

- **Pathogens with Intermediate Virulence**

- Dermatophytes**

- **opportunistic Pathogens**

- *Cryptococcus neoformans*
 - *Candida albicans*
 - *Aspergillus* species
 - *Pneumocystis carinii*

Dermatophytes

- Named for *derma* “skin”
- Cause cutaneous mycoses – strictly confined to epidermis and its derivatives (hair and nails)
- All are communicable diseases
- Well adapted to breaking down keratin; termed keratinophiles
- Most diseases are termed “ringworm” or tinea because they develop in circular scaly patches
- Treatments include topical antifungal cream, debridement of skin and UV treatments
- Difficult infections can be treated with griseofulvin; however, this drug is both hepatotoxic and nephrotoxic

Cutaneous mycoses

- infections strictly confined to keratinized epidermis (skin, hair, nails) are called dermatophytoses - ringworm & tinea
- 39 species in the genera *Trichophyton*, *Microsporum*, *Epidermophyton*
- communicable among humans, animals, & soil
- infection facilitated by moist, chafed skin

Trichophyton



(a)

CDC

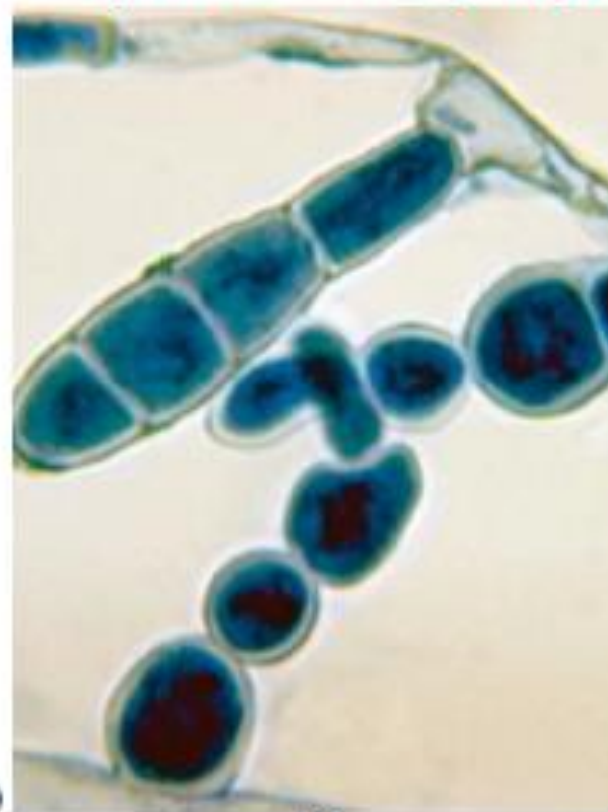
Microsporum



(b)

CDC

Epidermophyton



(c)

CDC

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Closely related and morphologically similar

Epidemiology and Pathology of Dermatophytes

- Ringworm of scalp (**tinea capitis**) affects scalp and hair-bearing regions of head; hair may be lost →
- Ringworm of beard (**tinea barbae**) affects the chin and beard of adult males; contracted mainly from animals
- Ringworm of body (**tinea corporis**) occurs as inflamed, red ring lesions anywhere on smooth skin →



- Ringworm of groin (**tinea cruris**) “jock itch” affects groin and scrotal regions
- Ringworm of foot and hand (**tinea pedis** and **tinea manuum**) is spread by exposure to public surfaces; occurs between digits and on soles
- Ringworm of nails (**tinea unguium**) is a persistent colonization of the nails of the hands and feet that distorts the nail bed

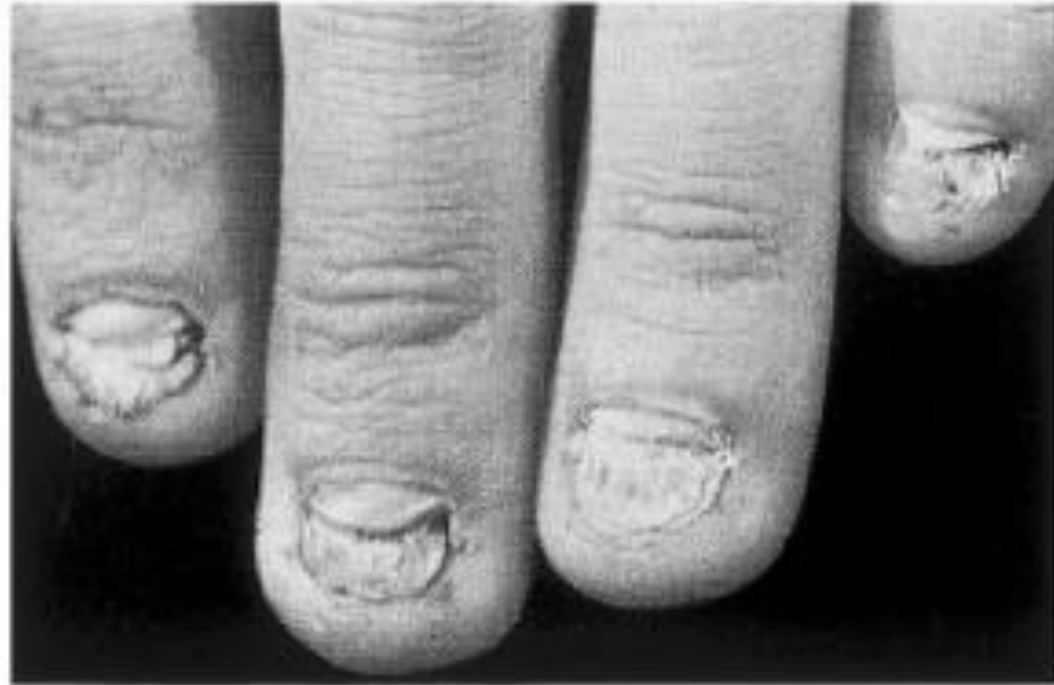
Figure 22.18 Ringworm of the extremities



