

**General Medical
Microbiology
and Infectious Disease
BMS 6301**

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Director**
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2003 – 2004 Course Syllabus

Description: This course provides learning opportunities in the basic principles of medical microbiology and infectious disease. It covers mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora. The biology of bacterial, viral, fungal, and parasitic pathogens and the diseases they cause are covered. Relevant clinical examples are provided. The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.

Format: Combination of 1-hour lecture/case-based class sessions and 2-hour case-based discussion/demo lab sessions with small groups (see topical syllabus, below).

Course Director: David L. Balkwill, Ph.D.
Office: Room 526
Office Hours: Open – students are welcome to stop by anytime.

Other Instructors:

Lecture: Myra Hurt, Ph.D.

Small Group Facilitation: Curtis Altmann, Ph.D., Myra Hurt, Ph.D., Edward Klatt, M.D., Graham Patrick, Ph.D., Yanchang Wang, Ph.D.

Required Text:

Medical Microbiology, 4th Ed. (2002) Murray, Rosenthal, Kobayashi, and Pfaller, Mosby-Year Book, ISBN: 0323012132.

Recommended Texts:

Mechanisms of Microbial Disease, 3rd Ed. (1998) Schaechter, Engelberg, Eisenstein, and Medoff, Lippincott, ISBN: 0683076051.

Medical Microbiology & Immunology: Examination & Board Review, 7th Ed. (2002) Levinson and Jawetz, McGraw-Hill/Appleton & Lange, ISBN: 0071382178.

Electronic Resources: <http://www.cdc.gov/mmwr/>

Harrison's Online

Detailed information on weekly assignments, class schedules, coverage of exams, etc. will be posted on the Blackboard website for this course. Copies of all handouts, summaries, Power Point presentations, answers to cases for discussion in the labs, etc. will also be posted at this site.

Topical Syllabus

1-Hour Lecture/Case-Based Class Sessions

Introduction to the Course: learning objectives; course format; evaluation, testing, and grading policies; expectations; etc.

Lecture 01. Bacterial Classification, Morphology & Cell Structure: medically important groups of microorganisms, classification (taxonomy) of bacteria, morphology (cell shapes, Gram stain), ultrastructural features (cytoplasm, cell envelope, external features), bacterial spores.

Lecture 02. Bacterial Metabolism & Growth: nutrient requirements, overview of metabolism, aerobic respiration, anaerobic respiration, fermentation, biosynthesis, bacterial growth.

Lecture 03. Bacterial Genetics – Basic Concepts & Gene Expression: the bacterial genome (chromosome, extrachromosomal elements, bacteriophages), gene organization (operons, cistrons), DNA replication (binary fission, replication rules & fidelity), polymerase chain reaction.

Lecture 04. Bacterial Genetics – Genes, Maintenance & Exchange: mutation & repair (types of mutations, mutagens, DNA repair processes), gene transfer (transposons, extrachromosomal elements, mechanisms of DNA exchange, recombination, genetic engineering, etc.).

Lecture 05. Viral Classification, Structure, & Replication – I: basic characteristics and classification of viruses, virion structure (non-enveloped viruses, enveloped viruses), viral replication: overview, recognition & attachment to host cell, penetration.

Lecture 06. Viral Classification, Structure, & Replication – II: viral replication: uncoating, macromolecular synthesis (general information, transcription and replication of DNA and RNA viral genomes, production of viral proteins), assembly, release from host cell.

Lecture 07. Basic Biology of Fungi: general characteristics, classification, medical importance of major fungal groups, fungal cell structure, fungal morphology, fungal replication, general information on fungal pathogenesis.

Lecture 08. Basic Biology of Parasites: medical importance of parasites & parasitic diseases, classification & structure of protozoa (Sarcomastigophora, Ciliophora, Apicomplexa, Microspora), classification & structure of metazoa

(helminths, arthropods), physiology & replication.

Lecture 09. Commensal & Pathogenic Human Microflora: normal microflora of the human body, dual nature of normal flora with respect to disease, normal flora of major human body systems (respiratory tract & head, gastrointestinal tract, genitourinary system, skin).

