

Most common diseases and ailments of feet – prevention and treatment. Part II

Najczęstsze schorzenia i dolegliwości stóp – profilaktyka i leczenie. Część II

ANNA GAŁĘBA^{1/}, BEATA BAJURNA^{2/}, JERZY T. MARCINKOWSKI^{3/}, MARIA D. GŁOWACKA^{2/}

^{1/} Private Practice of Aesthetic Medicine and Anti-Aging in Warszawa and Poznan. Wellness Chanel in Konin

^{2/} Chair and Department of Organization and Management in Health Care, Poznan University of Medical Sciences, Poznan

^{3/} Chair of Social Medicine, Poznan University of Medical Sciences, Poznan

W pracy przedstawiono krótką charakterystykę najczęstszych schorzeń i dolegliwości stóp, powstałych na skutek działania stałych mikrourazów spowodowanych np. nieprawidłowym sposobem chodzenia, złe dobranym obuwiem czy deformacją kości – takich jak nagniotek (*Clavus*), modzel (*Callus*, *Tyloma*), czy też dolegliwości powstałych w wyniku tarcia lub ucisku dużego stopnia – takich jak pęcherz (*Bulla mechanica*). Przedstawiono również inne częste schorzenia występujące w obrębie stóp, do których należą: EBA, krwawienia w obrębie pięty występujące najczęściej u sportowców (*Talon noir*), wrastający paznokieć, odmrożenia stóp (*Congelatio*), brodawki stóp (*Verrucae plantares*), grzybica stóp (*Tinea pedis*), grzybic paznokci stóp (*Onychomycosis*), a także nadmierną potliwość stóp (*Hyperhidrosis plantares*).

W artykule przedstawiono krótką charakterystykę każdego ze schorzenia lub dolegliwości stóp – jego etiologię, patogenezę, objawy, przebieg, profilaktykę i leczenie.

Słowa kluczowe: grzybica stóp, grzybica paznokci stóp, profilaktyka, leczenie

The study presents a brief description of the most common foot afflictions and diseases, appearing by the action of permanent micro-damages caused by: incorrect way of walking, poorly chosen shoes or deformed bones – such as corn (*Clavus*), callus (*Callus*, *Tyloma*), or the problems of high-grade friction or compression – such as blister (*Bull Mechanic*). It also presents other common diseases occurring within the foot area, which include: EBA, bleeding within the heel, occurring most often among athletes (*Talon noir*), ingrown toenail, chilblained foot (*Congelatio*), foot warts (*verrucae plantares*), athlete's foot (*tinea pedis*), fungal infection of toenail (*Onychomycosis*) and foot hyperhidrosis (*hyperhidrosis plantares*).

This article presents a brief description of each of the foot affliction and disease: its etiology, pathogenesis, symptoms, course, prevention and treatment.

Keywords: athlete's foot, tinea pedis, onychomycosis, prevention

© Hygeia Public Health 2014, 49(1): 62-68

www.h-ph.pl

Nadesłano: 20.01.2014

Zakwalifikowano do druku: 14.02.2014

Adres do korespondencji / Address for correspondence

dr n. med. Anna Gałęba

ul. L. Teligi 6, 62-510 Konin

tel. +48 603 247 306, e-mail: dr.anna@annagaleba.pl

Introduction

The skin on the soles of feet is four times thicker than in other parts of the body. Due to its structure, feet can take the pressure of the body while standing and walking. The build-up of thickened skin on feet is a natural process but due to abnormal way of walking, poorly chosen shoes or bone deformation many foot afflictions may occur. Prolonged micro-damages of low intensity can cause hypertrophy of the living layers of the epidermis and hyperkeratosis, resulting in the formation of corns (*Clavus*) and calluses (*Callus*, *Tyloma*). A high degree of pressure or friction, usually caused by a working tool, acting as recurring

trauma in a short time can lead to the development of the blister (*Bull Mechanic*), preceded by cell necrosis of the stratum spinosum [1].

