

Endocrinology - Biology 317, 319, 519 - Lecture

Fall 2017

MWF 1:00-2:00

M-01-0409

Dr. Kenneth Campbell

ISC - 5720

W 11:00 – 1:00

Syllabus

Date	Day	Topic	Suggested Reading		
<i>These lectures introduce basic information about endocrine systems and their components.</i>					
09/06	W	Chemical Communication Systems	M 1	G 1	
09/08	F	Hormones & Receptors I	M 1	G 1	
09/11	M	Hormones & Receptors II	M 1	G 1	
<i>We move to examine how hormones produce their actions in target cells, the biochemical and cell physiological events that make up the several mechanisms of hormone action.</i>					
09/13	W	Transduction & Effectors I: cAMP, PIPs, Ca ⁺⁺	M 1	G 1	
09/15	F	Transduction & Effectors II: RAS, Steroids, etc.	M 1	G 1	
<i>The anatomical sources and targets of hormones are discussed and a few of the approaches for evaluating the qualitative and quantitative properties of hormones are covered.</i>					
09/18	M	Anatomical Organization	M 2-9	G 1,4,7-9,12,13,17	
09/20	W	Measurement Methodology	M 1	G 3	
<i>Peptide and protein hormones are introduced in more detail including sites of production of releasing and inhibiting factors controlling anterior pituitary cells, the products of those cells, and the feedback loops involved.</i>					
09/22	F	Peptide and Protein Production	M 1,3	G 1,4	
09/25	M	Hypothalamic Hormones	M 2	G 1,4,5	
<i>We consider how endocrine events interact with the basic controls on cell division and growth and how these events may become disrupted in cancer.</i>					
09/27	W	Oncogenes, Products & Cell Cycles I		G 1,21,22	P 1-9
09/29	F	EXAM 1			
10/02	M	Oncogenes, Products & Cell Cycles II		G 1,21,22	P 1-9
<i>Pituitary hormones are covered as related groups and linked to physiological controls and actions.</i>					
10/04	W	LH, FSH, TSH & hCG	M 3,8,9	G 1,4,7,12,13,15,16	
10/06	F	GH, PRL, hPL, IGFs, & GHbPs: I	M 2,3	G 1,4,6,15	
10/09	M	COLUMBUS DAY HOLIDAY	--	--	
10/11	W	GH, PRL, hPL, IGFs, & GHbPs: II	M 2,3	G 1,4,6,15	
10/13	F	POMC & ACTH	M 2,3,7,10	G 1,4,9,10	
<i>Consideration now moves to the physiological and biochemical events involved in synthesis and control of the formation of steroids, the best known of the small lipophilic hormones that play key roles in regulation of central metabolism, growth, and immune function (adrenal fasciculata and reticularis steroids), salt and water balance and blood pressure control (adrenal glomerulosa steroids), and gonadal functions including gametogenesis and the control of pregnancy and birth.</i>					
10/16	M	Lipoproteins and Steroid Synthesis	M 1,6,8,9	G 1,9,12,13,16,19	
10/18	W	Steroid Control Systems	M 1,6,8,9	G 1,4,9,10,12,13,15,16,23	
<i>Coverage moves to the critical role of the endocrine system in maintenance and regulation of the reproductive tract in both the male and the female. Gamete production is examined with emphasis on both the similarities and the differences that exist between the mammalian sexes. Consequences of the comparisons and contrasts should be considered. The endocrinology of pregnancy is covered along with major developmental milestones such as fertilization, implantation, major organ formation, sex determination, and birth. The segment concludes with the endocrine controls supporting the newborn (lactation) and development to reproductive capacity (puberty).</i>					
10/20	F	Meiosis and Gametogenesis	M 8,9	G 12,13	

10/23	M	Testicular Physiology & Spermatogenesis	M 8	G 12	
10/25	W	Ovarian Physiology & Oogenesis	M 9	G 13	S
10/27	F	EXAM II	--	--	
10/30	M	The Female Cycle	M 9	G 13	S
11/01	W	Fertilization & Nidation	M 9	G 12,13,16	S
11/03	F	Maternal-Feto-Placental Unit	M 9	G 16	S
11/06	M	Pregnancy & Pregnancy Loss	M 9	G 13,16	S
11/08	W	Sex Determination & Differentiation	M 8,9	G 13,16	V
11/10	F	Parturition	M 9	G 16	
11/13	M	Breast Physiology & Lactation	M 9	G 16	
11/15	W	Puberty	M 8,9	G 6,15	
11/17	F	Growth	M 8,9	G 1,4,6,15	

We turn to consideration of other key endocrine control systems. The role of the thyroid and the hormones formed in it in the processes of central metabolism and development is covered first. The cell anatomy of the thyroid, its regulation by pituitary hormones, and the cellular physiology/ biochemistry involved in thyroid hormones is covered.