Lecture 10. Sterilization, Disinfection & Antisepsis: medical importance of methods, definitions and approaches (sterilization, disinfection, antisepsis), mechanisms of action (physical and chemical agents).

Lecture 11. Transmission of Infectious Microbial Diseases: spread of disease in populations, reservoirs of infection (human, animal, and non-living reservoirs), portals of entry and portals of exit, modes of transmission (contact, vehicles, vectors).

Lecture 12. Mechanisms of Bacterial Pathogenesis: entry into the human body; adhesion, colonization & invasion; pathogenic actions of bacteria (tissue destruction, toxins, immunopathogenesis); mechanisms for escaping host defenses.

Lecture 13. The Gram-Positive Cocci – I: *Staphylococcus aureus* (cutaneous infections, food poisoning, endocarditis, toxic shock syndrome, etc.), *Staphylococcus epidermidis* (endocarditis, catheter & shunt infections, etc.), *Enterococcus* (urinary infections, septicemia, etc.).

Lecture 14: The Gram-Positive Cocci – II: *Streptococcus pyogenes* (pharyngitis, impetigo, erysipelas, rheumatic fever, etc.), *Streptococcus pneumoniae* (pneumococcal pneumonia, otitis media, sinusitis, meningitis, etc.), *Streptococcus agalactiae* (neonatal diseases, other infections).

Lecture 15. The Gram-Positive Bacilli: *Bacillus anthracis* (anthrax), *Listeria monocytogenes* (neonatal diseases, etc.), *Corynebacterium diphtheriae* (diphtheria), *Clostridium perfringens* (gas gangrene, food poisoning, etc.), *Clostridium tetani* (tetanus), *Clostridium botulinum* (botulism), *Clostridium difficile* (gastroenteritis), *Erysipelothrix rhusiopathiae* (erysipeloid).

Lecture 16. The Gram-Negative Cocci & Anaerobic Bacilli: *Neisseria gonorrhoeae* (gonorrhea, PID, etc.), *Neisseria meningitidis* (meningitis, etc.), *Escherichia coli* (gastroenteritis), *Salmonella* (gastroenteritis, enteric fevers, etc.), *Shigella* (shigellosis), *Yersinia* (bubonic plague, enterocolitis), *Vibrio* (cholera, gastroenteritis, etc.), *Campylobacter* (gastroenteritis), *Helicobacter* (gastritis, gastric & duodenal ulcers).

Lecture 17. The Gram-Negative Aerobic Bacilli: *Pseudomonas aeruginosa* (pulmonary, skin & urinary infections, etc.), *Bordetella pertussis* (whooping cough), *Francisella tularensis* (tularemia), *Brucella* (undulant fever, etc.), *Haemophilus* (meningitis, otitis, chancroid, arthritis, etc.), *Legionella pneumophila* (Legionnaires' Disease, Pontiac fever).

Lecture 18. Anaerobes, Actinomyces, Mycobacteria & Mycoplasmas:

Actinomyces (endogenous infections), *Propionibacterium* (acne), anaerobic Gram-negative bacilli (chronic sinusitis & otitis, brain abscesses, skin & tissue infections, etc.), *Nocardia* (pulmonary & cutaneous infections), *Mycobacterium* (tuberculosis, leprosy, etc.), *Mycoplasma* (atypical pneumonia, etc.).

Lecture 19. Spirochete, Rickettsial, & Chlamydial Pathogens: *Treponema pallidum* (syphilis, yaws, etc.), *Borrelia* (relapsing fever, Lyme disease), *Rickettsia rickettsiae* (Rocky Mountain spotted fever), *Rickettsia prowazekii* (epidemic typhus), *Rickettsia typhi* (endemic typhus), *Coxiella burnetii* (Q fever), *Chlamydia trachomatis* (trachoma, urogenital infections, etc.), *Chlamydophila pneumoniae* (pneumonia), *Chlamydophila psittaci* (ornithosis).

Lecture 20. Mechanisms of Viral Pathogenesis: acquisition & infection of target tissue, cytopathogenesis (lytic & nonlytic infections, oncogenic viruses), human host defenses against viral infection, immunopathology, epidemiology of viral diseases, (age, immune status & other host factors), control of viral spread.