There are many diseases and conditions associated with feet and the most common can include: foot hyperhidrosis, foot warts, ingrown toenails, calluses, corns, and blisters, EBA, chilblained foot, and heel bleeds usually occurring among athletes, commonly referred to as a “black heel” or finally, athlete's foot and *onychomycosis*. This section of the article describes: *tinea pedis* and *onychomycosis*. All the above mentioned diseases or symptoms have been described in the first part of the article.

Athlete's foot (*Tinea pedis*)

Currently, athlete's foot is one of the most widely recognized forms of fungal infection of the skin; it applies to 20-70% of the world's population [28-30]. The rarity of *tinea pedis* in children before puberty is emphasized. In children before 15 years of age athlete's foot is rare. The percentage of patients with this disease is about 6%. In adolescents between 16 and 18 years of age this percentage is much higher, at over 22%. Total morbidity increases significantly with age [31].

In some social groups, the incidence of developing athlete's foot is much higher. For example, athletes, especially swimmers and runners are more likely to have the disease. Similarly, it is more common among certain professional groups – soldiers, miners, steelworkers.

An increased occurrence of *tinea pedis* in these patients is related to the existence of a variety of factors such as: the use of common showers and washrooms, poor hygiene (no flip-flops, common use of towels, walking barefoot on wet carpets, wooden floor covers in the showers), poor foot care or long wearing of protective footwear that favors hyperhidrosis and changes in the skin pH. In addition, improper footwear predisposes to mechanical damage of feet, often leading to abnormalities in blood circulation, formation of sores and calluses [32].

Athlete's foot can also be found in patients with diabetes. Disorders that occur within the diabetic foot (neuropathy, impaired blood supply to the limbs, increased susceptibility to injury, impaired wound healing) favor fungal infections. The infection occurs as a result of secondary infection of the existing skin lesions – cracks, erosion within the inter-digital spaces which facilitates the penetration of pathogenic fungi. In the case of negligence or improper treatment, athlete's foot can affect the course of diabetes [32].

Athlete's foot is most commonly caused by dermatophytes, less often by yeast-like fungi. Among dermatophytes, the common species is *Trichophyton rubrum*, less common *Trichophyton mentagrophytes* and sporadically *Epidermophyton floccosum*. Among the yeast-like fungi that cause athlete's foot the most common species are: *Candida albicans*, *Candida stellatoidea* and *Candida crusei*. The disease has a chronic course with frequent relapses, which is a significant problem for the patient, the patient's immediate environment, as well as their doctor. The treatment requires multiple visits to the doctor, good doctor-patient cooperation, following hygiene rules and the patient's self-discipline in relation to relapses of the disease and retreatment in case of reinfection.

Athlete's foot typically affects the plantar, interdigital surface of feet, and the side surfaces of

toes. Sometimes the fungal infection is transferred to the dorsal surface of toes. There are three main types of *tinea pedis*: *tinea interdigitalis intertriginosa*, *tinea Dyshidrotic* and *tinea desquamativa et hyperkeratolica*.

To prevent the athlete's foot development a proper prophylaxis is needed [31-37]:

- feet should always be clean and dry (feet should be carefully wiped, especially in interdigital spaces – moisture and heat promote the growth of fungi)
- a separate towel for the feet should be used, disposable towel is the best
- breathable shoes and cotton socks should be worn – plastic materials promote sweating, shoes should not be too tight and socks always clean and dry
- shoes should be ventilated after every use, the same pair of shoes should not be worn day after day, shoes should not be borrowed or lent
- only own products should be used for foot care and hygiene
- at a swimming pool, sauna and shower protective footwear should be worn
- foot products to prevent excessive foot sweating should be used
- prophylactic antifungal powders should be used – when doing sports especially, deodorant for shoes should be used, and insoles in shoes should be washed and replaced.

