

Skin and soft tissue infections

Anežka Gryndlerová

-
- ▶ Skin, subcutaneous tissue, fascia, muscles, adnexa of skin





Source: Goldsmith LA, Katz SI, Gilchrest BA, Paller AS, Leffell DJ, Wolff K: *Fitzpatrick's Dermatology in General Medicine*, 8th Edition: www.accessmedicine.com

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<https://coreem.net/core/herpes-zoster/>
<https://www.cdc.gov/fungal/nail-infections.html>

Source: Goldsmith LA, Katz SI, Gilchrist BA, Paller AS, Leffell DJ, Wolff K: *Fitzpatrick's Dermatology in General Medicine*, 8th Edition: www.accessmedicine.com

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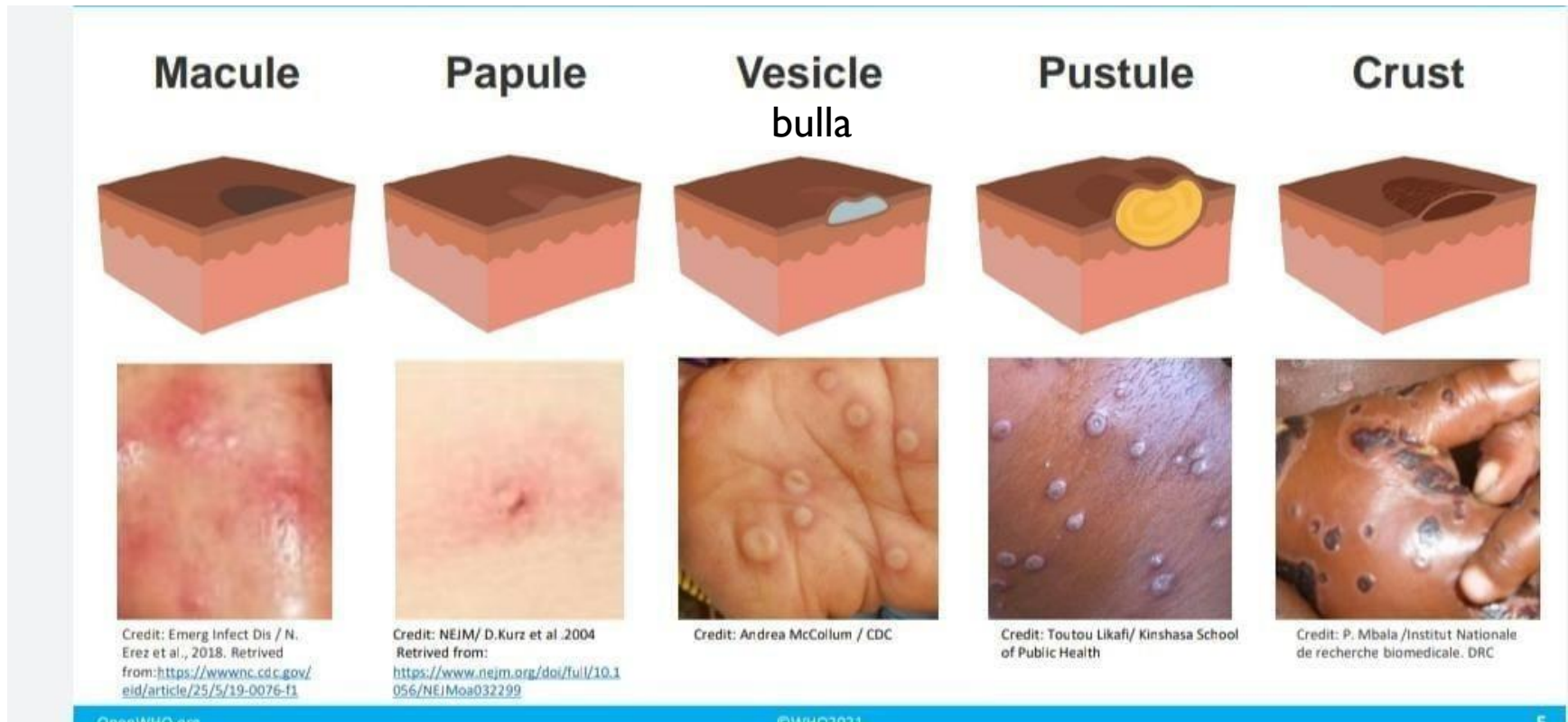
Content

