

**SYLLABUS
SPRING 2013**

COURSE: NSC 4358.001 NEUROBIOLOGY OF PAIN

Instructor: Aage R. Møller PhD

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Class schedule: Main Campus:

MW 1:00 PM - 2:15 PM MC2.410 (Library)

January 14, 2013

Class text: Møller AR.: "PAIN: Its Anatomy, Physiology and Treatment"

(The book will be provided by the Instructor)

Supplementary readings:

Brodal P.: The Central Nervous System 4th ed
New York, Oxford University Press, 2010, \$69.50
ISBN 978-0195381153, 0195381157

Wall, PD.: Pain: The science of suffering. Columbia University Press, 2002.

List price: \$23.50

Grading:

1. Midterm Exam (take home) distributed February 24; due February 28:
Covers the first section to February 28th.

2. Final Exam (take home) distributed April 25; due May 2nd

Results of midterm test will not count to the final grade.

Course purpose: To develop an understanding of the anatomical and functional basis for pain.

The course will include reading assignments from a book and from handouts.

The course will cover the following topics:

1. Students will understand the basic mechanisms involved in the different kinds of pain.
2. Understand how noxious stimuli can activate pain circuits in the dorsal horn of the spinal cord and in the caudal part of the trigeminal nucleus.
3. Know the anatomy and basic physiology of sense organs for noxious stimuli.
4. Know the anatomy of the ascending pain pathways
5. Know the anatomy of descending pain pathways.
6. Understand the difference between peripheral and central pain.
7. Know the difference between peripheral and central sensitization and understand the basic principles underlying these two forms of sensitization
8. Understand the anatomical and functional basis for such phenomena as hyperalgesia, allodynia and “wind-up”
9. Understand how hyperalgesia is related to sensitization.
10. Understand principles of neuropathy and central neuropathic pain.
11. Understand the difference between somatic pain and visceral pain.
12. Know many of the neural transmitter substances involved in different forms of pain
13. Understand the basic principles of pain relief, using drugs, electrical stimulation of the peripheral and central nervous system.
14. Know about placebo effect and hypotheses sounding this phenomenon

Course layout

This is a systems oriented course covers the anatomical and physiologic basis for different forms of pain. The course emphasizes the similarities and differences between the different forms of pain and describes the basic features of neural processing of pain signals in the dorsal horn of the spinal cord and the brain. The anatomy of both the classical and the non-classical ascending pathways are described in detail. The transformation that occurs in the nuclei of the ascending neural pathways and the processing that occurs at different levels of the central nervous system is discussed. The anatomy and the function of the descending systems that can control transmission of pain signals are discussed. Peripheral and central sensitization and the basis for such phenomena as hyperalgesia, allodynia and the wind-up phenomena are discussed. The physiological and molecular basis for treatment of pain is discussed. Treatment of pain has a large placebo effect and hypotheses for that are discussed. The pathophysiology of some common disorders of sensory systems and the role of neural plasticity in creating symptoms and signs of disease are discussed.

OUTLINE

Acute pain

Nociception, general

Anatomy or receptors

 Pain pathways

Physiology

 The dorsal horn and brainstem

Processing in the dorsal horn

Cause of nociceptive pain

Trauma

Inflammation

 Viscera

 Referred pain

Neuropathic pain

 Trauma to nerves

Neuralgia

Viral infections

Reflex sympathetic dystrophy (or CRPS I & II)

Modulation of pain

Peripheral modulation and sensitization

Relation between sensitization and primary hyperalgesia

Modulation of pain at the dorsal horn

Central neuropathic pain

Phantom pain

Central sensitization

Relation between sensitization and secondary hyperalgesia

The role of neural plasticity in central pain

Dorsal horn

Different modes of function

Central modulation of pain
Role of NMDA receptors
COX1 & 2
Cognitive aspects of pain
Emotional aspects on pain
Treatment of pain
 Measurement of pain
Opioids
 Addiction
NSAIDs
COX2 inhibitors
SSRIs
Hypnosis
Transderm electric nerve stimulation (TENS)
Acupuncture
Electrical stimulation of spinal cord and brain structures
Placebo effect
Cognitive aspects on pain treatment
Darwinian aspects on pain

12/10/12