Lecture 21. Papovaviruses, Adenoviruses & Poxviruses: Papovaviridae—human papilloma viruses (warts, benign tumors, cervical cancer, etc.), BK virus (cystitis), JC virus (PML); Adenoviridae—adenoviruses (pharyngitis, conjunctivitis, cold-like infections, gastroenteritis, pneumonia, acute respiratory tract disease, etc.); Poxviridae—variola virus (smallpox), molluscipoxvirus (molluscum contagiosum), etc.

Lecture 22. Herpesviruses & Picornaviruses: Herpesviridae—herpes simplex viruses (cold sores, genital herpes, encephalitis, etc.), varicella-zoster virus (chicken pox, shingles, etc.), cytomegaloviruses (congenital disorders), Epstein-Barr virus (mononucleosis, Burkitt's lymphoma); Picornaviridae—rhinoviruses (common colds), polioviruses (polio), Coxsackie viruses (meningitis, encephalitis, myocarditis, pericarditis, cold-like diseases, conjunctivitis, etc.), echoviruses (meningitis, encephalitis, exanthems, myocarditis, pericarditis, etc.).

Lecture 23. Parvoviruses, Paramyxoviruses, Orthomyxoviruses & Reoviruses: Parvoviridae—B19 (fifth disease, aplastic crisis); Paramyxoviridae—parainfluenzaviruses (cold-like diseases, croup, etc.), mumps virus (mumps), measles virus (measles), respiratory syncytial virus (colds, bronchitis, etc.); Orthomyxoviridae—influenzaviruses (influenza, other respiratory infections, etc.); Reoviridae—rotaviruses (gastroenteritis), coltivirus (Colorado tick fever).

Lecture 24. Rhabdoviruses, Togaviruses & Bunyaviruses: Rhabdoviridae—rabies virus (rabies), vesicular stomatitis virus (flu-like disease); Togaviridae—various encephalitis viruses (flu-like disease, encephalitis, etc.), rubella virus (German measles); Bunyaviridae—various encephalitis viruses (flu-like disease, encephalitis), phleboviruses & nairoviruses (hemorrhagic fevers, encephalitis, etc.), hantaviruses (hantavirus pulmonary syndrome, ARDS, etc.).

Lecture 25. Hepatitis Viruses, Retroviruses, Miscellaneous Viruses & Prions: summary of hepatitis viruses; Retroviridae—HIV (AIDS), HTLV (adult acute T-cell lymphocytic leukemia); Calciviruses—Norwalk virus (gastroenteritis); Coronaviridae—coronoviruses (common colds, SARS); Flaviviridae—flaviviruses (encephalitis, dengue hemorrhagic fever, yellow fever, etc.); Filoviridae—Ebola &

Marburg viruses (hemorrhagic fevers); prions.

Lecture 26. Superficial, Cutaneous & Subcutaneous Mycoses: mechanisms of fungal pathogenesis, superficial mycoses (pityriasis versicolor, tinea nigra, black piedra, etc.), cutaneous mycoses (etiology, ecology & epidemiology, clinical manifestations), subcutaneous mycoses (lymphocutaneous sporotrichosis, chromoblastomycosis, phaeohyphomycosis, etc.).

Lecture 27. Systemic and Opportunistic Mycoses: histoplasmosis (reticuloendothelial cytomycosis), blastomycosis (Gilchrist's disease, North American blastomycosis), paracoccidioidomycosis (South American blastomycosis), coccidioidomycosis, cryptococcosis, candidiasis (skin and nail diseases, disseminated infections, etc.), aspergillosis, zygomycosis, *Pneumocystis carinii* pneumonia.

Lecture 28. Intestinal & Urogenital Protozoa: pathogenesis of parasitic disease (exposure & entry, adherence & replication, cell & tissue damage, evasion of host defenses), *Entamoeba histolytica* (amebiasis), *Trichomonas vaginalis* (vaginitis), *Balantidium coli* (gastroenteritis), *Cryptosporidium parvum* (gastroenteritis), *Cyclospora cayentanensis* (gastroenteritis).