- ▶ Bacterial soft tissue infections
- ▶ Fungal soft tissue infections

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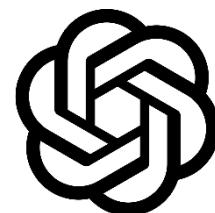
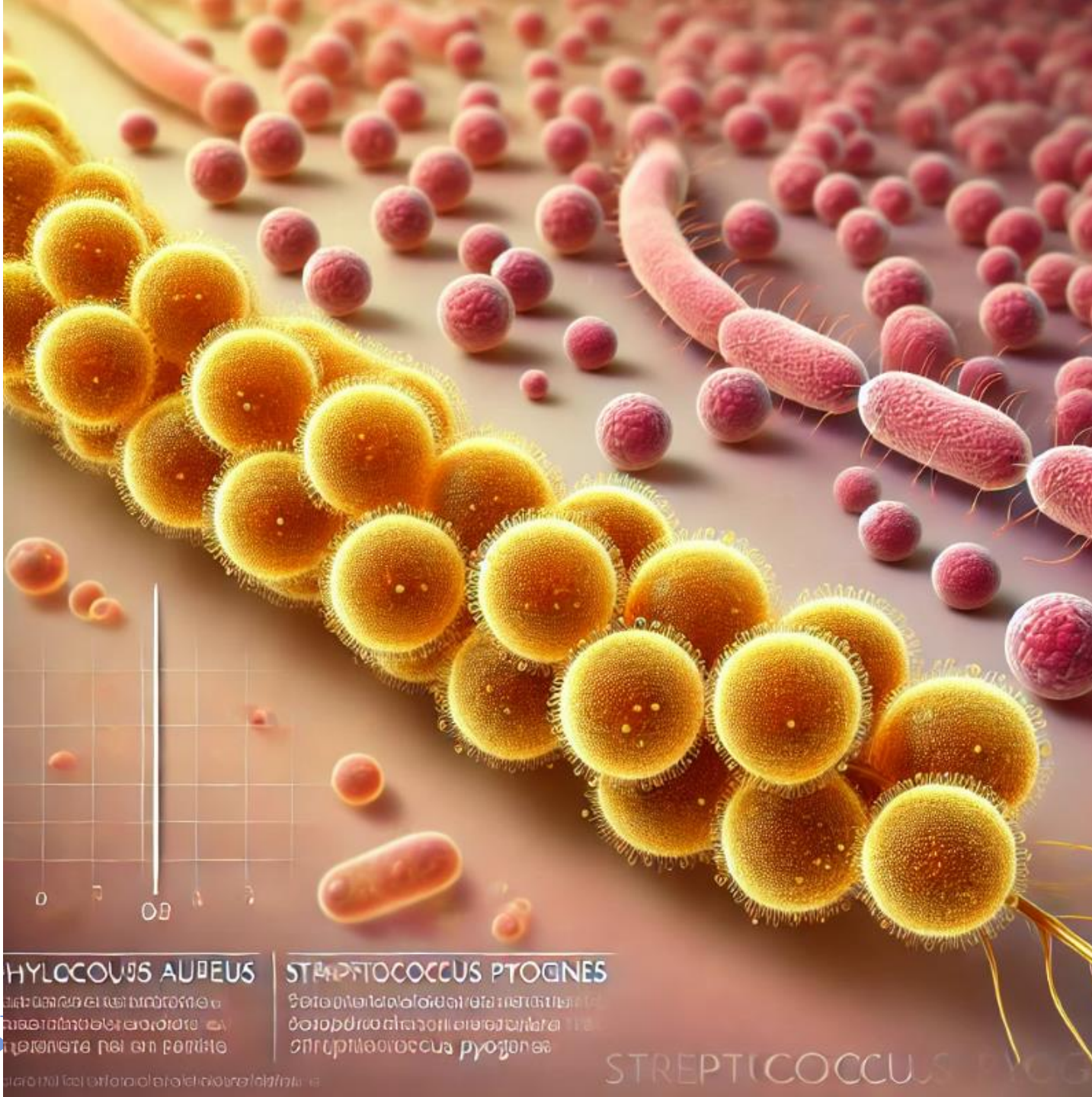