Conventional treatment of the athlete's foot typically involves a wide range of topical and general use products. Before the implementation of therapy, the diagnosis should always be confirmed by mycological examination. For this kind of testing the material is collected from the affected area. They can be skin scrapings, scales, content and covers of blisters and marginal scaling of the erosion and skin crack edges. A full mycological diagnosis (mycological examination and culture) takes about four weeks. The topical treatments that do not pose a risk of side effects to the patient (such as liver toxicity, toxic epidermal Lyela's necrolysis) can be started after obtaining a positive result of direct mycological examination. In the case of patients who should receive general treatment (general treatment is recommended if there is no improvement after local therapy), prior to the treatment, athlete's foot should be fully confirmed – there should be a positive result in both direct examination and culture [36-38].

Table I provides a detailed athlete's foot treatment – topical and general treatment [32, 36, 37, 39, 40].

In the event of a severe inflammation, treatment can be started with 2-3 days of antifungal topical application of products containing steroids – Dactacort, Mycosolon, Pevisone, Travocort.

Table 1. Treating athlete's foot

International name of the product	Commercial name of the product	Dosage	Duration of therapy
Topical therapy			
klotrimazol	Canesten Clotrimazolom 1% cream, liquid	2-3 × daily	6 weeks
mikonazol	Daktarin cream	2 × daily	2-6 weeks
izokonazol	Travogen cream	1 × daily	2-4 weeks
ekonazol	Pevaryl Pevazol	2 × daily	2-6 weeks
bifonazol	Mycospor	1 × daily	2-3 weeks
flutrimazol	Micetal cream	1 × daily	Until the disappearance of skin changes, and up to 2 weeks after their disappearance.
ketokonazol	Nizoral 2% cream	2 × daily	2-4 weeks
terbinafina	Lamisilatt 1% cream	2 × daily	2 weeks
cyklopiroks	Batrafen cream Hascofungin cream Pirolam gel, solution	2 × daily	2-4 weeks
naftifina	Exoderil cream	2 × daily	Until the disappearance of skin changes, and up to 2 weeks after their disappearance.
chlormidazol	Polfungicid krem	2-3 × daily	4-6 weeks
General treatment			
terbinafina	Lamisil Terbisil	250 mg/24 hours	2 weeks
itrazonazol	Orungal	2 × 100mg	30 days
		2 × 200mg	7 days in a fungal hyperkeratotic
flukonazol	Mycosyst Fluconazole Flumycon	150 mg/per week	4-6 weeks
	ketokonazol		

Fungal infection of the toenail (*onychomycosis*)

One third of all fungal infections of the skin include *onychomycosis* (*tinea unguium*, *onychomycosis*), responsible for the increasing social and epidemiological problem in the world. About half of all abnormalities of the nail plate are caused by fungal infection [41].

Onychomycosis is most common in toenails. It is 4-7 times more common than *onychomycosis* of fingernails. Nail growth takes place in a continuous manner. It is about 1 mm per week and decreases with age. Generally toenails grow more slowly than fingernails. A higher incidence of fungal infection is therefore most likely related to slower growth rates of the toenail plate. In addition, in case of toenail fungal infection, most commonly, at least a couple of toenail plates are infected, and in case of the fingernail *onychomycosis* usually one or two plates are infected [42].

The severity of *onychomycosis* depends on gender (mostly male), age (elderly people), education (those with lower education get infected more often) and place of residence (rural areas). In case of elderly patients there often coexist other diseases, such as diabetes, which predispose to fungal infections; often such patients also have impaired blood supply to the distal parts of the limbs, which promotes fungal

infection as well. Disorders of the blood supply to the further parts of legs also contribute to abnormal growth and deformation of toenail plates, which are thus more susceptible to fungal infections. Men suffer more often because women pay more attention to their appearance, including the appearance of nails; they faster (in the early stages of the disease) seek medical attention. People living in rural areas are more likely to develop *onychomycosis* due to the type of work they do and difficult access of such patients to professional specialist care, while those with lower education get infected more often because, firstly, they pay less attention to the appearance of their nails, and secondly, it has to do with the type of work they do (physical work in a humid environment, such as miners) and thirdly it is due to their poor economic situation [43, 44].

