Microbiology

2025-2024

Dr.Saja Ebdah

ARKAN
ACADEMY

Nosocomial infection, Zoonotic disease and emerging microbial threats

- **Topics discussed**:
  - Hospital-Acquired Infections
  - Zoonotic Diseases
  - Emergence of Bacterial Pathogens

- **Hospital-Acquired Infections (HAIs)**
  - Definition
    - ✓ Infections not present or incubating at admission, manifesting 48 hours after hospitalization.
    - ✓ Includes:
      - Central Line-Associated Bloodstream Infections (CLABSI)
      - Catheter-Associated Urinary Tract Infections (CAUTI)
      - Surgical Site Infections (SSI)
      - Hospital-Acquired Pneumonia (HAP)
      - Ventilator-Associated Pneumonia (VAP)
      - Clostridium Difficile Infections (CDI)

  - Epidemiology
    - ✓ Risk factors:
      - Immunosuppression
      - Older age
      - Length of stay in hospital
      - Multiple comorbidities
      - Frequent healthcare visits
      - Mechanical ventilatory support
      - Invasive procedures
      - Indwelling devices
      - ICU stay
    - ✓ Pathogens may come from:
      - Other patients
      - Hospital staff
      - Hospital environment
    - ✓ HAI prevalence:
      - 19.5% of ICU patients have at least one HAI (231,459 patients across 947 hospitals).
      - In 2014, 4% of hospitalized patients had at least one HAI (survey of 11,282 patients from 183 hospitals).

  - Types of Infections
    - ✓ Most common infections:
      - Pneumonia (21.8%)
      - Surgical site infections (21.8%)
      - Gastrointestinal infections (17.1%)
      - Urinary tract infections (12.9%)
      - Primary bloodstream infections (9.9%)

- ✓ Leading pathogens:
  - Clostridium difficile (12.1%)
  - Staphylococcus aureus (10.7%)
  - Klebsiella (9.9%)
  - Escherichia coli (9.3%)
- ✓ Skin and surgical infections:
  - Often caused by Staphylococcus aureus (including MRSA).

➢ Specific Types of Infections

- ✓ CLABSI:
  - Increased morbidity, mortality, and healthcare costs.
  - Reduced by 58% in ICU (2001-2009), saving 6,000 lives and $414 million in costs.
  - Most common pathogens: Gram-negative (39.2%), Gram-positive (33.2%), Candida spp. (27.6%).
- ✓ SSI:
  - Most common complication in postoperative patients.
  - Common pathogens: Staphylococcus species (including MRSA), Acinetobacter species, Pseudomonas species, Enterococcus species.
- ✓ CAUTI:
  - Most common healthcare-associated infection (40% of all HCAIs).
  - Can cause higher mortality in asymptomatic bacteriuric patients.
- ✓ VAP:
  - Second most common HCAI in ICU patients.
  - Affects 9% to 27% of mechanically ventilated patients.
  - Common pathogens: Staphylococcus aureus, Acinetobacter baumannii, Pseudomonas aeruginosa.

➢ Management of HAI

- ✓ Key steps:
  - Empiric antibiotics based on risk factors and patient stability.
  - Start antibiotics within an hour, especially for CLABSI.
  - Obtain blood cultures from both peripheral and central venous sites before initiating antibiotics.
  - Identifying pathogen and susceptibility guides the use of specific antibiotics.

- **Zoonotic Diseases**

➢ Definition

- ✓ Zoonotic diseases: Diseases naturally transmitted from vertebrate animals to humans or vice versa.
- ✓ 60% of emerging human infections are zoonotic, with 70% of those originating from wildlife.

➢ Types of Zoonotic Diseases

- ✓ Bacterial: Anthrax, Salmonellosis, Tuberculosis, Lyme disease, Brucellosis, Plague.
- ✓ Viral: Rabies, AIDS, Ebola, Avian Influenza.
- ✓ Parasitic: Trichinosis, Toxoplasmosis, Giardiasis, Malaria, Echinococcosis.
- ✓ Fungal: Ringworm.
- ✓ Other: Q-fever (rickettsial), Psittacosis (chlamydial), Mycoplasma pneumonia, Transmissible spongiform encephalopathies (mad cow disease).

➢ Transmission Factors

✓ Wild animals contribute to the transmission and maintenance of zoonotic diseases.

✓ Environmental changes (globalization, habitat destruction, climate change) disrupt ecological relationships and trigger new zoonotic diseases.

➢ Reverse Zoonoses

✓ Some pathogens can be transmitted from humans to animals (e.g., MRSA, Campylobacter spp.).

➢ Zoonotic Diseases from Pets and Companion Animals

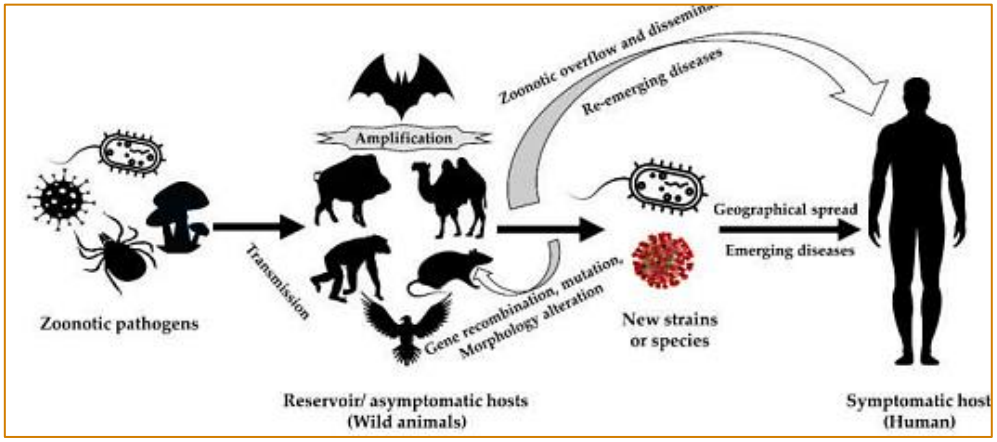
✓ Common zoonotic diseases:

- Brucellosis, Campylobacteriosis, Chlamydiosis, Cat Scratch Fever, Ehrlichiosis, Giardiasis.
- Rabies: Most common dog-associated zoonosis.
- Cat Scratch Disease: Caused by Bartonella henselae.

➢ Zoonoses from Fish and Aquatic Environments

✓ Vibrio species (V. cholerae, V. parahaemolyticus, V. vulnificus) are common zoonotic agents from fish.

✓ Non-tuberculous mycobacterial infections linked to aquariums and aquaculture.



- **Emergence of Bacterial Pathogens**

✓ Reasons for Emergence

- Bacteria have a stable genome, making their divergence less common compared to viruses.
- Most emerging infectious diseases (EIDs) are from bacteria that have long been in the environment.

✓ Key Aspects of Bacterial Disease Emergence

1. ***Development of new diagnostic tools:***
   - PCR and MALDI-TOF mass spectrometry for faster and more accurate detection.
2. ***Increased human exposure:***
   - Higher population density and more invasive medical procedures lead to more healthcare-associated infections.
3. ***Emergence of more virulent strains:***
   - Increased antibiotic resistance (e.g., MRSA, multidrug-resistant tuberculosis, carbapenem resistant bacteria).

✓ Future Challenges

- Difficult to control the emergence of new bacterial diseases.
- Efforts should focus on rapidly identifying potential epidemic sources using new technologies like social networks and media.

ARKAN

ACADEMY

علم في كل مكان

Arkan academy

Arkanacademy

www.arkan-academy.com

+962 790408805