Lecture 29. Blood & Tissue Protozoa & Nematodes: *Plasmodium* (malaria), *Leishmania* (visceral & cutaneous leishmaniasis), *Trypanosoma* (African sleeping sickness, Chagas' disease), *Ascaris lumbricoides* (ascariasis), *Trichuris trichuria* (trichuriasis), *Trichinella spiralis* (trichinosis), *Toxocara* (toxocarasis).

Student Presentation with Informatics Skills

In conjunction with the parasitology section of the course, students will be divided into groups and each group will prepare a presentation on one parasitic organism to give to the whole class. Students will use informatics skills to obtain, organize, and present the information.

2-Hour Case-Based Discussion/Demo-Laboratory (Small Group) Sessions

Lab 01. Diagnosis of Infectious Disease – General Principles: collection of specimens, microscopic methods (simple stains, Gram stain & other differential stains, fluorescent stains), biochemical methods, etc..

Lab 02. Molecular & Serologic Diagnostic Methods: cases illustrating the technology of DNA probes, DNA fingerprinting methods, PCR-based methods, precipitation & immunodiffusion, enzyme-linked immunofluorescence assays (ELISA), radioimmunoassay (RIA), etc.

Lab 03. Laboratory Diagnosis of Bacterial Diseases I – Culture & Handling: cases illustrating collection & handling of specimens, types of pathogens to be expected for various body fluids & tissues, etc.

Lab 04. Laboratory Diagnosis of Bacterial Diseases II – Epidemiology: cases illustrating infections related to epidemiologic surveillance.

Lab 05. Bacterial Genetics & Antibiotic Resistance: cases illustrating the role of gene transfer in rapid spread of antibiotic resistance & development of multiple resistance, causes of antibiotic resistance, implications for future practice of medicine.

Lab 06. Aseptic Practice & Nosocomial Infections: cases illustrating the etiology & epidemiology of nosocomial infections, medical & economic significance, techniques for prevention of nosocomial infections.

Lab 07. Laboratory Diagnosis of Viral Disease: cases illustrating use of cytology, electron microscopy, viral isolation & growth (cell culture, etc.), detection of viral proteins & genetic material, viral serology.

Lab 08. Laboratory Diagnosis of Protozoan & Other Parasitic Diseases: cases illustrating the general considerations of life cycle and pathogenesis of infection for intestinal, urogenital & blood infections (collection of specimens, techniques for specimen examination), alternatives to microscopic methods.

Evaluation of Student Performance and Grading

The material for examinations and quizzes will come from lectures, small group sessions, material on the Blackboard site for the course, handouts, and the textbook. The format for written examinations will be multiple choice questions (single best answer).

There will be three integrated block examinations in the Fall semester. These examinations will cover material in all the courses for the four weeks prior to each examination. The microbiology component of each examination will consist of 36 multiple choice questions. There will also be eight laboratory (small group session) quizzes and one parasitology presentation (using informatics skills) in this course. The final grade will be based upon the total score calculated from the total number of points as follows:

32 questions on each of the integrated block examinations	= 108 points
5 questions on each of laboratory (small group session) quizzes	= 40 points
Parasitology presentation	= 10 points
Total	= 158 points

Grading for the course is based on a numeric score calculated as a percentage achieved from all possible points, as follows:

A	= >90%
B+	= 87 – 89.9%
B	= 80 – 86.9%
C+	= 77 – 79.9%

C = 70 – 76.9%

D = 65 – 69.9%

F = < 64.9%

Attendance, Remediation, and Other College of Medicine Policies

The following policies have been adopted by the Florida State University College of Medicine for all courses in the medical curriculum.

Attendance Policy:

Students are expected to attend all scheduled activities. Students are expected to be on time. Being on time is defined as being *ready to start* at the assigned time. If a student has an emergency that prevents her/him from attending a scheduled activity, she/he is to call and notify the Office of Student Affairs and request that they inform the supervisors/professors/clerkship faculty for that activity. If at all possible, the student should also call and, at a minimum, leave a message with one of the course/clerkship directors. *It is important that students realize that their absence or tardiness negatively impacts a number of other people.* Attendance, including tardiness, is part of the student's evaluation for professionalism. Negative evaluations may result in decreased grades and, in severe cases, referral to the college Student Evaluation and Promotion Committee.

