES IN CHILDREN

Skin eruptions, both primary and secondary, make up the clinical picture of rash diseases, which are common ailments in the paediatric population. A rash is a lesion that affects the appearance and texture of the skin surface. The aetiology of diseases which involve a rash is diverse. In this paper, the most common infectious diseases with a rash in the clinical picture will be discussed.

Viral infectious diseases

Herpes

Herpes simplex is one of the most common infections among the human population.

Fig. 14. Secondary eruption – scab (from the authors' own collections)

Fig. 15. Ulceration in the diaper area (from the authors' own collections)

Fig. 16. Scar in the knee area (from the authors' own collections)

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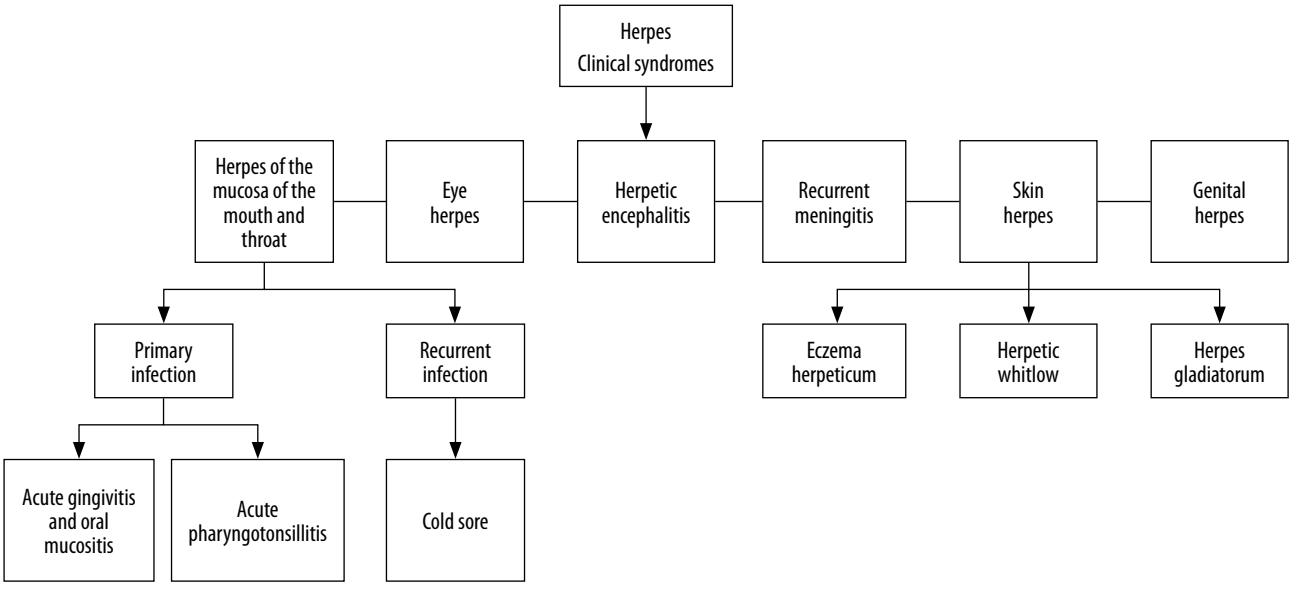

Fig. 17. Clinical syndromes in the course of which herpes occurs (original work)