The rarity of athlete's foot and fungal toenail infection in children before puberty is emphasized. In children under 15 years of age foot *onychomycosis* is rare. The percentage of patients with this disease is in fact about 6%. Among adolescents between 16 and 18 years of age this percentage is much higher and in case of fungal infection is almost 21%. In recent years, attention has been drawn to an increased occurrence of *onychomycosis* in children and adolescents due to the popularity of physical activities and, thus, the usage

of public swimming pools, showers (eg school) and fitness clubs. The most common form of *onychomycosis* in pediatric patients is the fungal infection of the distal-side of a toenail [45].

Onychomycosis can be caused by dermatophytes (most common), yeasts and molds (sporadic). *Trichophyton rubrum* and *Trichophyton mentagrophytes* var. *interdigitale* often attack nail plates. *Epidermophyton floccosum* rarely causes this disease [26]. Among yeast the most common yeast pathogen is *Candida albicans*. *Scopulariopsis brevicularis* (molds) rarely causes infection but if it does, it is usually the infection of toenails [5].

Since there exists an individual disposition to disease, especially in patients with impaired immunity (immunosuppression related to disease or treatment) or hormonal disorders (such as hypothyroidism, Cushing's syndrome), with impaired blood supply to the distal part of the limbs or diabetes, it is important that these patients pay special attention to prophylaxis. Mechanical compression also predisposes to the toenail infection, e.g. by wearing shoes that are too tight or closely adjacent to the foot, and can be also evoked by self-infection if for instance one suffers from athlete's foot [44].

The infection occurs most frequently in hot and humid places. Such places are carpets, wet floors in swimming pools, sports halls, in dressing rooms, fitness clubs or hotels where it is easy to catch the infection by walking barefoot and also by sharing a common bath or shower. To prevent the development of *onychomycosis* the proper prevention is needed. It is important to make sure that the feet are always clean and dry, to use a separate towel for the feet, to wear breathable shoes and cotton socks, to only use own nail care items (clippers, nail file, scissors), to always cut the nails straight, to use protective footwear at a swimming pool, sauna and in the shower and to prophylactically use antifungal powders. It is also important to prevent the development of athlete's foot, since with time it leads to self-infection and development of *onychomycosis* [32, 35, 44].

Onychomycosis is most commonly treated in a noninvasive fashion. In cases of the small degree of destruction of the nail or infection of several plates, topical treatments are recommended.

In the topical treatment [38, 40, 44, 46-50] the following medications are used:

- bifonazole + 40% urea (Mycospor Onychoset), 1 × daily for 1-2 weeks; allows the chemical ablation of the infected part of the nail plate; the kit is used in case when the general medication is impossible to administrate.

- Amorolfine (LOCERYL, 5% nail polish), 1 × per week for 6-12 months;
- ciclopirox (Batrafen 8% nail polish, Nagel Batrafen 8% nail polish), 1 × daily for 6-12 months.

Topical therapy in the form of nail polish is recommended for infection of individual toenail plates and for infection limited to the distal part of the nail. Such treatment is also preferred with children because of the safety of the treatment and different structure of their nail plate – in children the nail plate is thinner than in adults, which also promotes a better penetration of topical antifungal medicines.

Topical treatment using Amorolfine is most commonly chosen in treating severe cases of fungal infection of toenail as a combined therapy – antifungal nail polish for 6-15 months + oral medicine according to the scheme:

- itraconazole: 2×200 mg per day for 7 consecutive days in a month, then a 21-day break (the time of treatment: fingernails – 2 months, toenails – 3 months)
- terbinafine: 250 mg per day (the time of treatment: fingernails – 6 weeks, toenails – 12 weeks).