Procedure for Notification of Absence:

If the student knows in advance of an upcoming legitimate absence, the "Advance Notification of Absence from Educational Activity(ies)" form should be completed with signatures from the student, the Assistant Dean for Student Affairs, the course or clerkship faculty member and the Course/Clerkship Director. The form will be filed in the Office of Student Affairs. The implications for the absence (*e.g.*, remediation, course grade adjustment, make-up exam, etc.) will be given to the student by the course/clerkship director and final decisions regarding these actions shall rest with the course/clerkship director.

If the absence occurs due to an unforeseen emergency, the student should contact the course/ clerkship director and the Assistant Dean for Student Affairs immediately to report the absence, including the reason for the absence. The implications for the absence (*e.g.*, remediation, course grade adjustment, make-up exam, etc.) will be given to the student by the course/clerkship director and final decisions regarding these actions shall rest with the course/clerkship director.

Remediation Policy for Absences from Examinations, Quizzes,

Small Group Sessions, Laboratory Sessions, Clinical Learning Center Sessions,

Preceptor Visits, and Clerkship Call:

The remediation policies for absences from examinations, quizzes, small group

sessions, laboratory sessions, clinical learning center sessions, preceptor visits, and clerkship call are:

1. **POLICY ON MISSED EXAMINATIONS:** Students are required to take major in-term and final examinations. According to the Curriculum Committee, a student can only be excused from an examination by a course director decision based on the personal situation of the student. The course director will determine the time of the exam make-up session. Also, according to the Curriculum Committee decision and the existence of the FSU-COM honor code, the student will be given the same examination given to the other students. *In this course (BMS 6301), all examinations must be made up within 1 week of returning to class.*
2. **POLICY ON MISSED QUIZZES:** Students are required to take scheduled and unscheduled quizzes in the courses. A student can only be excused from a quiz by a course director decision based on the personal situation of the student. The student must make arrangements with the course director to make up a missed quiz. Also, according to the Curriculum Committee decision and the existence of the FSU-COM honor code, the student will be given the same quiz given to the other students. *In this course (BMS 6301), all quizzes must be made up within 1 week of returning to class.*
3. **POLICY ON MISSED SMALL GROUP SESSIONS, LABORATORY SESSIONS, CLINICAL LEARNING CENTER SESSIONS, PRECEPTOR VISITS AND CLERKSHIP CALL:** The student should contact the course director, small group leader or clerkship director for instructions on remediation of the missed session and material covered. *In this course (BMS 6301), missed small group sessions must be made up within 1 week of returning to class. They will be made up by handing in the answers to the questions in the small group session and a 1-page discussion of the material covered in the session.*

Remediation Policy for Students Who Fail the Course

Remediation of courses/clerkships will be planned and implemented by a combined decision of the Evaluation and Promotion Committee in collaboration with the course/clerkship director.

Unexcused Absences

Each unexcused absence from an academically required small group, laboratory, PBL, or other group activity where students are broken into smaller meeting units, will be penalized by deduction of the points attributable to the quiz administered for that session, if applicable, from the "final point score." Students who have an unexcused absence from an examination will lose the entire score (points) awarded for that examination, and the final grade for the course will reflect this loss.

Students with more than two such absences in the Fall Term will not receive academic credit for the course, and a grade of "F" will be submitted to the Registrar.

Academic Honor Code

Students are expected to uphold the Academic Honor Code published in the Florida State University Bulletin and the Student Handbook: *The Academic Honor System of the Florida State University is based on the premise that each student has the*

responsibility (1) to uphold the highest standards of academic integrity in the student's own work, (2) to refuse to tolerate violations of academic integrity in the University community, and (3) to foster a high sense of integrity and social responsibility on the part of the University community.

Students with Disabilities (ADA Statement)

Students with disabilities needing academic accommodation should:

1. Register with and provide documentation to the student disability Resource Center (SDRC).
2. Bring a letter to the instructor from the SDRC indicating that you need academic accommodations. This should be done within the first week of class. Specific arrangements should be settled with the instructor 5 working days prior to each exam for which accommodations are being requested.

