

# MICROBIOLOGY/INFECTIOUS DISEASE.

## **A. GOALS AND OBJECTIVES:**

1. To promote the learning of microbiology related to infectious diseases in a clinical context.
2. To support student
3. learning towards developing an approach to investigation, diagnosis and treatment for common and important infectious diseases.

## **B. CURRICULUM PLAN SUMMARY:**

Micro/ID objectives in Years 1 to 4 as outlined in the tables below are spiraled to add complexity as students transition from pre- clinical to clerkship years, with the goal of achieving exit competencies, primarily from the Expert domain, but others as well. These exit competencies are achieved by setting milestones for segments of the curriculum. The course and session-level objectives are associated with these milestones. With the exception of the Microbiology section in the Introductory module of Foundations I, micro/ID related session objectives in Years 1 and 2 will typically focus on students' ability to recognize clinical presentations of urgent and common infectious diseases, describe most likely pathogen(s) for the presentation, the investigations required and treatment.

To support student learning, lists of essential 'need to know' pathogens are provided at the end of this roadmap, along with supplemental listings for further advancement of learning.

| <b>C. OBJECTIVES</b>   |  |
|--|--|
| <b>Years One and Two</b>                                     | <b>Milestone Goals</b>   |
| Microbiology section of Introductory Module in Foundations I | 1. Recognize local and systemic clinical features of infection in general  |
|  | 2. Recognize variation in micro-organisms in general terms, including differences between normal flora ecosystems, propensity to cause human disease and factors influencing virulence.<br>- Classify bacteria according to Gram stain reaction and morphology |
|  | 3. Describe common and clinically important bacterial, viral, fungal and parasitic agents implicated in common infectious diseases.  |
|  | 4. Describe methods of transmission of infectious diseases being able to give common examples for each   |
|  | 5. Describe methods of infection control including personal protection strategies and aseptic technique.   |
|  | 6. Describe the different classes and the spectrum of activity of commonly used antibiotics.<br>- name commonly used antibiotics<br>- describe which organisms/type of infection they are commonly used for  |
|  | 7. Begin to recognize the role/value of antibiotic stewardship in minimizing development of antibiotic resistant organisms.  |
| Respiratory  | 1. Tuberculosis disease and TB infection (latent TB)   |
|  | 2. Lower respiratory tract infections including influenza and covid-19   |
|  | 3. Pediatric upper respiratory tract infections including Croup, Tracheitis, Epiglottitis, Retropharyngeal abscess/Tonsillar abscess, otitis media, otitis externa, sinusitis, pharyngitis   |
|  | 4. Respiratory tract infections in special populations- COPD and Cystic Fibrosis   |
| Neurosciences  | 1. Acute and chronic meningitis  |
|  | 2. Encephalitis  |
|  | 3. Cerebral abscess  |
|  | 4. Viral infections  |
|  | 5. Neurocysticercosis  |
|  | 6. Ocular infections- Conjunctivitis, keratitis  |
| Kidney and Urinary Tract                                     | 1. Pediatric UTI   |
|  | 2. Cystitis  |
|  | 3. Pyelonephritis  |
|  | 4. Renal abscess   |
|  | 5. Epididymitis and orchitis   |
|  | 6. Fournier's gangrene   |