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(a) **Tinea pedis**



(b) **Tinea unguium**

- **opportunistic Pathogens**
 - *Cryptococcus neoformans*
 - *Candida albicans*
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 - *Pneumocystis carinii*

Cryptococcus neoformans:

Cryptococcosis

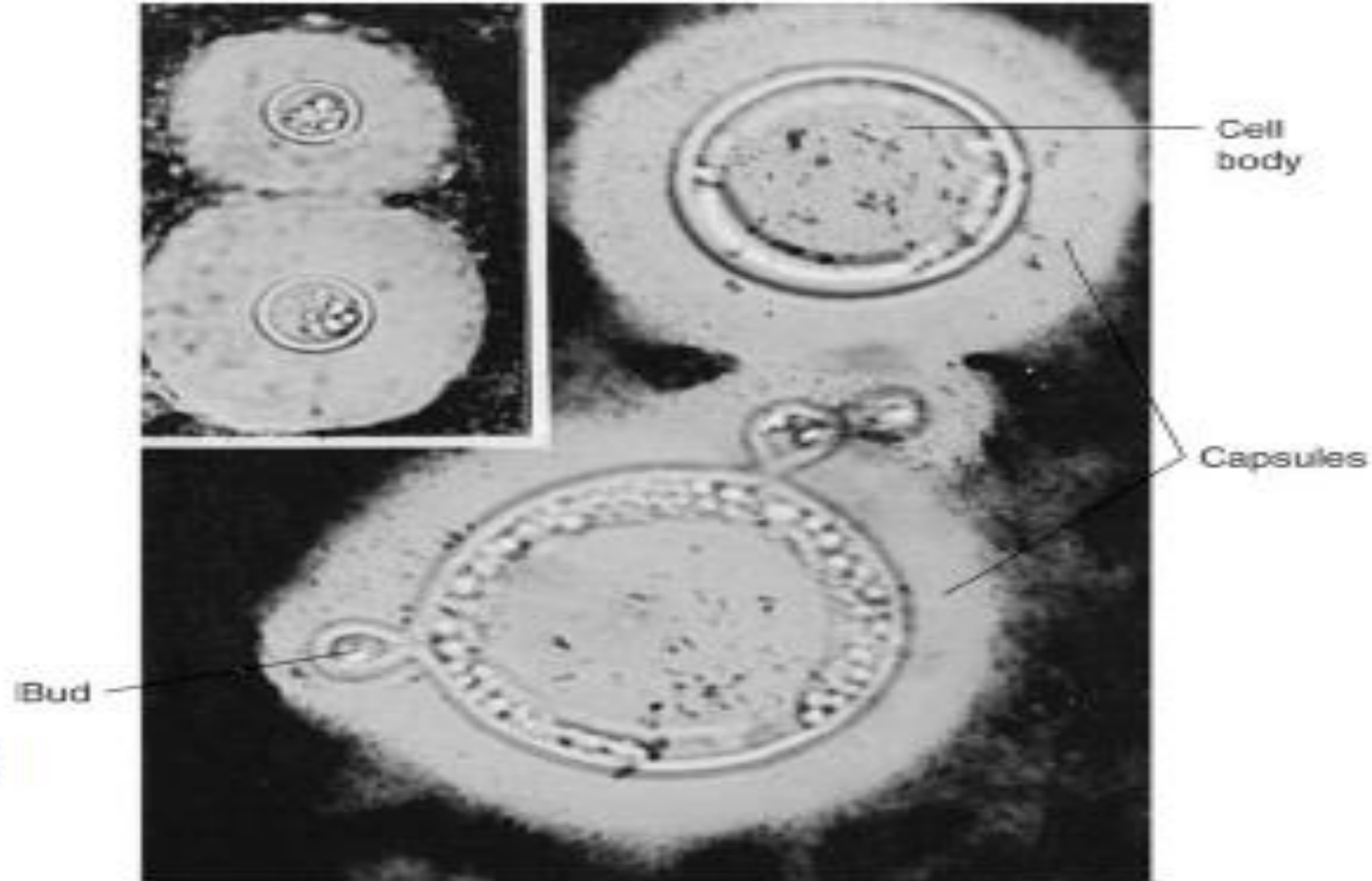
- Widespread; associated with birds, and bird guano
- Transmission is through spore inhalation
- Common infection of AIDS, cancer or diabetes patients
- Infection of lung leads to cough, fever, and lung nodules
- Dissemination to meninges and brain can cause severe neurological disturbances and death
- Systemic cryptococcosis requires immediate treatment with amphotericin B and fluconazole over a period of weeks or months