Cause: *Herpes simplex* virus (HSV) 1 and 2.
Type 1 – oral mucosa, facial skin.
Type 2 – genital mucosa, rectal mucosa.
Reservoir: human.
Route of infection: direct contact.
Clinical picture of the disease: the course involves a vesicular rash and coexisting prodromal symptoms (including pain, burning, itching), followed by an inflammatory papule that evolves into a vesicle, and the final secondary eruptions are erosions and ulcerations. Herpes occurs in a number of clinical syndromes (Fig. 17). The most common manifestation of primary HSV infection in children is acute gingivitis and oral mucositis. Typically, this infection occurs between the ages of 6 months and 5 years. It is characterised by a sudden onset of symptoms such as high fever, malaise, and anorexia. In the course of the disease, vesicles with a red rim within the oral mucosa are typical. The lesions are covered with a thin epithelium that ruptures easily, causing the lesions to coalesce and form shallow, painful erosions. The eruptions may be accompanied by swelling, redness, pain, and enlargement or soreness of regional lymph nodes. Skin herpes includes herpetic whitlow, herpes gladiatorum, and eczema herpeticum. Herpetic whitlow typically presents with swelling, erythema, pain, and vesicular-pustular lesions located on the fingertips. Herpes gladiatorum usually occurs in athletes who come into close contact with their rivals. In this case, the eruptions most often appear on the skin of the chest, ears, face, and hands. Eczema herpeticum is typical for children aged 1–2 years with atopic dermatitis. It is usually caused by primary HSV-1 infection. The disease is accompanied by high fever. The eruptions appear on affected areas of the skin in the form of papules, which evolve into vesicles, to then burst and merge with each other. Eczema can be life-threatening because as a result of severe lesions, loss of epidermis over a large area of the body may occur, resulting in protein loss and water and electrolyte disturbances. Accompanied by pruritus, bacterial hyperinfection may occur, which is associated with the risk of spreading the virus to the central nervous system and other organs[6–11] (Figs. 17, 18).

Fig. 18. Cold sore (from the authors' own collections)

Herpangina

Cause: enteroviruses, mainly Coxsackie A virus.
It is characterised by acute pharyngitis with papulovesicular eruptions involving the posterior pharyngeal wall, tonsils, palatine arches, soft palate and uvula, which develop into erosions and ulcerations. The eruptions are light-coloured, grey-white, located on an erythematous base. The lesions are accompanied by fever, sore throat, and dysphagia. They usually last 3–6 days and resolve spontaneously[6–10,12].

Hand-foot-and-mouth disease

Cause: enteroviruses, mainly Coxsackie A virus.

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Age group: 5–7 years old.
Time of occurrence: seasonal, late spring to early autumn.
Route of infection: faecal-oral.
Incubation period: 2–10 days.
It typically presents with fever and maculopapular vesicular lesions on the oral mucosa, palms and soles of the feet, appearing on the second or third day of illness. The papular rash can appear on the buttocks, trunk, or other parts of the body. It usually subsides after a week from the onset of the disease. The recovery period may include coarse scaling on the palms of the hands and soles of the feet, and sometimes detachment of the nails from the matrix, 3–6 weeks after resolution of the disease[6–10,12] (Fig. 19).

Molluscum contagiosum

Cause: smallpox virus of the *Poxviridae* family.
Age group: usually up to 10 years old.
Route of infection: direct contact, indirect contact, sexual, autoinoculation.
Typically, flesh-coloured, pearly, solid papules with a pathognomonic depression in the centre appear on the skin. These lesions are filled with cheese-like matter. The diameter of the papule is usually 2–6 mm. The papules may occur singly, linearly in groups, or diffusely. They can appear all over the body, but typically on the face, neck, lower abdomen, back, and arms. In patients with a normal immune response, the disease resolves without treatment in 18 months to 4 years[6–10,13,14] (Fig. 20).

Infectious mononucleosis

Cause: Epstein–Barr virus (EBV).
Source of infection: infected human.
Route of infection: contact with saliva or contaminated objects.
Incubation period: 30–50 days.
Transmissibility period: 6 months, periodically – with saliva – throughout life.
Typically, the disease entails prodromal symptoms, such as: flu-like symptoms, pharyngitis and tonsillitis, enlarged lymph nodes and spleen, hepatitis, and a specific skin rash. The lesions may appear in the form of maculopapular rash, antibiotic-induced rash, or Gianotti–Crosti syndrome. A maculopapular or morbilliform rash occurs in 5%

Fig. 19. Maculopapular eruptions on the hands in hand-foot-and-mouth disease (from the authors' own collections)

Fig. 20. Flesh-coloured solid papules in molluscum contagiosum (from the authors' own collections)

of patients with infectious mononucleosis. It causes itching and burning. It affects the skin and mucous membranes. An antibiotic-induced rash appears 7–10 days after the administration of an antibiotic (usually ampicillin or amoxicillin) due to a misdiagnosis (streptococcal angina). Gianotti–Crosti syndrome is caused by: EBV, hepatitis B virus (HBV), Coxsackieviruses, enteroviruses, respiratory syncytial virus (RSV), cytomegalovirus (CMV), and human herpesvirus 6 (HHV-6). It is most common in children under 15 years of age. It takes the form of a papular rash; the eruptions are monomorphic and do not coalesce. They are usually not accompanied by itching. The papules range in colour from pink to dark red. They appear symmetrically on the face, buttocks, and extensible parts of the limbs. Typically, they do not occur in joint bends or on mucous membranes. Symptoms persist for several weeks[6–10,15–17] (Fig. 21).