As a supportive treatment with elderly patients it is recommended to administrate medications to improve blood circulation (pentoxifylline 2 × 400 mg) and drugs acting on the microcirculation (diosmin 2 × 1 tablet).

In most cases of *onychomycosis* it is necessary to use a general treatment. Before starting the treatment, the overall diagnosis of *onychomycosis* should be confirmed by direct mycological examination and by culture. In the event of dermatophytes being the etiological agent, the recommended drugs are terbinafine and itraconazole. In the case when nail changes are caused by infection of *Candida* fungus and molds (*Scopulariopsis most brevicularis*), itraconazole is suggested. In mixed infections of nails caused by dermatophytes and molds or by dermatophytes and yeasts it is recommend to use itraconazole or so called combined therapy, the oral administration of itraconazole or terbinafine in combination with topical treatment with antifungal nail polish e.g. Amorolfine [40].

Table II [43, 44, 51] shows schemes of oral treatments with terbinafine and itraconazole in cases of fingernail and toenail *onychomycosis* in adults. When *onychomycosis* is treated in children, itraconazole and terbinafine are recommended, in accordance to the scheme shown in Table III [40, 43, 44, 52]. If the lesions affect many nail plates or when the local treatment does not result in a desired outcome the general treatment is recommended.

Table II. Treatment scheme for fungal infection of toenail in adults

Drug name	Drug dose	Duration of therapy
Terbinafina	250 mg/day	– six weeks if fingernail plates are infected – six weeks if toenail plates are infected
	200 mg 2 × daily pulse therapy	– for 7 consecutive days per month (2 pulses) if fingernail plates are infected – for 7 consecutive days per month (3 pulses) if toenail plates are infected
Itrakonazol	100-200 mg/ day continuous therapy	3-6 months

Table III. Treatment scheme for fungal infection of toenail in children

Drug name	Dosage	Duration of therapy
Terbinafina	– 3-6 mg/kg/day or	4-6 weeks
	– 62.5 mg/kg/day for body weight <20 kg	
	– 125 mg/kg/day for body weight of 20-40 kg	
	– 250 mg/kg/day for body weight >40 kg	
Itrakonazol	5 mg/kg/day pulse therapy	for 7 consecutive days per month (3-4 pulses)
	3-5 mg/kg/day Continuous therapy	4 weeks

Conclusion

The beauty and aesthetics of feet are very important, however the comfort and lack of any pain and affliction are also important, and in case of feet they are still a common phenomenon. Patients are faced with many problems related to foot diseases which pose a significant social problem. It causes a substantial discomfort both mental and physical, and therefore an appropriate prevention is desirable.

Nurturing the body with numerous beauty products, one often forgets about the feet. Regular and proper care can assure that they will be the true embellishment of the body. Additionally this will prevent the occurrence of a number of unpleasant symptoms. All foot diseases and disorders are cumbersome, and also it is difficult to fight them, because they tend to recur. One should remember their feet not only when they start to hurt, or when the summertime is coming. This is why it is important to know how to prevent the problems (proper prophylaxis) and how to treat common foot and toenail diseases. It is always easier to prevent than to treat, especially when these afflictions are prone to reappear and it is difficult to get rid of them permanently.

Fungal infections are a major epidemiological and therapeutic problem. They should not be neglected

either by doctors or by patients themselves. Despite a significant progress in the diagnosis and treatment of fungal infections of feet in recent years there has been a steady increase in morbidity. Unfortunately it is very easy to get the fungal infection. Fungi get transferred from an infected person to a person in the immediate surroundings, and also from the animals, especially domestic ones – cats, dogs, hamsters, guinea pigs. The civilization factors play a significant role in the increase of the number of athlete's foot cases – particularly due to the trend to be physically active and the usage of public swimming pools and fitness centers associated with it. One can also get infected with mycosis through the contact with spores located on carpets, clothes (e.g. socks), or by not wearing breathable shoes made of synthetic materials. Therefore, it is important to follow the basic principles of prevention.

