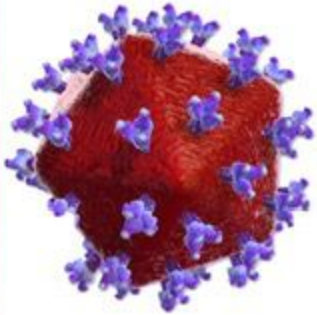
Virus

Retroviridae

ssRNA+

- Genome Type
- Envelope
- Structure
- Genera & Viruses
- Pathogenesis
- Disease
- Diagnosis
- Treatment
- Prevention
- Buzzwords



Opportunistic Mycoses

Name

Opportunistic Mycoses –
Fungal infections that occur **primarily in immunocompromised individuals** (e.g., HIV, transplant patients, chemotherapy, diabetes).

Morphology

- Caused by **yeasts or molds**
- Most are **monomorphic**, not dimorphic
- Appear as **hyphae, pseudohyphae, or yeast cells** depending on species

Habitat & Reservoir

- Ubiquitous in **environment** (soil, air, decaying matter) or part of **normal flora** (e.g., *Candida*)
- **Inhalation**, **catheter contamination**, **gut translocation**, or **direct inoculation**

Pathogenic Form

- No environmental-to-yeast switch like dimorphic fungi
- Pathogenic form = **same as colonizing or environmental form**

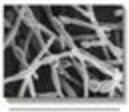
Infective Agents

- **Candida spp.** – *Candida albicans*, etc.
- **Aspergillus spp.** – *Aspergillus fumigatus*
- **Cryptococcus neoformans**
- **Mucor, Rhizopus** (Zygomycetes/Mucormycosis)
- **Fusarium, Penicillium marneffei (Talaromyces)** in endemic areas
- **Pneumocystis jirovecii**

Virulence Factors

- Biofilm formation (*Candida*)
- Capsule (*Cryptococcus*)
- Angioinvasion (*Aspergillus*, *Mucor*)
- Resistance to oxidative burst
- Thermotolerance and enzyme production

Oral candidiasis (thrush)



Candida albicans

Cryptococcus neoformans

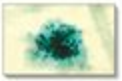
Aspergillus species

Clinical Manifestations

- **Candida**: oral thrush, esophagitis, vaginitis, bloodstream infections (candidemia)
- **Aspergillus**: allergic bronchopulmonary aspergillosis (ABPA), invasive aspergillosis, aspergilloma
- **Cryptococcus**: chronic meningitis, pneumonia (especially in AIDS)
- **Mucor**: rhinocerebral mucormycosis in diabetics with ketoacidosis
- **Pneumocystis jirovecii**: interstitial pneumonia (PCP) in AIDS

Laboratory Diagnosis

- **Microscopy**: KOH mount, silver stains, India ink (*Cryptococcus*)
- **Culture**: Sabouraud dextrose agar
- **Antigen testing**: cryptococcal antigen, galactomannan (*Aspergillus*), β-D-glucan
- **PCR & imaging** (CT scan shows halo sign in aspergillosis)



Pneumocystis jirovecii

Treatment

- **Candida**: fluconazole, echinocandins (e.g., caspofungin)
- **Aspergillus**: voriconazole (first-line), amphotericin B
- **Cryptococcus**: amphotericin B + flucytosine, then fluconazole
- **Mucor**: surgical debridement + amphotericin B
- **Pneumocystis**: TMP-SMX (cotrimoxazole), prophylaxis in HIV

Prevention & Control

- Prophylactic antifungals in high-risk patients
- Good catheter hygiene, control of diabetes
- Antiretroviral therapy in HIV
- Minimize immunosuppression when possible

Fungi

Opportunistic Mycoses

- Name
- Morphology
- Habitat & Reservoir
- Pathogenic Form
- Infective Agents
- Virulence Factors
- Clinical Manifestations
- Laboratory Diagnosis
- Treatment
- Prevention & Control

Retroviridae

Genome

Single-stranded, positive-sense RNA (2 copies per virion)

Envelope

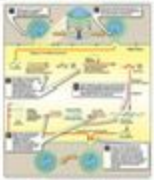
✅ Yes

Genera & Viruses

1. **HIV-1** (Human Immunodeficiency Virus type 1)
2. **HIV-2** (less common, slower progression of AIDS)
3. **HTLV-1** (Human T-cell Leukemia Virus type 1)
4. **HTLV-2**

Transmission

Route	Details
Sexual Contact	Unprotected vaginal, anal, or oral sex with an infected person
Parenteral (Blood)	Sharing needles (IV drug use), blood transfusions (rare today), organ transplants
Vertical Transmission	From mother to baby during pregnancy, childbirth, or breastfeeding
Occupational Exposure	Needle-stick injuries or exposure to infected fluids in healthcare settings