Roseola (sixth disease)

Cause: HHV6 and HHV7 viruses.
Age group: 6 months to 4 years of age.
Source of infection: saliva of an infected human.
The disease begins with a sudden high fever lasting 2–4 days. After the fever subsides, a fine, pale pink rash appears. The lesions occur first on the trunk, and then on the arms, neck and face. The eruptions disappear after 1–2 days, without leaving discolouration. The most common complication of the disease is febrile seizures[6–10,16,18] (Fig. 22).

Erythema infectiosum (fifth disease)

Cause: parvovirus B19.
Reservoir: human.
Route of infection: droplet.
Incubation period: several to 21 days.

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Fig. 21. Antibiotic-induced rash (amoxicillin with clavulanic acid) in infectious mononucleosis (from the authors' own collections)

Fig. 22. Rash in roseola (from the authors' own collections)

Fig. 23. Rash in erythema infectiosum (from the authors' own collections)

The initial symptoms of the disease are flu-like. Then, skin eruptions appear in the form of a garland-like descending rash – first on the cheeks, subsequently on the trunk, limbs, buttocks. The lesions may resolve and reappear. The patient is contagious for about 7 days, until the appearance of skin eruptions. The rash may be accompanied by symptoms such as arthralgia or arthritis, bone marrow aplasia, gloves-and-socks syndrome (sharply demarcated erythema followed by a papular or haemorrhagic rash on the hands and feet, with associated pruritus and pain)[6–10,16,19,20] (Fig. 23).

Measles

Cause: virus of the genus *Morbillivirus*.
Source of infection: human.
Route of infection: droplet, direct.
Transmissibility period: from the fifth day of illness to 4 days after the appearance of skin lesions.
The disease presents with high fever, involvement of mucous membranes, and rash. Nowadays, thanks to widespread vaccination, it is relatively rare. Before that, it mainly affected children aged 5–9. The course of the disease can be divided into 4 periods: incubation (10–12 days), prodromal (2–4 days), exanthema (2–4 days), and recovery. The incubation period is asymptomatic. In the prodromal period, symptoms such as high fever, rhinitis, dry cough, conjunctivitis with photophobia and lachrymation occur. At the end of this period (1–2 days before the rash), Koplik's spots (pathognomonic for measles) appear on the buccal mucosa – small white papules surrounded by a red inflamed halo, which resolve 1–2 days after the skin rash subsides. This symptom is specific to measles, but its absence does not exclude the diagnosis. During the prodromal period, enanthema – red spots of various sizes, separated by the mucous membrane, of a natural colour – may occur on the oral mucosa. The rash is descending, maculopapular, dark red to violet in colour. Lesions with a diameter of 0.1–1 cm tend to merge. On the first day, the rash occurs along the hairline, on the forehead, behind the ears (except the scalp), then on the trunk, upper limbs, and finally, lower limbs. Eventually, on the fourth day, it begins to subside, fading in the same order it appeared, leaving brown discolouration and fine bran-like flaking[6–10,16,21–23] (Fig. 24).

Chickenpox

Cause: primary infection with *Varicella zoster* virus (VZV).
Age group: children aged 5–9 and adults who have not been infected before.
Occurrence period: seasonal, from March to May, epidemics every 3–4 years, mainly in spring and winter.
Reservoir: human.
Source of infection: infected human.
Route of infection: droplet, direct contact, placenta.
Incubation period: 10–21 days.
Transmissibility period: from 48 hours before the appearance of skin lesions to the moment all vesicles are covered with a scab.