Onychomycosis is not a disease that could be life-threatening, but should not be considered only as a cosmetic problem but also as a disease requiring an early and effective treatment and prevention. Nail plates play an important role in the execution of many complex human functions. Lesions in the nail area can clearly interfere with normal functioning in daily life or work, or cause psychosocial consequences such as feelings of anxiety, loss of confidence, can interfere with relationships and in extreme cases, can even lead to depression [44, 45, 53]. Nail plates infected with mycosis can be a harmful reservoir of fungi for the patients and their environment and also a source of fungal allergens [44, 54] and the site of penetration of pathogenic bacteria and the development of secondary bacterial infection [28, 44]. If it applies to healthcare personnel, it can lead to an inter-hospital outbreak of infection.

Fungal infections are the cause of unpleasant and troublesome symptoms. Mycosis is highly contagious, both for those who are already infected and for those who are in the immediate contact with objects belonging to the infected person. Fungi that live on the skin of feet can attack any area of the body – nails, groin, mucous membranes and even the hair on the head and body. A patient with athlete's foot and foot *onychomycosis* is not destined to have these diseases for life – they are in fact fully curable, however they should not be neglected either by doctors or by patients themselves. Physicians should educate patients about the causes and effects of these diseases.

Piśmiennictwo / References

1. Bowszyc J. Dermatozy pochodzenia mechanicznego, ciepłego i powstałe wskutek promieniowania jonizującego. [w:] *Dermatologia*. Miedziński F (red). Tom I. PZWL, Warszawa 1982, 9: 178-186.
2. Adamski Z, Kaszuba A. *Dermatologia dla kosmetologów*. UIM, Poznań 2008.
3. Magdziarz-Orlitz J. Metody leczenia zachowawczego wrastającego paznokcia – doświadczenia własne. *Dermatol Estet* 2010, 1(66).
4. Rassner: *Dermatologia*. Tłumaczenie i opracowanie W Silny. Urban & Partner, Wrocław 1994, 7: 41-48, 78-81.
5. Jabłońska S, Chorzelski T. Choroby skóry dla studentów medycyny i lekarzy. PZWL, Warszawa 1994: 28-36, 108-109.
6. Huczek M, Woźniak K. Epidermolysis bullosa acquisita mediowane immunoglobulinami klasy A u dziecka. *Dermatol Klin* 2008, 10 (2): 89-91.
7. Woźniak K, Kowalewski C, Rosinska-Borkowska D, Ciupinska M. Two patients with localized epidermolysis bullosa acquisita: diagnostic value of laser scanning confocal microscopy. *Br J Dermatol* 2007, 156: 1066-1068.
8. Jordon RE, Beutner EH, Witebsky E, et al. Basement membrane antibodies in bullous pemphigoid. *JAMA* 1967, 200: 751-756.
9. Nieboer C, Boersma DM, Woerdeman M, et al. Epidermolysis bullosa acquisita: immunofluorescence, electron microscopic and immunoelectron microscopic studies in four patients. *Br J Dermatol* 1980, 102: 382-392.
10. Yaoita H, Briggaman RA, Lawley TJ. Epidermolysis bullosa acquisita: ultrastructure and immunological studies. *J Invest Dermatol* 1981, 76: 288-292.
11. Christiano A, Greenspan D, Lee S, et al. Cloning of type VII collagen: Complete primary sequence of the α 1(VII) chain and identification of intragenic polymorphisms. *J Biol Chem* 1994, 269: 20256-20262.
12. Shimizu H. New insights into the immunoultrastructural organization of cutaneous basement membrane zone molecules. *Exp Dermatol* 1998, 7: 303-313.
13. Chorzelski T, Petkow L, Dąbrowski A. Epidermolysis bullosa acquisita. *Hautarzt* 1981, 32(suppl): 487-491.