11/20	M	Thyroid Hormones & Function I	M 2-4	G 1,4,7	L
11/22	W	Thyroid Hormones & Function II	M 2-4	G 1,4,7	L
11/24	F	THANKSGIVING HOLIDAY	--	--	

Next the endocrine pancreas is discussed along with its influence on central glucose metabolism. In addition, we will examine the more diffuse regulation of appetite involving several hypothalamic factors and the adipose and stomach derived protein and peptide hormones.

11/27	M	Insulin, Glucagon & Diabetes	M 7,10	G 17-20	
11/29	W	Leptin and Appetite Control	M 7,10	G 17-20	
12/01	F	EXAM III	--	--	

Salt and water balance along with blood pressure control involving hormones and hormonally controlled enzymes from the adrenal cortex and the kidney glomerulus complex, respectively, are discussed. Peptide hormones from the heart atrium are introduced as counterbalances that help maintain homeostasis in this important system.

12/04	M	Renin, Angiotensin, Aldosterone & ANF	M 6,10	G 5,10,23	
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We close with a discussion of the hormonal controls involved in maintaining calcium ion balance in blood and the associated impacts on calcium uptake from the gut, reuptake from the urine, and storage or retrieval from bone. Protein hormones from the parathyroid and thyroid glands are covered as well as the biochemistry of synthesis and actions of the sterol-derived, small hormone calcitriol. The cell anatomy and physiological changes in bone that occur in response to these hormones are discussed.

12/06	W	CT, PTH & Vitamin D, Bone Metabolism I	M 5	G 8,23	
12/08	F	CT, PTH & Vitamin D, Bone Metabolism II	M 5	G 8,23	
12/11	M	Catch up and/or summarize			
12/13	W	Catch up and/or summarize			

**Text chapters or readings: M = Molina, G = Gardner, P = Pecorino, L = Løhre, S=Speroff, V= Valerio*

Notes:

Add/Drop Ends Tuesday, September 12, 2017

Daylight Saving Time Ends Sunday, November 5, 2017

Course Withdrawal and Pass/Fail Deadline is Wednesday, November 22, 2017

Classes End Wednesday, December 13, 2017

Exam Period is Saturday, December 16, 2017 to Friday, December 22, 2017

Grading:

1. Exams: 3 exams and a final; total of 500 pts. (Final = 200 pts., Highest 2 exams = 300 pts., Lowest exam = 0 pts. Lowest exam is dropped. No makeup exams. Exams are 80%-85% objective, 15%-20% essay. **All exams are rewritten each year; several new forms of question will be included.** While old exams have been posted, answers are not posted; these should be part of any group study discussions that take place prior to the exam dates. Note that all exams will be monitored. **Use of written (on paper, skin, clothing, etc.) or electronic aids during exams is prohibited. If any such materials are seen by the instructor, or reported to him by others, the user will receive a zero for the exam in question and cannot make up that grade. Other attempts at "cribbing" from others will be similarly penalized.** Again, the exams are rewritten each year so while some questions may be similar from year to year, the answers will be different.
2. Course grading is derived in the following way.

For Lecture only (Biology 319) a total score accumulated from the exams as described above and is expressed as a percentage of 500 points.

For Lecture + Lab (Biology 317) the total of the lecture score from exams is multiplied by 0.7; this total is added to 0.3 times the total score achieved in Lab from summaries, quizzes, the major report, and the attendance score expressed as a percentage of the total possible 1000 points.

For Graduate Lecture (Biology 519) a score is computed from exams as with Biology 319, above. This score is multiplied by 0.8 and added to the attained score for the graduate course project multiplied by 0.2. The overall score is therefore 80% from exams and 20% from an additional project agreed upon with the instructor.

After these overall percentages are computed, a histogram of all students in the Biology 317, 319, and 519 courses is displayed. Major breaks or jumps in the histogram distribution normally fall within +/- 3% of decadal scores (90, 80, 70, 60, 50); these are assigned letter grades. Minor breaks or jumps in the histogram distribution falling on either side of the major breaks are assigned pluses or minuses. **Anyone scoring below 50% on the final histogram fails the course regardless of whether they are taking the course for a grade or Pass/Fail.** There are no letter grades assigned to the course or any single exams, papers, or projects during the term. Letter grades are only determined after all work and exams are completed by all students so the overall class performance histogram can be generated; this is after the final exam at the end of the term. **Your key competitor in this class is yourself; apply yourself and you should do well.** I have no problem with assigning lots of high grades if all the students in the class do well. Nor do I balk at assigning low grades if that is what is earned. Grading is as objective as I can make it since that makes my job easier and since it provides a firm basis for any decisions needed.

