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Format: During our Tuesday meetings, a lecture will be presented as an overview of a topic. During the Thursday meetings, we will have a journal club format for students to present research articles on the same topic.

Goals: This course will provide an in-depth discussion of the interface of hormones and the nervous system. The course is intended for undergraduate students interested in the biological basis of behavior. The topics will include sex differences in the brain, hormone action in the brain, and the control of energy balance. Although most of the material will focus on animal models, the topics will be related to mental health and weight maintenance in humans. The specific goals of the course are: 1) to involve students in clinically relevant, cutting edge and paradigm-shifting ideas in the scientific literature; 2) expose students to drug mechanisms for current, common therapies for neuroendocrine problems; and 3) foster multidisciplinary approaches to understanding brain-hormone interactions.

Grading: Students will be evaluated based on five (5) written assignments. There will be three one-page papers focused on drug treatments (10% each). There also will be one five-page paper focused on a neuroendocrine disorder (20%). In addition, there will be one 10-page paper focused on proposing research on a novel drug/therapy for a neuroendocrine health problem (30%). Finally, grades also will be based on participation in class discussions and journal clubs (20%).

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Neuroendocrinology Journal Club

"Journal Clubs" will occur every Thursday throughout the semester. Students should be prepared to discuss assigned journal articles, including an explanation of why and how the experiments were done, what was discovered, and what the authors conclude. Students are encouraged to describe any criticisms they have of the assigned readings. Participation in the Journal Club discussions is an important component of the final grades (20%). The readings will be posted on Blackboard (courseweb.upenn.edu).

2 Jan 24 Sexual Differentiation


3 Jan 29, 31 Hormone Receptors


4 Feb 5, 7 Brain targets of sex hormones


5 Feb 12, 14 Monogamy

CD38 is critical for social behaviour by regulating oxytocin secretion. 

Feb 19, 21 Sex and mood disorders

Steiner M. Dunn E. Born L. 
Hormones and mood : from menarche to menopause and beyond. 

Bielsky IF. Hu SB. Young LJ. 
Sexual dimorphism in the vasopressin system: lack of an altered behavioral phenotype in female V1a receptor knockout mice. 
Behavioural Brain Research. 164(1):132-6, 2005

Sex and pain
Feb 26, 28

Cairns BE. 
The influence of gender and sex steroids on craniofacial nociception 

Morgan MM. Fossum EN. Stalding BM. King MM. 
Morphine antinociceptive potency on chemical, mechanical, and thermal nociceptive tests in the rat. 

Mar 4, 6 Sexual ambiguities

Mar 20 Part 2: Fat Biology

Novak CM. Levine JA. 
Central neural and endocrine mechanisms of non-exercise activity thermogenesis and their potential impact on obesity 

Irani BG. Dunn-Meynell AA. Levin BE. 
Altered hypothalamic leptin, insulin, and melanocortin binding associated with moderate-fat diet and predisposition to obesity. 
Endocrinology. 148(1):310-6, 2007

Mar 27 Insulin Secretion

Glucose sensing mechanisms in the pancreatic beta cells. 
Philosophic Transactions of the Royal Society B. 360: 2211-2225, 2005

11 Apr 3 Insulin Action


12 Apr 10 Brain targets of energy hormones


13 Apr 17 Stress and energy balance


14 Apr 22, 24 Sex and fat

Writing Assignments

Deadlines:
  Three one-page drug write-ups: Due Jan 29, Feb 19, Mar 18
  One five-page disease paper: Due April 8
  One 10-page novel drug proposal: Due April 29

Lists of drugs and diseases are provided as possible topics for these papers.

Drugs for first paper: Clomid, Lupron, Metformin (as treatment for PCOS)

Drugs for second paper: Avandia, Meridia, Byetta, Januvia

Drugs for third paper: Ritalin, Pramlintide, Rimonabant

Diseases for fourth paper:

Polycystic ovarian syndrome; Turner’s Syndrome; Congenital Adrenal Hyperplasia; Cushing’s syndrome, Galactorrhea, Kallman’s syndrome, Metabolic Syndrome, Prader-Willie syndrome. If students wish to write about other diseases, they should get prior approval from the professor.

The drug write-ups will describe the mechanisms of action of commonly prescribed drugs. Describe each drug’s action at the most cellular level you can understand, which should progress during the semester. The kind of information to include should be: the protein/receptor/enzyme targeted by the drug; the neurotransmitter/hormone system affected, the reason this pharmacological manipulation has a therapeutic outcome (if known); site of action in nervous system; common side effects.

The disease paper will describe the known pathology of neuroendocrine disorders. Describe the pathology at the most cellular level you can understand. The kind of information to include should be: the incidence of the disease; the genetic versus environmental cause, the mechanism of any available treatments, the shortcomings of any treatments, and the research potential (in your opinion) for this disease.

The novel treatment proposal should have the following sections: 1) Background information on the disease targeted, 2) the Significance of your novel treatment, if it works, 3) the Logic of why you expect your novel treatment to work, 4) three simple Experiments that would test the premise of your proposed treatment. Creativity counts in this assignment.