

**OUTLINE OF MEDICAL MICROBIOLOGY**

**医学微生物学英文教学大纲**

**课程代码： BMS0551**

**Department of Pathogen Biology**

**Tongji Medical College**

**Huazhong University of Science and Technology**

**2018-7-11**

# Medical Microbiology Course Outline

## Introduction

Categories of microorganisms

## Bacteriology Morphology and Structure of Bacteria

### [Requirement]

1. Master bacterial cell structure, esp. structure of bacterial cell wall and their corresponding features and functions
2. Master basic definitions: bacteria L form, plasmid, inclusion granules, capsule, flagellum, pilus, spore
3. To be familiar with procedure and significance of Gram staining

### [Contents]

1. Bacterial morphology and structure
2. Observe bacterial morphologic methods

## Bacterial Physiology

### [Requirement]

1. Master bacterial growth features and medically significant synthetic products
2. Understand methods of bacterial cultivation

### [Contents]

1. Bacterial growth
2. Bacterial metabolism substances
3. Artificial cultivation of bacteria

## Disinfection and Sterilization

### [Requirement]

1. Master basic definitions: sterilization, disinfection, antisepsis, bacteriostasis, asepsis
2. To be familiar with important sterilizing methods: autoclaving, UV radiation and their corresponding principles

### [Contents]

1. Physics methods of disinfection and sterilization
2. Chemic methods of disinfection and sterilization

## Bacterial Genetics

### [Requirement]

Bacterial genetic material and bacterial gene transfer: definitions and corresponding features

### [Contents]

1. Substance of bacteria

2. Mechanism of bacterial genetic variation

## **Bacterial Infection and Immunity**

### **[Requirement]**

1. Master basic definitions: normal flora, opportunistic pathogens, pathogens
2. Master bacterial virulence factors: invasiveness, toxins (exotoxin and endotoxin, their features)
3. To be familiar with types of systemic infection and their features

### **[Contents]**

1. Normal flora and opportunistic pathogens
2. Bacterial virulence factors
3. Immunity in bacterial infections

## **Laboratory diagnosis, prophylaxis and treatment of bacteria**

### **[Requirement]**

1. To be familiar with important principles of detection, diagnosis, prophylaxis and treatment of bacterial infection
2. To be familiar with definitions: vaccine, artificial active immunization, active passive immunization

### **[Contents]**

1. Laboratory diagnosis of bacteria
2. prophylaxis and treatment of bacterial infection

## **Coccus**

### **[Requirement]**

1. Master types of important pathogenic cocci
2. Master *staphylococcus*: biological characters, virulence factors, causing disease and diagnosis procedure
3. Master *neisseria gonorrhoea*: biological characters, causing disease and diagnosis procedure
4. To be familiar with *streptococcus*: biological characters, virulence factors, causing disease and diagnosis procedure
5. To be familiar with *pneumococcus*: biological characters and causing disease
6. To be familiar with *neisseria meningitidis*: biological characters, causing disease and diagnosis procedure

### **[Contents]**

*Staphylococcus; streptococcus; pneumococcus; neisseria meningitidis; neisseria gonorrhoea*

## **Enterobacteria**

### **[Requirement]**

1. Master types of important *enterobacteria* and their common features

2. Master *Escherichia coli*: biological characters, pathogenesis and diagnosis procedure
3. To be familiar with *Shigella* dysentery: pathogenesis
4. To be familiar with *Salmonella*: biological characters, pathogenesis and diagnosis (Widal' test)

**[Contents]**

*Escherichia coli*; *Shigella*; *Salmonella*

## **Vibrio cholera**

**[Requirement]**

Master pathogenesis of *Vibrio cholera*

**[Contents]**

*Vibrio cholera*

## **Anaerobic Bacteria**

**[Requirement]**

1. Master anaerobic spore-formers (Clostridia): *C. tetani*, *C. perfringens*, *C. botulinum*. Virulence factors, diseases.
2. To be familiar with anaerobic spore-formers :diagnosis procedure and prevention.