|                     |  |
|---------------------|--|
|                     | 7. Asymptomatic bacteruria   |
| MSK                 | 1. Osteomyelitis   |
|                     | 2. Septic arthritis  |
|                     | 3. Septic bursitis/tendonitis  |
| Gastrointestinal    | 1. Peritonitis   |
|                     | 3. Liver abscess   |
|                     | 4. HIV   |
|                     | 5. Peptic ulcer disease  |
|                     | 6. Infectious causes of diarrhea   |
|                     | 7. Acute hepatitis   |
| Cardiovascular      | 1. Valvular disease and endocarditis   |
|                     | 2. Diabetic foot management  |
|                     | 3. Shock and Sepsis  |
| Dermatology         | 1. Folliculitis  |
|                     | 2. Furuncles and Carbuncles  |
|                     | 3. Glandular infections including hordeolum and chalazion  |
|                     | 4. Cellulitis, erysipelas, impetigo,   |
|                     | 5. Fungal skin infections  |
|                     | 6. Infestations- scabies, lice and bed bugs  |
|                     | 7. Warts, growths, blisters/bullae and ulcers  |
|                     | 8. Toxin related infections  |
|                     | 9. Deep tissue infections including necrotizing fasciitis  |
|                     | 10. Lymphocutaneous infections   |
|                     | 11. Ulceroglandular infections including agents of bioterrorism                                  |
| Reproductive system | 1. Cervical dysplasia and HPV  |
|                     | 2. Viral and Bacterial Perinatal infections  |
|                     | 3. PID and tubo-ovarian abscess  |
|                     | 4. Urethritis  |
|                     | 5. Cervicitis  |
|                     | 6. Balanitis   |
|                     | 7. Vaginitis   |
|                     | 8. Valvular disease including warts and ulcers   |
|                     | 9. Puerperal sepsis- endometritis  |
|                     | 2. Mastitis/abscess  |
| Hematology          | 1. Febrile neutropenia   |
| Year 3 and 4        |  |
|                     | 1. Shock/Sepsis<br>-know the definition and clinical presentation of shock/sepsis                |
|                     | 2. Line/catheter infections<br>-know the importance of aseptic technique in infection prevention |
|                     | 3. Fever in the returning traveler (including tropical infections such as malaria and typhoid)   |

|  |  |
|--|--|
|  | -know the importance of a detailed travel history and the relevant risk factors in establishing the diagnosis  |
|  | 4. Infections in immunocompromised hosts<br>- splenectomy<br>- recognize the importance of the innate immune system  |
|  | 5. vaccination recommendations in different populations<br>- infancy and childhood<br>- elderly<br>- splenectomy<br>-recognize the importance of vaccination in infection prevention and control on a personal as well as a population level |
|  | 6. Bites – human and animal  |
|  | 7. Blood and body fluid exposures  |

**Pathogen List:**

Pathogens listed in the **Essential Tables** are an inventory of infectious agents for which graduating medical students should be able to recognize clinical presentations, understand diagnostic tests, and provide management plans (including an appropriate antimicrobial agent..

Pathogens listed in the **Supplementary Tables** are infectious agents for which graduating medical students should be able to recognize clinical presentations. Additional information with respect to investigation and management is not necessary at the level of the undergraduate student.

| <b>Essential to know Gram positive cocci</b> |  |
|--|--|
| <i>Genus</i>                                 | <i>Species</i>   |
| Staphylococcus                               | aureus, Coagulase Negative Staphylococci                 |
| Streptococcus                                | viridans group, pneumoniae, Beta-hemolytic streptococci, |
| Enterococcus                                 | faecium, fecalis   |

| <b>Essential to know Gram positive bacilli</b> |                   |
|--|-------------------|
| <i>Genus</i>                                   | <i>Species</i>    |
| Clostridium                                    | difficile, tetani |
| Listeria                                       | monocytogenes     |

| <b>Essential to know Gram negative bacilli</b> |                |
|--|----------------|
| <i>Genus</i>                                   | <i>Species</i> |
| Escherichia                                    | coli           |
| Pasteurella                                    | multocida      |
| Helicobacter                                   | pylori         |
| Klebsiella                                     | pneumoniae     |
| Pseudomonas                                    | aeruginosa     |
| Salmonella                                     | typhi          |
| Shigella                                       | dysenteriae    |

| <b>Essential to know Gram negative coccobacilli</b> |   |
|---|---|
| <i>Genus</i>  | <i>Species</i>                            |
| Bordetella  | pertussis                                 |
| Haemophilus   | influenzae type B, influenzae non-typable |

