

Summer Medical Neuroscience 2009

CBN 215

Course Description

Summer Medical Neuroscience at the University of South Alabama College of Medicine is a team-taught, interdisciplinary course aimed for second year medical students. The course content is nearly identical to the Spring semester course given to medical students at this College of Medicine. In 2007 the semester version of the course placed the class in the 74th percentile nationally among Neuroscience Miniboard examinees and significantly above the national mean on the Special Senses/Neuroscience component STEP1.

The overall objective is to provide students with a fundamental understanding of the human nervous system in health and disease. This is accomplished through an integrated series of basic neuroscience lectures with a heavy emphasis on clinical problem-solving skills, self-directed and tutorial-based laboratories, case studies presented in a small group discussion format and self-study utilizing internet-based resources and software programs.

Building on knowledge of the development, histology and peripheral anatomy of the nervous system gained through gross anatomy and histology courses, Medical Neuroscience teaches essential principles of cellular and molecular neurobiology, neuroanatomy, neurophysiology, neurochemistry, neuropathology, systems neuroscience and higher cortical function. Students are provided with both a broad conceptual framework and acumen necessary for further clinical study of the normal and malfunctioning nervous system. Relevant topics in neurology, neurosurgery, ophthalmology and neuroradiology are introduced.

This course begins by laying down an anatomical and clinical framework through orientation to gross structures of the CNS and an introduction to the neurologic examination. Concise reviews of high-yield developmental anatomy and neurohistology follow as segues for the topics of congenital diseases and neuro-oncology. Students subsequently learn the anatomy and disorders of the cerebrospinal fluid circulatory system and prominent vasculature. This initial section on gross anatomy and correlative radiologic anatomy culminates with an introduction to neurotrauma, including the major types of intracranial bleeds.

Against this structural context, the course moves to the molecular and subcellular levels to address principles of neural transmission by covering neurotransmitter metabolism, electrical signaling, myelination and related

toxicology. This material serves as foundation for the subsequent course emphasis on the functional anatomy of neural pathways.

Students learn systems neuroanatomy and neurophysiology by starting with the major ascending somatosensory pathways, adding descending motor pathways, and understanding how sensorimotor integration is achieved at spinal, cerebellar, basal ganglia and cortical levels. Prototypical spinal cord injuries and neurodegenerative disorders of cerebellum and basal ganglia are emphasized through patient problem-solving exercises.

A section on visual afferent system function and visual field problem-solving exercises is followed by the challenge of learning the functional organization of the brainstem and how to localize brainstem injuries based on cranial nerve and long tract signs. Integrated lectures introduce the neurophysiology of special senses.

Medical Neuroscience culminates with coverage of fundamental homeostatic mechanisms of the CNS, emphasizing central autonomic control, neuroendocrine regulation and cortical arousal, drug seeking behaviour and behavioral state (e.g. sleep-wakefulness, motivation and reward systems, mood). Topics on limbic and higher order cerebral function address abilities, activities and dysfunction of the cerebral cortex we view as unique to, or having their highest level of development in, humans (e.g., abstract thinking and language). Finally, the neurology and pathology of dementias receives special emphasis.

Course Objectives

Are designed to provide students with:

- Integral knowledge of the anatomic organization (conventional and radiological), physiology and prevalent neuropathologic disorders of the human nervous system
- Exposure to clinical neuroscience and related disciplines
- Neurological problem-solving skills through analysis of case-based study and an emphasis on functional neuroanatomy
- Knowledge of electronic resources accessible for life-long education in basic and clinical neuroscience

Student Goals

- To acquire an anatomical knowledge base of the CNS which enables the clinician to deduce and predict the nature and location of prevalent and prototypical neurological disorders and injuries
- To acquire an introductory understanding of neuroimaging modalities and radiologic anatomy of the CNS
- To understand how the functional integrity of the CNS is clinically tested
- To acquire a fundamental understanding of the neurochemical and neurophysiologic mechanisms of neural transmission both in normal function and in relationship to the pathobiology of prevalent disease and metabolic and toxic mechanisms
- To review and extend knowledge of the embryologic origins and developmental dynamics of the nervous system in relationship to the major developmental disorders of the CNS and PNS
- To understand the anatomic and physiologic limitations on drug delivery to the nervous system and how this problem is circumvented
- To understand the regeneration potential of the nervous system and the determining mechanisms
- To learn the tumorigenic potential of neural cell types and acquire an introductory knowledge of the neuropathological distinction of tumor types
- To know the gross neuropathological features and pathobiology underlying neuroinjury, neural tumors and prevalent or classic degenerative disorders of the nervous system
- To acquire and utilize a webliography of high-yield internet-based resources for continuing medical education in neuroscience.