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Fig. 24. Rash in measles (from the authors' own collections)

In children, the disease presents with fever and skin eruptions. Older children and adults may experience prodromal symptoms such as fever, headache, myalgia, abdominal pain, rhinitis, and pharyngitis. This is followed by a polymorphic multiform rash. The skin lesions evolve as follows: first a red spot appears, then a papule, a vesicle filled with a clear fluid (high virus content), which transforms into a vesicle filled with a cloudy fluid (fibrin precipitation) and turns into a pustule, then a scab. Sometimes small scars and discolouration remain, which later disappear without a trace. Eruptions appear in flushes for the following 5–6 days. The lesions occur in particular locations in the following order: face, scalp, trunk, upper limbs, and lower limbs. They do not affect the area of the hands and feet. In a given area, lesions at different stages of evolution can be observed at the same time ("starry sky" appearance). The rash may be accompanied by fever, swollen lymph nodes, and pharyngitis[6–10,24–29] (Figs. 25, 26).

Shingles

Cause: activation of latent VZV infection.
Contact with a person who has shingles can result in chickenpox, but not shingles. The virus is present in the secretion of the blisters. The disease is contagious until the skin lesions heal. For a person with a normal immune response who has had chickenpox, contact with a person who has shingles poses no risk. In general, shingles leaves lasting immunocompetence. The skin eruptions appear as an erythematous vesicular rash along the sensory nerves, which mainly affects the trunk and face. The lesions can be painful, itchy, with swelling and redness of the affected area. The nature of the lesions may resemble that of chickenpox blisters, but in shingles the blisters usually occur on one side of the body and do not cross the midline of the face or trunk. The healing process begins after a week: the eruptions begin to dry up, and scabs form, which then fall off. The rash may be accompanied by malaise, fatigue, headache, and fever[6–10,28,29] (Fig. 27).

Rubella

Cause: virus of the *Togaviridae* family.
Reservoir: human.
Occurrence period: seasonal, early spring and winter.
Age group: 3–9 years old.
Route of infection: placenta, droplet route, direct contact.
Incubation period: 12–23 days.
Transmissibility period: from 7 days before the onset to 6 days after the appearance of skin lesions.
This disease is manifested by a typical rash and enlarged lymph nodes. The clinical picture may be preceded by flu-like symptoms. About 1–2 days before the appearance of the rash, enlargement of the cervical, occipital, mastoid, and posterior cervical lymph nodes is observed. The maculopapular rash is descending, initially over the face and behind the ears. Within 24 hours, it covers the skin of the whole body. It ranges in colour from pale pink to vivid red. On the trunk and limbs, there is a fine scarlatiniform rash, and on the face, a confluent morbilliform rash. It is frequently accompanied by slight pruritus. Typically, it lasts for 1–3 days, after which it resolves without leaving discolouration. Trace peeling of the epidermis may occur. Sometimes, there are nonspecific Forchheimer spots – red spots on the soft palate[6–10,16] (Fig. 28).

Bacterial infectious diseases

Scarlet fever

Cause: *Streptococcus pyogenes* bacteria (which causes e.g. streptococcal angina).

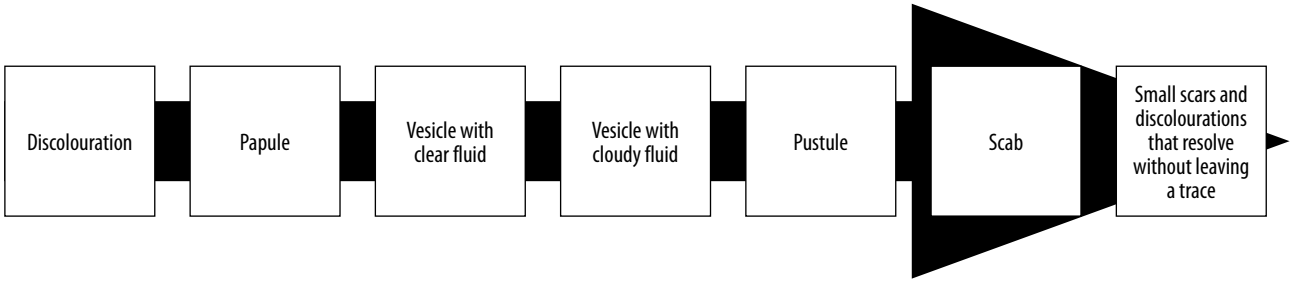

Fig. 25. Evolution of skin lesions in chickenpox (original work)