**[Contents]**

*C. tetani*; *C. Perfringens*; *C. botulinum*

## **Mycobacterium**

**[Requirement]**

1. Master *M. tuberculosis*: morphology, culture, identification, resistance to physical and chemical agents, variation, pathogenicity, diseases.
2. To be familiar with tuberculin test: method, mechanism
3. Understand laboratory diagnosis, prevention

**[Contents]**

*M. tuberculosis*; *M. leprae*

## **Mycoplasma / Chlamydia/ Spirochetes/ Rickettsiae**

**[Requirement]**

1. Master *Treponema pallidum*, *Leptospira interrogans* Pathogenicity
2. To be familiar with mycoplasma: identification, diseases caused by Mycoplasmas.
3. To be familiar with chlamydia: biological features, pathogenic species.
4. To be familiar with spirochetes: Pathogenicity, immunity, diagnosis and prevention of *Treponema pallidum*, *Leptospira interrogans*.
5. To be familiar with rickettsiae: identification, the pathogenic species and transmission.

**[Contents]**

Mycoplasma ; Chlamydia; Spirochetes; Rickettsiae

## **Mycology**

### **[Requirement]**

1. Master general mycology: biological characters, pathogenicity.
2. To be familiar with cutaneous Mycoses: pathogenicity.
3. To be familiar with systemic Mycoses: biological characters, pathogenicity of *Cryptococcus neoformans*.
4. To be familiar with opportunistic Mycoses: biological characters, pathogenicity of *C. albicans*.

### **[Contents]**

1. Mycology introduction
2. Pathogenic fungi

## **Virology Introduction**

### **[Requirement]**

1. Master the concepts of viruses.
2. To be familiar with the properties of viruses.
3. Understand the importances of virology in medicines.

### **[Contents]**

1. The concepts of viruses, The differences between virus and other microorganisms.
2. The importances of virology in medicines.

## **Shape and Structure of Virus**

### **[Requirement]**

1. Master the size and structure of viruses, the concepts of Capsid, Nucleic capsid, Capsomer, Envelope .
2. To be familiar with the chemical composition and function of viruses.
3. Understand the General Characteristics of Viruses.

### **[Contents]**

1. Size and Shape of viruses.
2. The general structure of viruses.
3. The special structure of viruses.
4. The chemical composition and function of viruses.

## **Viral Multiplication**

### **[Requirement]**

1. Master the proliferation 、 General steps in viral replication cycles , and the concepts of Defective virus and Abortive infections.
2. To be familiar with the processes of the replication, The Biosynthetic mechanisms of the six different genotypes, The concept of the interference..

### **[Contents]**

The proliferation of virus; the processes of the replication; the unusual proliferation

## **Viral Genetics and Mutation**

### **[Requirement]**

1. Master the concepts of mutation, Recombination.
2. To be familiar with the interaction of the genetic production.

### **[Contents]**

1. Viral mutation
2. Viral Recombination
3. The interaction of the genetic production

## **Effects of Physical and Chemical Agents on Viruses**

### **[Requirement]**

1. Master the concepts of viral inactivation.
2. To be familiar with the viral sensitivity to temperature.
3. Understand the Effects of other Physical and Chemical Agents on Viruses.

### **[Contents]**

1. The concepts of viral inactivation,
2. The effects of physical and chemical agents on viruses.

## **Classification of Viruses**

### **[Requirement]**

Master the classification of viruses.

### **[Contents]**

The principle of the classification of viruses, according different properties;

## **Mechanisms of viral Pathogenesis**

### **[Requirement]**

1. Master the mechanisms of viral pathogenesis;
2. Understand the cytopathogenesis.

### **[Contents]**

The mechanisms of viral pathogenesis: modes of transmission of viruses, types of viruses infections, courses of viral infection, cytopathogenesis, effects of viral infection to immune system.

