Neuroendocrinology, Spring 2008
BBB 460 and Psych 439
Tues-Thurs, 10:30-11:50 am, Solomon Lab room C21

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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%).

Week	Dates	Topic
1	Jan 17	Part 1: The Sexual Brain
2	Jan 22, 24	Sexual Differentiation
3	Jan 29, 31	Hormone Receptors
4	Feb 5, 7	Brain targets of sex hormones
5	Feb 12. 14	Monogamy
6	Feb 19, 21	Sex and mood disorders
7	Feb 26, 28	Sex and pain
8	Mar 4, 6	Sexual ambiguities
		SPRING BREAK
9	Mar 18, 20	Part 2: Fat Biology
10	Mar 25, 27	Insulin Secretion
11	Apr 1, 3	Insulin Action
12	Apr 8, 10	Brain targets of energy hormones
13	Apr 15, 17	Stress and energy balance
14	Apr 22, 24	Sex and fat
15	Apr 29	Conclusions

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

McCarthy MM. Konkle AT.
When is a sex difference not a sex difference?
Frontiers in Neuroendocrinology. 26(2):85-102, 2005.

Becker JB. Arnold AP. Berkley KJ. Blaustein JD. Eckel LA. Hampson E. Herman JP. Marts S. Sadee W. Steiner M. Taylor J. Young E.
Strategies and methods for research on sex differences in brain and behavior.
Endocrinology. 146(4):1650-73, 2005.

3 Jan 29, 31 Hormone Receptors

Mani SK.
Signaling mechanisms in progesterone-neurotransmitter interactions.
Neuroscience. 138(3):773-81, 2006.

Ronnekleiv OK. Kelly MJ.
Diversity of ovarian steroid signaling in the hypothalamus.
Frontiers in Neuroendocrinology. 26(2):65-84, 2005.

4 Feb 5, 7 Brain targets of sex hormones

Kauffman AS. Park JH. McPhie-Lalmansingh AA. Gottsch ML. Bodo C. Hohmann JG. Pavlova MN. Rohde AD. Clifton DK. Steiner RA. Rissman EF.
The kisspeptin receptor GPR54 is required for sexual differentiation of the brain and behavior.
Journal of Neuroscience. 27(33):8826-35, 2007.

Boulware MI. Kordasiewicz H. Mermelstein PG.
Caveolin proteins are essential for distinct effects of membrane estrogen receptors in neurons.
Journal of Neuroscience. 27(37):9941-50, 2007.

5 Feb 12. 14 Monogamy

Wismer Fries, A.B., T.E. Ziegler, J.R. Kurian, S. Jacoris, S.D. Pollak.
Early experience in humans is assocated with changes in neuropeptides critical for regulating social behavior.
PNAS 102: 17237-17240, 2005.

Jin D. Liu HX. Hirai H. Torashima T. Nagai T. Lopatina O. Shnayder NA. Yamada K. Noda M. Seike T. Fujita K. Takasawa S. Yokoyama S. Koizumi K. Shiraishi Y. Tanaka S. Hashii M. Yoshihara T. Higashida K. Islam MS. Yamada N. Hayashi K. Noguchi N. Kato I. Okamoto H. Matsushima A. Salmina A. Munesue T. Shimizu N. Mochida S. Asano M. Higashida H.
CD38 is critical for social behaviour by regulating oxytocin secretion.
Nature. 446(7131):41-5, 2007

6 Feb 19, 21 Sex and mood disorders

Steiner M. Dunn E. Born L.
Hormones and mood : from menarche to menopause and beyond.
Journal of Affective Disorders . 74(1):67-83, 2003.

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

7 Feb 26, 28 Sex and pain

Cairns BE.
The influence of gender and sex steroids on craniofacial nociception
Headache. 47(2):319-24, 2007

Morgan MM. Fossum EN. Stalding BM. King MM.
Morphine antinociceptive potency on chemical, mechanical, and thermal nociceptive tests in the rat.
Journal of Pain. 7(5):358-66, 2006

8 Mar 4, 6 Sexual ambiguities

9 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
Journal of Neuroendocrinology. 19: 923-40, 2007.

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

10 Mar 27 Insulin Secretion

MacDonald, P.E., J.W. Joseph, and P. Rorsman.
Glusose sensing mechanisms in the pancreatic beta cells.
Philosophic Transactions of the Royal Society B. 360: 2211-2225, 2005

Gallardo, N., E. Bonzon-Kulichenko, T. Fernandez-Agullo, E. Molto, S. Gomez-Alonso, P. Blanco, J. M. Carrascosa, M. Ros, and A. Andres.
Tissue-specific effects of central leptin on the expression of genes involved in lipid metabolism in liver and white adipose tissue.
Endocrinology 148:5604-5610, 2007.

11 Apr 3 Insulin Action

Levin BE.
Neuronal glucose sensing: still a physiological orphan?
Cell Metabolism. 6(4):252-4, 2007

Jackson MB. Ahima RS.
Neuroendocrine and metabolic effects of adipocyte -derived hormones.
Clinical Science. 110(2):143-52, 2006.

12 Apr 10 Brain targets of energy hormones

Dhillon J, Zigman JM, Ye C, Lee CE, McGovern RA, Tang V, Kenny CD, Christiansen LM, White RD, Edelstein EA, Coppari R, Balthasar N, Cowley MA, Chua S, Elmquist JK, Lowell BB. 2006.

Leptin directly activates SF1 neurons in the VMH and this action by leptin is required for normal body-weight homeostasis.
Neuron 49:191-203.

13 Apr 17 Stress and energy balance

Dallman MF. Pecoraro NC. la Fleur SE.
Chronic stress and comfort foods: self-medication and abdominal obesity
Brain, Behavior, & Immunity. 19(4):275-80, 2005.

Adam TC. Epel ES.
Stress, eating and the reward system
Physiology & Behavior. 91(4): 449-58, 2007.

14 Apr 22, 24 Sex and fat

Flanagan-Cato, L.M., S.J. Fluharty, E.B. Weinreb, and D.R. LaBelle.
Food restriction alters neuronal morphology in the hypothalamic ventromedial nucleus of male rats.
Endocrinology, 149: 93-99, 2008.

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.