Skin lesions - terminology





Bacterial skin and soft tissue infections



Skin infection types

- ▶ **Pyoderma („Pyodermie“)**
 - ▶ Skin infections with purulent inflammation
 - ▶ Impetigo
 - ▶ Folliculitis, furuncle, carbuncle
 - ▶ Cellulitis, erysipelas
- ▶ **Deep soft tissue infections**
- ▶ **Skin ulcers of infectious origin**
- ▶ **Other (erysipeloid, erythema migrans, ...)**

Pyoderma gangrenosum

- non-infectious disease
- Associated with other disorders (IBD)



Pyoderma - impetigo

- ▶ Epidermis
- ▶ Children, contagious (itching)
- ▶ Face, head - hair, hands
- ▶ *S. aureus*, *S. pyogenes*
- ▶ Vesicle → pustule → brown crust „honey-coloured“
- ▶ Ecthyma – ulcers (dermis affected)
- ▶ Bullous form (= bullous impetigo)
 - ▶ *S. aureus* with exfoliatin production („localised SSSS“)



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- ▶ Therapy according to clinical condition, mostly topical (5-7 days)
- ▶ Extensive multiple lesions – systemic treatment (5-7 days)



Topical ATB therapy – skin infections

- ▶ Topical ATB x systemic (oral, parenteral)
- ▶ Advantage
 - ▶ High concentration at the site of infection
 - ▶ Low risk of systemic adverse effects and toxicity
- ▶ Local side effects (contact dermatitis)
- ▶ Poor penetration into the deep tissue
- ▶ Effect on G⁺ bacteria (staphylococci, streptococci)



Topical ATB therapy – skin infections

▶ Framykoin*

- ▶ neomycin-sulphate
 - ▶ Aminoglycoside
 - ▶ G- bacteria, staphylococci, poor effect on streptococci
- ▶ bacitracin
 - ▶ Polypeptide
 - ▶ Mostly G+
 - ▶ isolated from *Bacillus subtilis*, from Margaret Tracy

▶ Bactroban* = mupirocin

- ▶ Inhibits proteosynthesis
- ▶ G+ cocci
- ▶ Eradication of nasal colonization by *S. aureus*

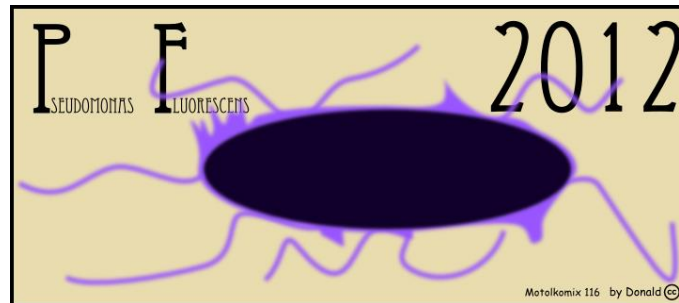


Balbina Johnson



▶ Fucidin* = fusidic acid

- ▶ *Fusidium coccineum*
- ▶ Inhibits proteosynthesis
- ▶ G+ bacteria



*Czech trade name

Pyoderma - impetigo



- ▶ Diagnosis – clinical, ev. culture (swab, pus)
- ▶ Therapy according to clinical condition:
 - ▶ mostly topical ATB, antiseptics (non-bullous form)
 - ▶ systemic ATB (extensive multiple lesions, bullous f., ecthyma)

S. pyogenes

- Penicilin V
- Alt. clindamycin



S. aureus or etiology unknown

- Flukloxacilin, amoxicilin/clavulanate
- Alt. clindamycin

- ▶ Other oral antistaphylococcal penicillin: dicloxacillin (not in ČR)