| <b>Essential to know Gram negative cocci</b> |                          |
|--|--------------------------|
| <i>Genus</i>                                 | <i>Species</i>           |
| Neisseria                                    | meningitidis, gonorrhoea |
| Moraxella                                    | catarrhalis              |

| <b>Essential to know – Other bacteria</b>   |                             |
|---|-----------------------------|
| <i>Genus</i>  | <i>Species</i>              |
| Chlamydia   | trachomatis,                |
| Respiratory Atypical Infections<br>(Chlamydia pneumoniae,<br>Mycoplasma pneumoniae) |                             |
| Mycobacterium   | tuberculosis, avium complex |
| Treponema   | pallidum                    |
| Anaerobic bacteria (general)  |                             |

| <b>Essential to know – yeasts/molds</b>                      |                    |
|--|--------------------|
| <i>Genus</i>   | <i>Species</i>     |
| Candida  | Albicans, glabrata |
| Dermatophytes (Trichosporon,<br>Microsporum, Epidermophyton) |                    |
| Aspergillus  | fumigatus          |
| Cryptococcus   | Neoformans, gatii  |

| <b>Essential to know – parasites/worms</b> |                |
|--|----------------|
| <i>Genus</i>                               | <i>Species</i> |
| Cryptosporidium                            |                |
| Enterobius                                 | vermicularis   |
| Plasmodium                                 | falciparum     |
| Giardia                                    | lamblia        |

| <b>Essential to know - viruses</b>      |  |
|---|--|
| Human immunodeficiency virus            |  |
| Epstein-Barr virus                      |  |
| Herpes simplex virus                    |  |
| Varicella zoster virus                  |  |
| Influenza                               |  |
| Parainfluenza                           |  |
| Respiratory syncytial virus             |  |
| Norovirus                               |  |
| Rotavirus                               |  |
| Hepatitis A virus                       |  |
| Hepatitis B virus                       |  |
| Hepatitis C virus                       |  |
| Enterovirus                             |  |
| West Nile virus                         |  |
| Human papilloma virus                   |  |
| Measles                                 |  |
| Covid-19 and Monkeypox as new pathogens |  |

| <b>Supplementary - bacteria</b>   |                        |
|---|------------------------|
| <i>Genus</i>  | <i>Species</i>         |
| Aeromonas   | hydrophila             |
| Bacillus  | Anthraxis, cereus      |
| Bartonella  | henselae               |
| Borrelia  | burgdorferi            |
| Campylobacter   | jejuni                 |
| Clostridium   | perfringens, botulinum |
| Corynebacterium   | diphtheriae            |
| Coxiella  | burnetii               |
| Enterobacter  |                        |
| HACEK – Haemophilus aphrophilus, Actinobacillus, Cardiobacterium, Eikenella corrodens, Kingella |                        |
| Legionella  | pneumophila            |

|                 |           |
|-----------------|-----------|
| Lymphogranuloma | venereum  |
| Proteus         | mirabilis |
| Rickettsiae     |           |
| Serratia        |           |
| Vibrio          | cholera   |

|   |
|---|
| <b>Supplementary - yeasts / molds</b>   |
| Dimorphics – Blastomyces, Histoplasma, Coccidioides<br>Pneumocystis jirovecii |

|  |                  |
|--|------------------|
| <b>Supplementary – parasites / worms</b> |                  |
| <i>Genus</i>                             | <i>Species</i>   |
| Taenia                                   | Saginata, solium |
| Toxoplasma                               | gondii           |
| Ascaris                                  | lumbricoides     |
| Strongyloides                            | stercoralis      |

|                                |
|--------------------------------|
| <b>Supplementary – viruses</b> |
| Adenovirus                     |
| Cytomegalovirus                |
| Dengue                         |
| Hepatitis D virus              |
| Hepatitis E virus              |
| Mumps                          |
| Poliovirus                     |
| Rubella                        |
| Smallpox                       |
| Ebola                          |