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Fig. 26. Rash in chickenpox (from the authors' own collections)

Fig. 27. Erythematous vesicular rash in shingles (from the authors' own collections)

Age group: 5–15 years old.
Source of infection: sick people and carriers.
Route of infection: droplet.
Incubation period: 1–7 days.
Transmissibility period: up to 24 hours from the use of effective antibiotic therapy.
The disease presents with pharyngitis, high fever and a rash, with a sudden onset of symptoms. The typical rash – fine, spotted, papular, confluent – appears 24–48 hours after the onset of general symptoms. It covers the trunk, buttocks, groin, and skin folds. The most intense occurrence of skin lesions is attributed to the most warmed places, i.e. armpits, groin, lower abdomen. The lesions fade on pressure and range in colour from pale pink to red.
The pathognomonic symptoms are the Filatov triangle (the skin around the mouth and nose remains pale) and Pastia's lines (increased fragility of small vessels in natural skin folds). Finally, 1–4 weeks after the onset of the disease, peeling of the skin of the hands and feet occurs. Scarlet fever is diagnosed using the Strep A test, which involves taking a swab from the throat and tonsils[6–10,30,31] (Figs. 29, 30).

Fig. 28. Rash in rubella (from the authors' own collections)

Impetigo contagiosa

Cause: streptococci (*Streptococcus pyogenes*) or staphylococci (*Staphylococcus aureus*).
Age group: 2–5 years old.
Route of infection: indirect, direct.
The primary eruption in this disease is an erythematous vesicle, which, when bursting, forms an erosion covered with purulent secretion, and then dries up, evolving into a honey-coloured scab typical of impetigo. The eruptions usually affect the face and limbs, spreading centrifugally. The absence of general symptoms is characteristic. Occasionally, the surrounding lymph nodes become enlarged. There is a separate form of impetigo – bullous impetigo. Caused by strains of S. aureus, it occurs in newborns and infants. The vesicles grow into several-centimetre flaccid blisters filled with a clear yellow fluid. The lesions rupture easily, exposing a red, moist, oozing base. They resolve without leaving scars. As with impetigo contagiosa, they are usually not accompanied by general symptoms. The lesions may also occur on a secondary basis, as a result of hyperinfection of

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Fig. 29. Fine-spotted scarlet fever rash on the trunk (from the authors' own collections)

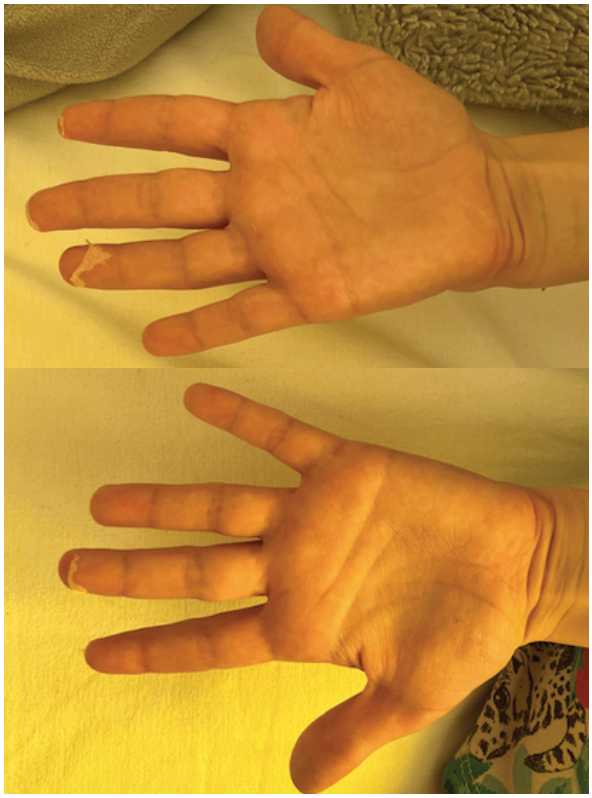

Fig. 30. Peeling of the skin of the palms in scarlet fever (from the authors' own collections)

other skin eruptions, e.g. in the case of atopic dermatitis, shingles, or insect bites. They are referred to as impetiginisation(6–10,32–34) (Fig. 31).