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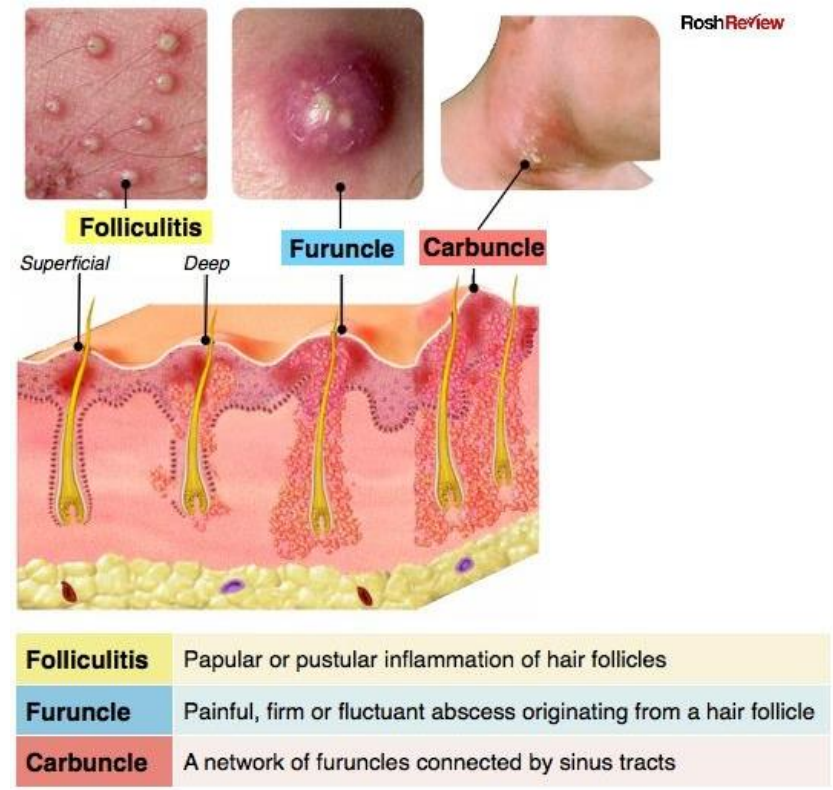


Pyoderma - folliculitis, furuncle, carbuncle

- ▶ Follicle infection, *S. aureus*
- ▶ „hot tub folliculitis“ – *P. aeruginosa*
- ▶ Diagnosis
 - ▶ Clinical finding + history
 - ▶ Ev. microscopy, culture

Acne vulgaris

- inflammatory disease of pilosebaceous unit – sebum hyperproduction, hyperkeratinization, inflammatory response caused by *Cutibacterium acnes*
- Usually without itching
- More in dermatology

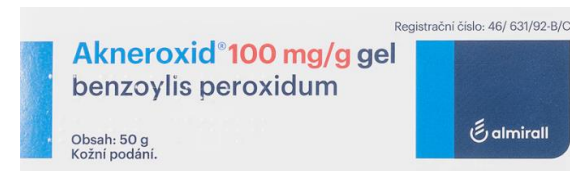
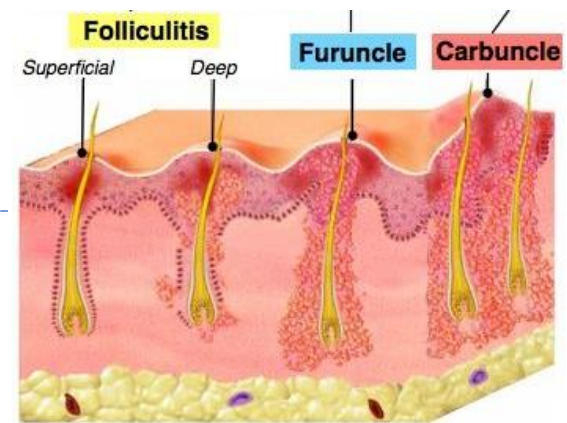


<https://cz.pinterest.com/pin/571886852687712354/>

<https://middlesexhealth.org/learning-center/diseases-and-conditions/boils-and-carbuncles>

Pyoderma - folliculitis, furuncle, carbuncle

- ▶ *S. aureus*
- ▶ „hot tub folliculitis“ – *P. aeruginosa*
- ▶ Therapy
 - ▶ Spontaneous improvement
 - ▶ Local disinfection, local ATB (mupirocin)
 - ▶ Surgery in extensive lesions
 - ▶ Systemic ATB therapy
 - ▶ Carbuncle – elevated temperature, fever, chills
 - ▶ Targeted for *S. aureus*
 - ▶ Severe pseudomonas folliculitis – ciprofloxacin p.o.