Texts and Readings:

The assigned texts are:

1. [Greenspan's Basic and Clinical Endocrinology, 10th or 9th Edition](#)
By: [David Gardner & Dolores Shoback](#)
ISBN10: 1259589285, ISBN13: 978-1259589287 (paperback), ISBN-10: 0071622438, ISBN-13: 978-0071622431 (paperback)
Copyright: September 29, 2017 or 2011
Publisher: McGraw-Hill Education or LANGE Clinical Medicine; McGraw-Hill Medical
\$86 or less (available in the UMB Bookstore)
2. [Molecular Biology of Cancer: Mechanisms, Targets, and Therapeutics, 3rd Edition](#)
By: [Lauren Pecorino](#)
ISBN: 978-0-19-957717-0
Copyright: 2012
Product Line: Oxford University Press
~\$42 (available in the UMB Bookstore).]

3. [Dictionary of Medical Terms: For the Nonmedical Person, 5th Edition](#)
By: [Mikel A. Rothenbery](#) [Charles F. Chapman](#)
ISBN-13: 978-0764134630
Copyright: 2006
Product Line: Barron's Educational Series
~\$10.00 (available in the UMB Bookstore)

The recommended readings are:

4. [Bodily Changes in Pain, Hunger, Fear and Rage: An Account of Recent Researches Into the Function of Emotional Excitement](#)
By: [Walter B. Canon](#)
ISBN10: 1684220483; ISBN13: 9781684220489
Copyright: 2016 [reprint of 1925 Ed.]
Publisher: Martino Fine Books
~\$12
5. [Moonlight Sonata at the Mayo Clinic](#)
By: [Nora Gallagher](#)
ASIN: B00IFFZ71Y (paperback)
Copyright: 2014
Publisher: Vintage; Reprint edition
~\$4
6. [In Due Time: A Journey Through Infertility, Loss, and Embracing the Unknown](#)
By: [Jen Noonan](#)
ISBN10: 0996308601; ISBN13: 978-0996308601
Copyright: 2015
Publisher: Mission Bay Press
~\$20

I review current available texts each summer. This year that review indicated the books 1-6 are the best choices for this fall. Other recommended backup references include: *Textbook of Endocrine Physiology*, Kovacs & Ojeda, ISBN: 978-0-19-974412-1, Oxford University Press, 2012; *Basic Medical Endocrinology, 4th Ed*, Goodman, ISBN: 978-0-12-373975-9, Academic Press, 2009; and *The Biological Basis of Cancer, 2nd Ed*, McKinnell, et al., ISBN-13: 978-0521606332, Cambridge University Press, 2006. Some of the older books are comprehensive and clinical in approach – we will not cover everything and you should concentrate on the nonclinical portions of assigned chapters. The *Molecular Biology of Cancer* book provides an excellent description of current understanding of the cellular and molecular biology underlying cancer as well as the concepts that best describe this process. There is no perfect text for this course, most have coverage gaps or contain too little or too much material to fit into a one semester course. The recent editions of other texts are reasonable alternates to the assigned texts if you have difficulty obtaining those listed. **Do not attempt to go through the course without a text and do not try to substitute a main text older than a 2010 publication (except the dictionary and cancer text above).** If you choose among the texts listed you should have a suitable reference. All should be available as new, used, or rental in technical bookstores or from Amazon.com or other major booksellers. You only need the texts listed to serve as references during the course.

I also want to point out the existence and growing utility of a specialized Wikipedia site associated with endocrinology and reproductive biology: [Repropedia](#) includes a lexicon created by researchers and practioners in reproductive biology and endocrinology. The definitions and illustrations should be useful adjuncts for some of the material covered in this course.

The last three books (Canon, Gallagher, Noonan) were written for more popular audiences but provide good coverage of issues associated with adrenal functions, an enigmatic endocrine malady, and fertility enhancement treatment respectively. Anyone thinking about entering medicine should read at least one of these to have a better idea of some of the important aspects of applied endocrinology and the issues that surround endocrine malfunction. The books are well-written with personal or historical flavor. These books are included to enrich our discussions and to provide the basis for extra credit questions on the Final.