Diagnosis and treatment

- Initially: negative staining of samples to detect encapsulated budding yeast
- Confirmation by pigmentation on birdseed agar
- Birdseed Agar: - *Cryptococcus neoformans* produces phenol oxidase, which breaks down the substrate resulting in the production of melanin and developing dark brown or black colonies. Other yeasts will appear cream-colored.
- Systemic cryptococcosis requires immediate treatment with amphotericin B and fluconazole over a period of weeks or months

Cryptococcus neoformans

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Cryptococcus neoformans

Figure 22.24 disseminated case of cutaneous cryptococcosis



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Secondary Pathogens

- *Cryptococcus neoformans*
- *Candida albicans*
- *Aspergillus* species
- *Pneumocystis carinii*

Candida albicans

- widespread yeast
- infections can be short -lived, superficial skin irritations to overwhelming, fatal systemic diseases
- budding cells of varying size that may form both elongate pseudohyphae & true hyphae
- forms off-white, pasty colony with a yeasty odor



Candida albicans

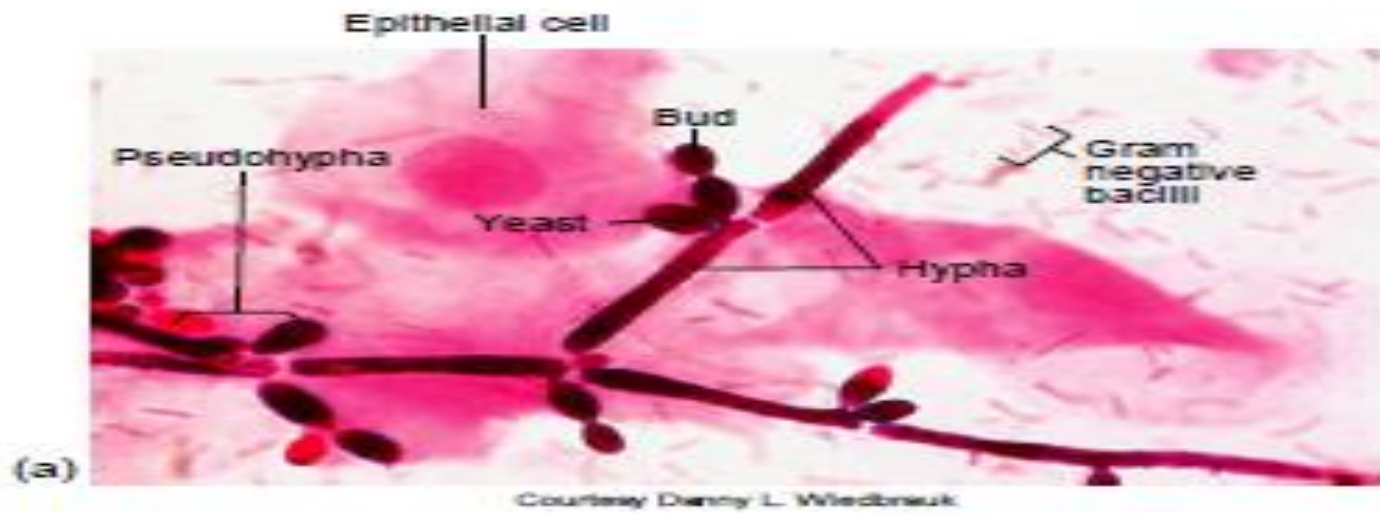
- Normal flora of oral cavity, genitalia, large intestine or skin of 20% of humans
- Can cause short-lived superficial skin irritations to fatal systemic disease
- Candidiasis is usually endogenous, but can be communicable

Candida albicans: Candidiasis

- Thrush – occurs as a thick, white, adherent growth on the mucous membranes of mouth & throat
- Vulvovaginal yeast infection – painful inflammatory condition of the female genital region that causes ulceration
- Cutaneous candidiasis – occurs in chronically moist areas of skin and burn patients
- Esophageal candidiasis – afflicts 70% of AIDS patients, causing painful bleeding ulcerations, nausea and vomiting
- Treatment: topical antifungals; amphotericin B in systemic infections

Diagnosis of Candidiasis

- Presumptive diagnosis by observing budding yeast cells and pseudohyphae in specimen
- Culturing on selective and differential yeast media ie trypan blue media – *Candida* appears light blue
- Also rapid yeast identification kits (multiple biochemical tests)



Stain of a vaginal smear



Pale blue colonies



Rapid ID test

Figure 22.21 *Candida albicans* infection of the mouth (oral thrush)