<https://cz.pinterest.com/pin/571886852687712354/>

<https://www.drmax.cz/ichtoxyl-mast-30g>

[https://www.notino.cz/akneroxid/akneroxid-50-mg-g-gel/p-](https://www.notino.cz/akneroxid/akneroxid-50-mg-g-gel/p-16131302/?gad_source=1&gclid=Cj0KCQIAx9q6BhCDARIsACwUxu5jLBgmKPkjCKqr7I9HJF9lpIqc0MjfT8aILgYVpJtf24laRiWjymlaAvq0EALw_wcB)

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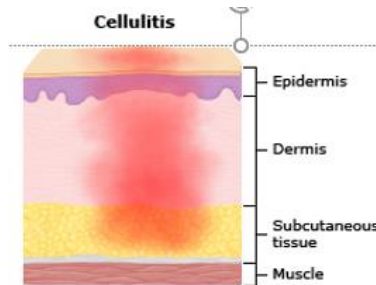
Skin abscess

- ▶ Abscess – enclosed collection of pus within a tissue
- ▶ Etiology – esp. *S. aureus*
- ▶ Furuncle, carbuncle
- ▶ Other: direct inoculation (trauma), complication of other soft tissue infections (cellulitis), hematogenous
- ▶ Microbiological diagnosis: aspirate, pus (microscopy, culture)
- ▶ Therapy – esp. surgery
 - ▶ ATB: flukloxacilin, amoxicilin/clavulanate, alt. clindamycin

- ▶ Abscesses in diff. localizations:



Cellulitis (phlegmon)



- ▶ Deep purulent inflammation of skin and subcutaneous tissue, not confined
- ▶ Impairment of skin barrier (excoriations, trauma, chronic skin defects, surgery, drug abuse, tinea, ...)
- ▶ Local inflammation signs, diffuse margins, systemic inflammation signs (fever chills)
- ▶ Pus formation (→ abscess)
- ▶ Etiology *S. aureus*, *S. pyogenes*, other β -hemolytic streptococci, G- rods less frequent
- ▶ Sampling
 - ▶ Infected wound – swab, pus; blood culture
- ▶ ATB therapy covering *S. aureus*
 - ▶ i.v. therapy in severe cases: oxacilin, aminopenicilins with inhibitors also effective

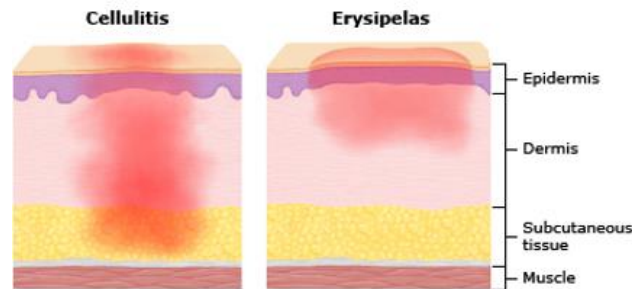
S. aureus

- Flukloxacilin, amoxicilin/clavulanate
- Alt. clindamycin



Erysipelas

- ▶ Skin and superficial lymphatic vessels
- ▶ Frequent localizations: shin, face
- ▶ Impairment of skin barrier
- ▶ Sudden onset of fever, chills, local inflammation signs, defined margins, „St. Anthony's fire“



- ▶ *S.pyogenes*
- ▶ Diagnosis: clinical presentation + blood culture
- ▶ Penicilin
- ▶ Complication – lymphatic vessels damage and recurrences



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Deep soft tissue infections

- ▶ Severe infections, fast progression
- ▶ Necrosis often present – bacterial toxins (streptokinase, hyaluronidase, protease, collagenase, ...), leukocytes
- ▶ Skin above the lesion doesn't have to be excessively damaged
- ▶ Cellulitis – skin and subcutaneous tissue
- ▶ Fasciitis – skin not involved, or much less than subcutaneous tissue
- ▶ Myonecrosis – extensive damage – involves muscles
- ▶ Risk factors
 - ▶ Impairment of physiological barriers (trauma, surgery)
 - ▶ Vascular supply impairment (chronic lower limb ischemia), devastating deep tissue trauma
 - ▶ Immune deficiencies



Deep soft tissue infections



<https://www.kauveryhospital.com/nightingale/successful-discharge-of-a-four-year-old-baby-with-life-threatening-gas-gangrene-and-compartment-syndrome>