14. Woodley DT, Briggaman RA, Gammon WR, et al. Epidermolysis bullosa acquisita antigen, a major cutaneous basement membrane component synthesized by human dermal fibroblasts and other cutaneous tissues. *J Invest Dermatol* 1986, 87: 227-231.
15. Żaba R, Król J, Karoń J, Żaba Z. Leczenie paznokcia wrastającego. *Dermatol Estet* 2000, 3(8).
16. Wąsik F, Baran E, Szczepietowski J. *Zarys dermatologii klinicznej*. Volumed, Wrocław 1995, 4: 78-81.
17. Michałowski R. Choroby wirusowe skóry. [w:] *Dermatologia*. Miedziński F (red). Tom I. PZWL, Warszawa 1982, 18: 301-305.
18. Solish N, Benohonian A, Kowalski JW. Prospective open-label study of botulinum toxin type A in patients with axillary hyperhidrosis: effects on functional impairment and quality of life. *Dermatol Surg* 2005, 31: 405-13.
19. Gałęba A, Ignaciuk A. Nadmierna potliwość – problem kosmetyczny czy choroba? *Acad Aesthet Anti-Aging Med* 2007, 2: 21-28.
20. Gałęba A. Użycie toksyny botulinowej w leczeniu nadmiernej potliwości. *Acad Aesthet Anti-Aging Med* 2009, 3: 21-29.
21. Ambroziak M, Kwiek B, Langner A. Leczenie nadmiernej potliwości. *Dermatol Estet* 2002, 19: 56-64.
22. Broniarczyk-Dyła G, Kujawska K, Fornalczyk-Wachowska E. Nadpotliwość – ważny problem kosmetyczny. *Dermatol Estet* 2005, 6(41): 297-301.
23. Fitzgerald E, Feeley TM, Tiemey S. Current treatments for axillary hyperhidrosis. *Surgeon* 2004, 2: 311-14.
24. Ro KM, Cantor RM, Lange KL, Ahn SS. Palmar hyperhidrosis: evidence of genetic transmission. *J Vasc Surg* 2002, 35: 382-86.
25. Dolianitis C, Scarff CE, Kelly J, Sinclair R. Iontophoresis with glycopyrolate for the treatment of palmoplantar hyperhidrosis. *Australas J Dermatol* 2004, 45: 208-12.
26. du Vivier A. *Atlas dermatologii klinicznej*. Majewski S (red). Urban & Partner, Wrocław 2005: 23-34, 617.
27. Braun-Falco O, Plewig G, Wolff HH, Burgdorf WHC. *Dermatologia*. Czelej, Lublin 2004: 1025.
28. Szczepietowski J. *Grzybica skóry i paznokci*. Vademecum Lekarza Praktyka. Med Prakt, Kraków 2001: 138-146.
29. Zuber TJ, Baddam K. Superficial fungal infection of the skin. Where and how it appears help determine therapy. *Postgrad Med* 2001, 109: 117-120, 131-132.
30. Masri-Fridling GD. Dermatophytosis of the feet. *Dermatol Clin* 1996, 14, 1: 33-40.
31. Gałęba A, Bajurna B. Grzybica stóp i grzybica paznokci stóp – problem dzieci i młodzieży. [w:] *Zagrożenia zdrowotne i społeczne dzieci i młodzieży*. Głowacka M, Mojs E (red). UIM, Poznań 2008.
32. Gałęba A. Grzybica stóp – typy kliniczne, objawy, zapobieganie i leczenie. *Essentia Medica* 2007: 4.
33. Falkiewicz-Dulik M, Macura AB. Higiena obuwia w profilaktyce grzybicy stóp. *Mikol Lek* 2006, 13(4): 265-271.
34. Hay RJ, Moore M. *Mycology*. [in:] *Rook/Wilkinson/Ebling Textbook of Dermatology*. Champion RH, Burton JL, Burns D, Breathnach SM. Blackwell Science, Oxford 1998, 1308-11.
35. Gałęba A, Bajurna B. Świadomość młodzieży dotycząca profilaktyki grzybicy stóp i grzybicy paznokci stóp. [w:] *Szanse i bariery w ochronie zdrowia. Wybrane aspekty organizacyjne, prawne i psychologiczne*. Głowacka M, Mojs E (red). UIM, Poznań 2008.
36. Adamski Z, Kociałkowski P, Mrozowski T. Grzybice stóp i paznokci – możliwości terapeutyczne (cz. I). *Dermatol Estet* 2002, 5(22).
37. Adamski Z, Kociałkowski P, Mrozowski T. Grzybice stóp i paznokci – możliwości terapeutyczne (cz. II). *Dermatol Estet* 2002, 6(23).
38. Hryncewicz-Gwóźdź A, Plomer-Niezgoda E, Maj J. Grzybica stóp, rąk i paznokci – epidemiologia, objawy, leczenie. *Mikol Lek* 2005, 12(1): 57-62.
39. Nowicki R. Grzybica stóp. *Zakażenia* 2003, 4: 39-44.
40. Gliński W, Baran E, Nowicki R, Maleszka R, Adamski Z, Kaszuba A. Konsensus dotyczący leczenia grzybic powierzchownych. *Prz Dermatol* 2002, 2: 85-92.