## **Antiviral Therapy**

### **[Requirement]**

The mechanisms of antiviral therapy

### **[Contents]**

Chemotherapy, interferon, artificial active immunity, artificial passive immunization

## **Respiratory viruses**

### **[Requirement]**

1. Master all of the contents about Influenza viruses
2. Understand the clinical illnesses caused by other respiratory viruses.

### **Influenza virus**

1. Biological properties
  - 1) Morphology and structure: spherical, filamentous, 80-120nm, helical symmetry
  - 2) Type and variation
  - 3) Cultivation
  - 4) Resistance
2. Pathogenesis and immunity
3. Microbiological detection
4. Control

### **Paramyxoviruses**

1. Pathogenesis and immunity
2. Microbiological detection

### **Other Respiratory viruses**

1. Biological properties
2. Pathogenesis and immunity
3. Microbiological detection
4. Control

## **Enteroviruses**

### **[Requirement]**

1. Master the common properties of enteroviruses.
2. Master the pathogenesis of poliovirus.
3. Understand the clinical illnesses caused by Coxsackie virus, ECHO virus and New enteroviruses.
4. Master the biological properties and pathogenesis of rotaviruses.

### **Poliovirus**

1. Biological properties:
  - 1) 27-30nm, spherical, non-enveloped
  - 2) +ssRNA, 7500bp, 3' terminal: polyA, 5 terminal: Vpg
  - 3) 4 structural proteins: Vp1-4
  - 4) culture in primates cells, CPE
  - 5) 3 serotypes, non-cross reaction
2. Pathogenesis and Immunity
3. Microbiological detection
4. Control

### **Coxsackie Virus, ECHO Virus and New Enteroviruses**

1. Coxsackie virus

2. ECHO virus
3. New enteroviruses

### **Rotaviruses**

1. Biological properties
2. Pathogenesis
3. Diagnosis
4. Control

## **Hepatitis Viruses**

### **[Requirement]**

1. Master biological characters, pathogenesis, diagnosis and prevention of HBV
2. To be familiar with biological characters, pathogenesis of HAV, HCV
3. Understand pathogenesis of HDV, HEV

### **[Contents]**

HAV, HBV, HCV, HDV, HEV

## **Herpesviruses**

### **[Requirement]**

1. Master the common properties of herpesviruses.
2. To be familiar with the classification and associated diseases of herpesviruses.

### **[Contents]**

1. Classification
2. Common properties
  - Linear dsDNA.
  - Icosahedral, spherical, 162 capsomers.
  - Enveloped 150-200nm, nucleocapsid 100nm.
  - Most can grow in HDC, CPE.
  - Various infectious expression:

## **Arboviruses**

### **[Requirement]**

Master the common properties of arboviruses.

### **[Contents]**

1. Common properties
  - 1) Spherical, 20-50nm, a few: 70-130nm.
  - 2) +ssRNA, icosahedral, enveloped, hemagglutinin.
  - 3) Sensitive to heat, lipo-solvents, acid.
  - 4) Intra-cytoplasmic multiplication, newborn mice are susceptible.
  - 5) Reproduce in arthropods, arthropods are vector and reservoir host.
  - 6) Epidemics with marked geographical and seasonal distribution.
2. Diseases caused by arboviruses



## **Retroviruses**

### **[Requirement]**

1. Master the structure, pathogenesis, of HIV.
2. Understand the genes, replication, diagnosis and control of HIV.

### **[Contents]**

Human immunodeficiency virus (HIV)

Pathogen of AIDS (Acquired Immune Deficiency Syndrome)

#### 1. Biological properties

1) Spherical, 100nm, enveloped, spikes.

2) Structure:

3) Genes:

4) Resistance

5) Replication

#### 2. Pathogenesis & immunity

1) Infectious source: patients, infectious people.

2) Transmission pathway:

By blood or blood products;

Sexual transmission;

Vertical transmission: from mother to child.

3) Pathogenesis:

4) Clinical features

#### 3. Diagnosis

Isolation of the virus in culture

The detection of viral components or detection of proviral DNA or RNA

The presence of antibody to HIV antigens in the serum.

#### 4. Control