Necrotizing soft tissue infections

▶ Clostridial cellulitis and myonecrosis

- ▶ Histotoxic clostridia (*C. perfringens*, *novyi*, *septicum*, *histolyticum*)
- ▶ Crepitus – gas bubbles in subcutaneous tissue – gas gangrene
- ▶ Therapy – Penicilin G + clindamycin

▶ Necrotizing fasciitis



I.Type

- Polymicrobial (anaerobes, streptococci, G-rods)
- Piperacilin/tazobactam/carbapenem + clindamycin
- Fournier gangrene – males (perineum)

2.Type

- Monomicrobial (*S. pyogenes* – „flesh-eating streptococcus“)
- Penicilin G + clindamycin

▶ Staphylococcal necrotizing soft tissue infections

- ▶ PVL toxin production, oxacilin + clindamycin/linezolid

▶ Rapid progression – hemodynamic instability, MODS

▶ Microbiological diagnosis

- ▶ Culture and microscopy of necrotic tissue, ev. PCR, blood cultures

▶ Always in combination with surgical therapy!

Necrotizing soft tissue infections

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Other bacterial skin and soft tissue infections

Vibrio vulnificus

- ▶ G- rod, environment – salt and brackish water
- ▶ Febrile gastroenteritis (contaminated water, seafood) – sympt. therapy
- ▶ Skin infection
 - ▶ Wound contamination by water
 - ▶ Different severity (cellulitis – myonecrosis, blisters – hemorrhagic bullae, abscesses)
- ▶ Culture TCBS (thiosulfate-citrate-bile salts-sucrose)



Erysipeloid

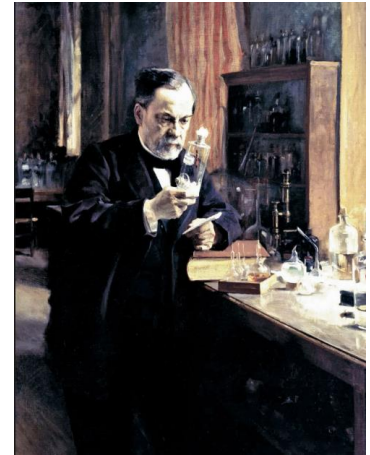


- ▶ Cellulitis – slowly spreading livid efflorescence
- ▶ *Erysipelothrix rhusiopathiae*
 - ▶ G+ rod
- ▶ Infections in animals – pigs and other livestock animals, poultry, dogs, cats, fish
- ▶ Skin injury when working with animals/meat (farmers, slaughterhouse workers, butchers, fishermen, farmers, veterinarians, ...)
- ▶ Diagnosis: clinical presentation + history
- ▶ Therapy: according to severity: penicillin V, penicillin G
- ▶ Naturally resistant to vancomycin



Bite wounds

- ▶ *Pasteurella multocida*, *P. canis*
- ▶ *Capnocytophaga canimorsus*
- ▶ Anaerobes (*Fusobacterium* spp., *Bacteroides* spp., *Prevotella* spp.)
- ▶ *Eikenella corrodens*
- ▶ ...
- ▶ Amoxicillin/clavulanate
- ▶ Clindamycin resistance (*Pasteurella*, ...)



Eikenella corrodens



Skin ulcers of infectious origin

- ▶ Lesions affecting dermis
- ▶ Ecthyma
 - ▶ Malnutrition, poor hygiene, *S.pyogenes*, colonisation/infection: *S. aureus*, G- rods
 - ▶ Systemic ATB treatment
- ▶ Ecthyma gangrenosum
 - ▶ Esp. *P. aeruginosa*, immunodeficiency (neoplasms, neutropenia)
 - ▶ Bacteriemia → perivascular invasion → ischemic necrosis
 - ▶ Macule → pustule, bullae → gangrenous ulcer
 - ▶ Can be multifocal; skin/mucosa, mostly axilla and perineum
 - ▶ Beta-lactams for *P. aeruginosa* + aminoglycosides



Skin ulcers of infectious origin

▶ Cutaneous diphtheria

- ▶ *Corynebacterium diphtheriae*, *C. ulcerans*
- ▶ Poor hygiene, unvaccinated
- ▶ Penicilin, (antitoxin more likely in respiratory form)