Teaching Formats

1. *Published Material*

Assigned readings in required textbooks and webliography exercises will be announced. We will use the Haines Atlas and its interactive CD-ROM for self-guided laboratory exercises on cross sectional anatomy. It is acceptable for Students coming from other medical schools to use texts and other atlases used by their institutions. The faculty approves the following:

Approved textbooks/CD-ROMs:

Purves, D. et al., Neuroscience, Sinauer , 4th ed. (2007)

Blumenthal, H. Neuroanatomy through Clinical Cases, Sinauer, 1st ed. (2002)

Haines, D. Neuroanatomy: An Atlas of Structures, Sections and Systems. Urban & Schwarzenberg, 7th ed. (2007) including on-line Atlas (\$65.95)

Haines, D. Fundamental Neuroscience for Basic and Clinical Applications. Elsevier, 3rd ed, (2006)

Fix, BRS Neuroanatomy, 4th edition, Lippincott Williams & Wilkins (2007)

Nolte, J. The Human Brain, Mosby, Inc., 6th ed., (2009)

2. *Internet*

All Medical Neuroscience lectures, case studies and laboratory exercises will be distributed on CD or flash drive. A lap top computer is required.

3. *Lectures*

The course includes basic science lectures including a heavy emphasis on clinical cases in order to effectively prepare students for STEP1 and clerkships . in the clinical neurosciences. Unless specifically stated, exam questions will be drawn from all lectures.

4. Laboratories

Labs will be held in the Gross Anatomy teaching lab for hands-on and DVD-assisted exercises, or in the 3rd floor laboratory suite for tutorials using electronic images of Weigert-stained histologic sections.

Dissections on DVD. Faculty will record tutorial dissections on DVD for student distribution. Such recordings are for internal student use only and remain the intellectual property of the author. Under no circumstances are COM students permitted to show, copy or distribute these recordings to parties outside the University of South Alabama College of Medicine without the express permission of both the author and author's departmental Chairperson.

5. Case Studies

Prepared small group presentations. Case Study sessions are scheduled periodically during the course. Each session will cover 3-4 cases related to a general topic, e.g. intracranial bleeds. Cases are prepared by the faculty before the course begins but will be presented by the students to each other with faculty facilitators present for productive discussion. Each presentation should last 20-30 minutes and be in a powerpoint format. Close attention should be paid to the patient history and clinical presentation, interpretation of neurologic exam findings and diagnosis, explanation of the functional neuroanatomy underlying the patient deficit and anticipated questions from the audience. Students are encouraged to incorporate representative neuroimages in their presentations. It is imperative that presenting groups carefully review the answers to the question set provided at the end of each case. Each midterm will include questions taken from the case sessions. Students are encouraged to consult with course faculty on cases prior to presentations.

Teaching/reviewing a concept with your classmates in this format will enhance your own learning proficiency. This exercise begins to challenge students to think on their feet in the manner they will face in the neurology clerkship.

Grading Policy

1. Components and Examinations

Three equally weighted exams and a class discussion component are calculated the final course grade as tabulated below:

% of Grade

Midterm 1	30%
Midterm 2	30%
Neuroscience NBME	30%
Class discussion	<u>10%</u>
	100%

The NBME consists of 125 multiple-choice questions and lasts 2.5 hrs.

2. *Computation of course grade*

Final percentage scores (100% possible) will be rounded to the nearest 0.5% to determine course letter grades, e.g, $\geq 79.50 = 80$; $\leq 79.49 = 79$, according to the scale:

A	=	90	-	100
B	=	80	-	89
C	=	75	-	79
D	=	70	-	74
F	=	<70		

A composite percentage of 70 is required for a passing grade.

Course Policies and Procedures

Students are responsible for reading and adhering to the following procedures and policies:

Examinations

1. Content

There will be two midterm examinations and a final examination, the Neuroscience NBME. The questioning format is multiple-choice. The large majority of questions will be written as short case clinical vignettes to prepare you for the standardized national examinations, the Neuroscience NNBME and STEP1. Each exam covers new material from lectures, labs and case studies, although midterms exams are fundamentally cumulative by nature of the subject matter.

3. Viewing Results and Make-up Exams

Following each midterm examination, students will discuss the questions with the faculty.

Make-Up Exams. *Students qualify for a make-up examination only in the event of a serious medical illness to the student, a death in the immediate family, or an unforeseen crisis. The student must notify the Course Director beforehand. All medical illness must be verified with a signed physician's excuse. The student will arrange with the Course Director to schedule the make-up examination.*

Attendance

You are expected to attend all lectures (basic science and clinical), small group case studies, and laboratories, and to arrive **on time** for each of the above.

Recording of Lectures

Audio-recording of lectures in the Medical Neuroscience course is permitted at the discretion of the Course Director and Faculty.

Students With Disabilities

In accordance with the “Americans With Disabilities Act”, students with *bona fide* disabilities will be afforded reasonable accommodation. The Office of Special Student Services will certify a disability and advise faculty members of reasonable accommodations. If you believe this may pertain to you, please see the Course Director. All communications between you and Course Director will be kept in strict confidence.

Faculty

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