Fig. 31. Skin eruption in impetigo contagiosa (from the authors' own collections)

Lyme disease

Cause: *Ixodes* ticks. The disease is caused by spirochetes of the genus *Borrelia*. In Europe, *B. garinii* and *B. afzelii* are most common.

Incubation period: 3–30 days.

The clinical picture of the disease proceeds in 3 successive stages: early limited, early disseminated, and late. Stages can overlap and occur simultaneously. The early limited stage is characterised by the typical clinical picture associated with Lyme disease – erythema migrans, which occurs in 70% of patients. It is the most typical manifestation of Lyme disease. It appears 3–30 days (usually around day 7) after being bitten by a tick at or near the bite site. In children, it most often affects the head and neck area. The eruption is in the form of a red spot or papule, rapidly expanding peripherally, typically over 5 cm in diameter. It takes on a ring shape, brightened in the middle. The centre tends to be uniformly coloured. The lesion, with clearly demarcated edges, remains in the plane of the skin. It is usually painless and not accompanied by itching. It resolves regardless of treatment within 4 weeks. The diagnosis is made on the basis of the clinical picture. Cutaneous lymphoma is also included in the early limited stage. The early disseminated stage includes arthritis, myocarditis, and inflammatory changes within the nervous system. Finally, in the late stage of the disease, chronic atrophic dermatitis of the extremities, chronic arthritis and, in extreme cases, neuroborreliosis are distinguished[6–9,35–37] (Fig. 32).

Parasitic infectious diseases

Head lice

Cause: head lice.

Route of infection: indirect, direct.

The female lice lives on the scalp for about 1 month. It lays up to 10 eggs a day. The eggs are attached to the root of the hair. As the hair grows, the nits move away from the scalp. Head lice outbreaks often occur in kindergartens and schools. The main clinical picture is severe itching of the scalp.

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Fig. 32. Erythema migrans in Lyme disease (from the authors' own collections)

The affected areas are the temporal and occipital regions of the head. There may be erythematous papules, erosions, scabs on the skin of the scalp, neck, and behind the ears[6–9,38].

Scabies

Cause: human itch mite.
Route of infection: direct or indirect contact.
Incubation period: 3–6 weeks.
The life cycle of the parasite takes place in the epidermis. The female burrows in the stratum corneum. It lays 2–3 eggs a day. Outside the human body, scabies mite is able to survive 2–3 days. The skin lesions are of various shapes, from papular to papulovesicular lesions. As a result of scratching, secondary lesions – excoriations and erosions – are formed. The lesions cover the sides of the fingers, skin folds, navel area, nipples, genital area, buttocks, palms, and soles. Typically, scabies does not involve the scalp, interscapular area, palms of the hands, or soles of the feet. However, in infants and small children, the lesions may occur in places that are not usually affected, such as the palms of the hands, soles of the feet, face, scalp, back. A typical phenomenon is itching that worsens when warmed. Scabies mite burrows can be seen locally as thin pink serpentine lines. There is a rare variety of scabies called crusted scabies (or Norwegian scabies), which usually occurs in immunocompromised patients. This variety is more contagious. The eruptions take the form of thick, layered scales. The greatest intensity of changes is observed in the areas of the knee and elbow joints, hands, and feet[6–9,39–41].

Enterobiasis (pinworm infection)

Cause: nematode – pinworm.
Age group: preschool and early school children.
Reservoir: human.
Route of infection: ingestion and inhalation.
Incubation period: 2–8 weeks.
In developed countries, enterobiasis is one of the most common parasitic diseases, and in the Polish population it is the most common parasitic disease of children. Approximately 16% of patients aged 7 years are infected. The typical symptoms of this disease include anal itching that worsens at night, sleep disturbances, loss of appetite, restlessness, tearfulness and irritability in children. Secondary eruptions, namely excoriations – caused by severe itching around the anus – are characteristic. The lesions may be accompanied by inflammation of the skin[6–9,42].