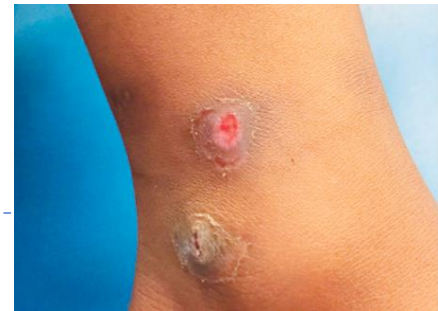
▶ Ulcus durum

▶ Tularemia

- ▶ *Francisella tularensis*
- ▶ Ulceroglandular form – ulcer, regional lymphadenopathy, fever
- ▶ (also oculoglandular, oroglandular, abdominal, pneumonic and generalized form)

▶ Anthrax

- ▶ *Bacillus anthracis*
- ▶ Cutaneous form – hemorrhagic bulla → necrotic ulcer (pustula maligna)
 - ▶ 20% mortality (other forms worse prognosis)
- ▶ Regional lymphadenopathy
- ▶ (also gastrointestinal, pneumonic form)



<https://www.nejm.org/doi/full/10.1056/nejmicm1701825>

<https://www.prolekare.cz/casopisy/cesko-slovenska-dermatologie/2010-2/kazuisticky-pripad-pacientky-s-netypickou-lokalizaci-primarniho-syfiliticke>

<https://www.cdc.gov anthrax/symptoms/index.html>

Wikipedia.org

Burnt tissue infections

- ▶ Skin barrier function impairment, immune system dysregulation
 - wound colonisation
 - local and systemic infection
- ▶ *Staphylococcus aureus* (incl. MRSA), *Pseudomonas aeruginosa*, *Acinetobacter baumannii*, enterobacteriales





Dermatomycoses

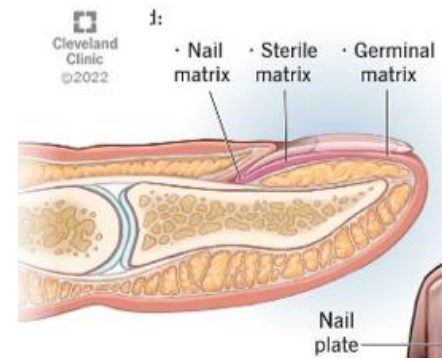
Dermatomycoses

- ▶ Mycotic skin infections (incl. adnexa)
- ▶ Risk factors: DM, neoplasms, ATB therapy, immunosuppression
- ▶ Cutaneous candidiasis
 - ▶ Itching, redness, often in warm moist areas
 - ▶ Skin swab, culture
- ▶ Dermatophytoses
 - ▶ Dermatophytes: *Trichophyton*, *Epidermophyton*, *Nannizzia* – primary pathogens
 - ▶ Anthropophilic, zoophilic, geophilic species
 - ▶ Tinea pedis, manuum, inguinalis, capitis, faciei, corporis, unguium (onychomycosis)



Dermatomycoses

- ▶ **Dermatophytes – microbiological diagnosis**
 - ▶ Sampling: decontamination with alcohol disinfection → skin scrapings (scalpel), subungual area, proximal part of nail plate; hair bulb
 - ▶ Microscopy (KOH preparation), culture, PCR
 - ▶ Long incubation period (weeks) → sampling 2-8 w. after ATM
- ▶ **Therapy: esp. topical (local polyenes – yeasts; azoles, allylamines – terbinafine)**

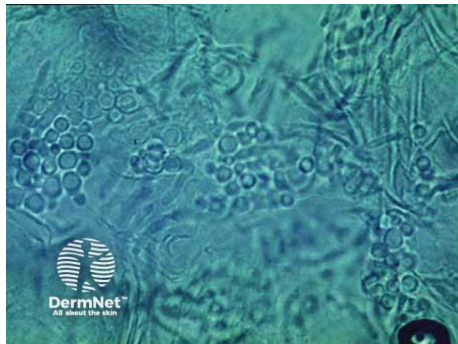


Pityriasis versicolor

- ▶ *Malassezia furfur* – lipophilic yeast
 - ▶ Skin microbiota
 - ▶ Warm, humid conditions
- ▶ Hyperhidrosis, seborrhea (sebum formation), immune suppression, corticosteroid therapy
- ▶ Light brown spots on non-pigmented skin, light spots on pigmented skin. Not itchy
- ▶ KOH preparation „spaghetti and meatballs“
- ▶ Topical therapy



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