Pathogenesis

1. **Entry:** gp120 binds CD4 & co-receptors (CCR5 early, CXCR4 late)
2. **Fusion & Uncoating:** gp41 mediates fusion
3. **Reverse Transcription:** Viral RNA → DNA via reverse transcriptase
4. **Integration:** Provirus integrates into host DNA (via integrase)
5. **Latency or Activation:** Depending on host cell activation state
6. **Assembly & Budding:** New virions formed and released

Disease

- **HIV-1 & HIV-2 → AIDS** (Acquired Immunodeficiency Syndrome)
  - Destroys CD4+ T cells
  - Opportunistic infections and cancers
- **HTLV-1 → Adult T-cell leukemia/lymphoma (ATLL)**
- **HTLV-2 → Myelopathy/neurologic syndromes (rare)**

Diagnosis

- **HIV:** ELISA (screening), Western blot/PCR (confirmation)
- **CD4 count & viral load** monitoring for disease progression

Treatment & Prevention

- **ART (Antiretroviral Therapy):** Combination of
  - NRTIs (e.g. zidovudine)
  - NNRTIs
  - Protease inhibitors
  - Integrase inhibitors
  - Entry inhibitors

Buzzwords

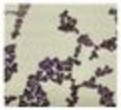
- **"Diploid genome"** → Only RNA virus with **2 copies of RNA**
- "Reverse transcriptase" → Converts RNA → DNA
- **"Integration into host DNA"** → Leads to lifelong infection
- **"gp120/gp41"** → Surface proteins of HIV
- **"CD4 and CCR5/CXCR4"** → Entry receptors for HIV

Staphylococci

Name

Genus: Staphylococcus
Clinically important species: S. aureus, S. epidermidis, S. saprophyticus

Morphology & Staining



Gram-positive cocci arranged in grape-like clusters. Non-motile, non-spore-forming. Stains purple on Gram stain.

Culture & Growth

Facultative anaerobes. Grow on Blood agar, Nutrient agar,Mannitol Salt Agar (MSA).

- *S. aureus*: Ferments mannitol (yellow colonies), beta-hemolytic
- *S. epidermidis* & *S. saprophyticus*: Do not ferment mannitol

Biochemical Characteristics

All are catalase positive.

- *S. aureus*: Coagulase positive
- *S. epidermidis* & *S. saprophyticus*: Coagulase negative
- *S. saprophyticus*: Novobiocin resistant
- *S. epidermidis*: Novobiocin sensitive

Virulence Factors

S. aureus: Protein A, coagulase, hemolysins, leukocidins, exfoliative toxins, TSST-1
S. epidermidis: Forms biofilms on prosthetic materials

Pathogenesis

Entry through skin breaches, wounds, or indwelling medical devices. Bacteria produce toxins and evade the immune system, leading to localized or systemic infections.

Clinical Manifestations

S. aureus:
Skin and soft tissue infections: Impetigo, cellulitis, furuncles (boils), carbuncles
Abscesses: Deep tissue and organ abscesses
Pneumonia: Especially post-viral or hospital-acquired
Osteomyelitis & Septic arthritis
Endocarditis: Particularly in IV drug users
Scalded Skin Syndrome: Due to exfoliative toxins
Toxic Shock Syndrome: TSST-1 mediated
Food poisoning: Due to enterotoxin (preformed toxin)
S. epidermidis:
Infections of prosthetic devices, catheters, shunts, and artificial heart valves
Often causes hospital-acquired bacteremia
S. saprophyticus:
Urinary tract infections (UTIs) in sexually active young females

Laboratory Diagnosis

Gram stain of sample, culture on Blood agar or MSA, catalase and coagulase tests, novobiocin sensitivity testing, and antibiotic susceptibility (e.g. for MRSA)

Treatment

S. aureus: Nafcillin or oxacillin for MSSA; Vancomycin or Linezolid for MRSA
S. epidermidis: Vancomycin (most strains are methicillin-resistant)
S. saprophyticus: Nitrofurantoin or trimethoprim-sulfamethoxazole (TMP-SMX)

Prevention & Control

Strict hand hygiene, sterile procedures in hospital settings, screening and decolonization for MRSA carriers, proper care of medical devices.

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Staphylococci

Gram-Positive (Cocci)

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- Morphology & Staining
- Culture & Growth
- Biochemical Characteristics
- Virulence Factors
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- Clinical Manifestations
- Laboratory Diagnosis
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Free-living Bacteria

- Gram-positive
  - Cocci
    - *Staphylococcus*
      - *Staphylococcus aureus* (+)
      - *Staphylococcus epidermidis* (-)
      - *Staphylococcus saprophyticus* (-)
    - *Enterococcus*
    - *Peptostreptococcus*
    - *Streptococcus*
  - Rods
- Gram-negative

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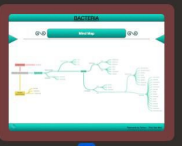

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Mind Map