Other diseases with skin eruptions included in the differentiation of infectious rash diseases

When differentiating infectious rash diseases in children, other – non-infectious – skin diseases, such as atopic dermatitis, seborrhoeic dermatitis, and psoriasis, should be taken into account. These are disease entities characterised by a diverse clinical picture depending on the stage of the disease and the age of the child.
When diagnosing a high-fever child, life-threatening conditions such as meningococcal sepsis, with petechiae that do not disappear under pressure, should always be considered. Prolonged fever, especially lasting more than 5 days, should prompt the physician to conduct diagnostics towards Kawasaki syndrome – a disease of ambiguous aetiology.

Kawasaki disease

Kawasaki disease, also known as mucocutaneous lymph node syndrome, is an acute febrile disease in children and the most common systemic vasculitis occurring in developmental age. It is characterised by self-limiting inflammation of small and medium-sized arteries and inflammation of large coronary vessels.
Occurrence period: seasonal, spring and winter.
Age group: children up to 5 years of age (with the peak being the second year of life), boys suffer from this disease 1.5 times more often than girls.
The clinical picture of the disease includes three stages: acute, subacute, and recovery. The acute stage lasts from the eighth to the fifteenth day. During this period, most symptoms occur, such as: fever, lymphadenopathy, skin lesions, conjunctival hyperaemia, and raspberry tongue. The subacute period lasts from day 12 to day 25 and is characterised by desquamation, arthritis, thrombocythaemia,

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Fig. 33. Raspberry lips (from the authors' own collections)

Fig. 34. Rash on the trunk of a child with Kawasaki disease (from the authors' own collections)

and involvement of the coronary vessels. The recovery period is from day 28 to day 31 and ends with the appearance of erythema and oedema of the hands and feet, followed by peeling of the skin of the affected areas.

The most common clinical symptom of Kawasaki disease is raspberry tongue, found in 90% of patients.

Fig. 35. Exfoliation on the skin of the foot in Kawasaki disease (from the authors' own collections)

Skin eruptions, such as polymorphic trunk rash, occur in 80% of patients; in turn, redness, oedema of the palms of the hands and soles of the feet, and bran exfoliation of the fingertips in the final stage of the disease concern 70% of patients. Due to the clinical picture – skin lesions and general symptoms – Kawasaki disease is differentiated from infectious rash diseases. Differential diagnosis should also include polyarteritis nodosa, leptospirosis, Stevens–Johnson syndrome, and rheumatic fever[6–9,43–46] (Figs. 33–35, Tabs. 2, 3).

CONCLUSION

The wide variety and continuous evolution of skin lesions often cause diagnostic problems, rendering the correct diagnosis difficult. Appropriate nomenclature and differentiation between primary and secondary skin eruptions will facilitate diagnosis and proper communication among healthcare personnel. Family history, epidemiological situation, last contact with an infected person, and living conditions are of great importance in the context of infectious rash diseases. In addition, attention should be paid to the time of year, as some diseases are seasonal. During the physical examination, the entire body surface and skin appendages should be carefully examined. Skin lesions are often located in hard-to-reach places, such as scalp, behind the ears, skin folds, or feet. Accompanying symptoms – including itching, burning, flu-like symptoms or fever – are particularly important. It is essential to translate all elements of interview and physical examination into a given clinical picture and distinguish it from the picture of non-infectious diseases, which are also associated with skin

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Kawasaki disease diagnosis criteria
Fever lasting more than five days and at least four of the following:
• Skin lesions on the limbs or perineum
• Polymorphic rash
• Bilateral conjunctivitis
• Lesions in the mouth and throat
• Lymphadenopathy of the cervical lymph nodes

Tab. 2. Kawasaki disease diagnosis criteria (original work)

Kawasaki disease differential diagnosis
Rash diseases:
• Measles
• Scarlet fever
• Infectious mononucleosis
• Polyarteritis nodosa
• Leptospirosis
• Stevens–Johnson syndrome
• Rheumatic fever

Tab. 3. Kawasaki disease differential diagnosis (original work)

eruptions. Examination of the child's skin and the ability to assess individual skin eruptions should be a routine part of the physical examination. A carefully conducted interview can additionally provide a lot of valuable information facilitating the correct diagnosis.

Conflict of interest

The authors do not declare any financial or personal links to other persons or organisations that could adversely affect the content of this publication or claim rights thereto.

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