Text readings are meant as a guide. Portions of chapters will be skipped or used at other times. Journals such as *Science* and *Nature* should be examined weekly for pertinent articles. It is also advisable to become familiar with the contents of other primary research journals such as *Endocrinology*, *Biochemistry*, *Cell* etc. Some volumes of *Endocrine Reviews*, *Trends in Endocrinology & Metabolism*, and *Trends in Cell Biology* are in the library. I will doubtless learn from what you've read!

Course Aims:

Endocrinology attempts to achieve the following general and specific objectives:

General --

1. To become more self reliant in acquiring and applying any new knowledge, scientific or otherwise, and less tied to traditional forms and sources such as "the classroom" and "the textbook."
2. To learn to integrate information from multiple levels of organization from chemical through inter-organismal in explaining physiological phenomena.
3. To learn how endocrine systems are important in each person's life, especially via the reproductive process from gametogenesis, the process of sex determination through the process of puberty and senescence, and the control of metabolism and body composition via hormones like those of the pancreas or the thyroid.

Specific --

4. To begin to understand intercellular chemical communication.
5. To learn details of several specific examples of complex intercellular communication within higher organisms, especially mammals.
6. To acquire the background knowledge, understanding of basic feedback controls, and use of diagnostic testing to approach and resolve real world problems.

Course WebSite:

Much of Endocrinology at UMB is on the Web. We are using many computerized versions of instructional figures and graphics in the classroom. Although we've tried to anticipate and work out many of the problems in computerizing this material, we expect we will continue to encounter some broken linkages so long as we connect to some materials via the Internet. The course URL at <http://kcampbell.bio.umb.edu/> is public, requires no password, and includes course and lab information like syllabi, as many classroom notes and illustrations as possible, a link to the instructor's e-mail, and suggested links to other potentially interesting sites. Your help and comments are solicited to allow us to upgrade and improve this site over the term. Tell us what's good and bad, what works, what doesn't. Thank you now for your input.

Academic Regulations:

All student performance and conduct in this class will be governed by University policies and regulations as given in the current Undergraduate Catalog and as posted at: https://www.umb.edu/life_on_campus/policies/academics. These include policies on attendance, conduct in the classroom, conduct during exams, and **plagiarism**. If you are not already familiar with these policies please read them so misunderstandings and problems are minimized.

Feedback:

In order for me to be a good instructor I need your help. If you have questions during lectures ask them; if I am going too fast, slow me down; if you have personal difficulties with the way I treat you or the subject in class, make an appointment to see me. Failure of students to ask questions results in lectures that are too didactic and that have gaps that may be apparent to other students (who usually have related questions) but not to the instructor. Since I have taught this course 35 times and do research in this area, some information that is routine for me is new to many in the lecture hall. Exactly what is new varies from class to class and student to student, I can only make educated guesses as to what information is redundant and what is not. I have also found that lecturing more rapidly is more effective at holding people's attention than is lecturing in a slow monotone. **I strongly urge you to make copies of my lecture figures prior to classes so that you can listen to what I'm saying rather than acting as a stenographer.**

Questions During Exams:

I proctor all exams. **If you have a question regarding the wording of an exam item, the meaning of an unfamiliar term, or you need clarification on exam instructions, please put your hand up and ask me that question.** The worst response I can give is to tell you that "I cannot answer that question." (Probably because it

was something you needed to learn for the exam.) Every year unasked questions cost students many points on exams. I am at the exams to act as a resource to answer those questions.

With Respect to Problems:

The subject matter of this course includes many bodily functions including reproduction; by training and research area I am a biochemist and reproductive endocrinologist. Since human studies provide some of the best information in this area of physiology, it is virtually impossible to teach this material without some discussion of human procreation. Unfortunately, some individuals find inclusion of this material offensive or draw subjective inferences from what are meant as objective lectures. If such topics form an insurmountable obstacle for you, you would be best advised to discuss the problem with me and/or to take an alternative course. A failure to discuss problems, of any sort related to the course, with the instructor prevents both identification of that problem and its resolution. Continuation of such situations impedes the student's ability to learn and achieve and leads to negative comments on Student Evaluation Forms that are unfair to the instructor. Let's resolve problems early. Thank you for your cooperation, and good luck with the course.

Disabilities:

If you have a disability and feel you will need accommodations in order to complete course requirements, please contact the Ross Center for Disability Services (Campus Center, UL Room 211) at (617) 287-7430 or via <http://www.umb.edu/academics/vpass/disability/>.

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