Evaluations

Student evaluations throughout the course are an important way of improving medical education, particularly during the founding years of the College of Medicine. Not only are your comments and suggestions valued, but the evaluation process represents one way for you to become familiar with the peer review process. Peer review is an important quality management function in all branches of medicine. In order for peer review to work properly, it must be taken seriously by both the evaluators as well as those being evaluated. Therefore, we ask that you give careful consideration to evaluations. When making comments, consider what you would say if you were face to face with the person to whom the comments are directed. How would you react if the comments were directed at you? Give thought to how learning resources were used in regard to the way to learn best. What worked for you and what did not? How is your time used optimally? Are you making adequate progress? Are you being challenged to improve? Be specific. Ultimately, your use of the evaluation process can help you learn how to improve your own medical practice.

Course Objectives

1. Develop a knowledge base of principles of microbial taxonomy, structure, physiology, and function.
2. Develop a vocabulary for describing the taxonomy of microbial organisms and the diseases they produce.
3. Develop familiarity with the major types of pathogenic microorganisms and the diseases that they produce in humans.
4. Demonstrate the ability to use the laboratory to diagnose infections, including appropriate specimen collection and test ordering.
5. Demonstrate the ability to interpret laboratory findings in the context of the patient's presentation and findings.
6. Demonstrate knowledge of general categories of therapeutic modalities available to treat infections.
7. Demonstrate knowledge of public health surveillance and measures to deal with infections in a population.
8. Demonstrate problem solving ability and diagnostic reasoning with infectious

diseases.

9. Develop an ability to use evidence-based medicine to determine methods for diagnosis and treatment of infections.
10. Demonstrate knowledge of clinical manifestations in the history and physical examination that point to infection.
11. Demonstrate the ability to correlate microbial infection with radiologic findings.
12. Demonstrate professional attitudes and behaviors towards others.

Integration with College of Medicine Goals and Objectives

Knowledge

- Demonstrate the application of the scientific bases of health, disease, and medicine to common and high impact medical conditions in contemporary society.
- Describe the development, structure and function of the healthy human body and each of its major organ systems at the macroscopic, microscopic, and molecular levels.
- Recognize and discuss the implications of altered structure and function (pathology and pathophysiology) of the body and its major organ systems that are seen in various diseases and conditions.
- Identify changes in the structure and function of the human body associated with the aging process and be able to distinguish normal changes associated with aging from those that denote disease.
- Describe the molecular basis of diseases and maladies and the way in which they affect the body (pathogenesis).
- Demonstrate the ability to use basic biobehavioral and clinical science principles to analyze and solve problems related to the diagnosis, treatment, and prevention of disease.
- Describe strategies to support life long learning via both print and electronic sources to assist in making diagnostic and treatment decisions (*e.g.*, practice guidelines) and to remain current with advances in medical knowledge and practice (*e.g.*, medical information data bases).

Skills

- Demonstrate the appropriate use of laboratory tests and radiographic studies in making diagnostic and treatment decisions.
- Demonstrate the ability to evaluate the patient's medical problems and to formulate accurate hypotheses to serve as the basis for making diagnostic and treatment decisions.
- Demonstrate the ability to acquire new information and data and to critically appraise its validity and applicability to one's professional decisions, including the application of information system technologies for support of clinical decision-making.
- Demonstrate the ability to organize, record, research, present, critique, and manage clinical information.
- Demonstrate the ability to communicate compassionately and effectively, both verbally and in writing, with patients, their families, colleagues and others with whom physicians must exchange information in carrying out their responsibilities.
- Demonstrate the ability to work effectively as part of a health care team, with appreciation for the multiple contributions of other health care professionals and

agencies to the health of the individual and the health of the community.

Attitudes/Behaviors

- Demonstrate professionalism and high ethical standards in all aspects of medical practice, specifically competence, honesty, integrity, compassion, respect for others, professional responsibility and social responsibility.
- Demonstrate awareness of the health care needs of aging patients and a willingness to care for the elderly.