41. Baran R, Dawber RPR. Diseases of the nails and their management. Blackwell Science, Oxford 1994.
42. Szczepietowski J, Reich A, Garłowska E i wsp. Czynniki predysponujące do rozwoju grzybicy paznokci stóp w populacji polskiej. *Mikol Lek* 2005, 12 (4): 231-234.
43. Gałęba A. Grzybica paznokci – etiologia, czynniki ryzyka, leczenie. *Essentia Medica* 2007, 2(38): 43-47.
44. Gałęba A. Grzybica paznokci – etiologia, typy kliniczne, zapobieganie i leczenie, *AAAM* 2008: 2.
45. Lange M, Bykowska B. Grzybica stóp i grzybica paznokci stop u dzieci i młodzieży – typy kliniczne i patogeny. *Mikol Lek* 2004, 11(1): 63-69.
46. Maleszka R, Ratajczak-Stefańska V, Bielecka-Grzela S. Miejscowe leczenie grzybic. *Mikol Lek* 2004, 11 (1): 85-92.
47. Adamski Z, Hasse-Cieślińska M. Grzybica paznokci – współczesne problemy diagnostyczne i terapeutyczne. *Zakażenia* 2000, 3: 37-42.
48. Baran E, Adamski Z, Maleszka R. Terapia skojarzona – zalecane leczenie ciężkich postaci grzybicy paznokci. *Mikol Lek* 2003, 10: 75-78.
49. Maleszka R, Baran E. Lecznictwo mikologiczne w końcu XX wieku. *Mikol Lek* 2000, 7: 47-55.
50. Gwóźdźński Z, Urbanowski S. Grzybica paznokci u dzieci. Częstość występowania i leczenie. *Prz Dermatol* 1998, 85: 133-137.
51. Roberts DT, Taylor WD, Boyle J. Guidelines for treatment of onychomycosis. *Br J Dermatol* 2003, 148, 402-410.
52. Hasse-Cieślińska M, Adamski Z. Rola itrakonazolu w leczeniu grzybiczych zakażeń paznokci. *Ordynator Leków* 2004, 3(29): 4.
53. Drake LA, Scher R, Smith EB, et al. Effect of onychomycosis on quality of life. *J Am Acad Dermatol* 1998, 38: 702-704.
54. Baran E, Baran W. Flukonazol w grzybicy paznokci w świetle nowych badań klinicznych i farmakokinetycznych. *Mikol Lek* 2001, 8 (2), 103-108.