Biology 383: Biology of Reproduction
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8 January 2013

COURSE SYLLABUS
Biology 383: Biology of Reproduction

Overview: Biology 383, Biology of Reproduction, will cover primarily mammalian reproduction, with some examples from other animal phyla and plants (see Topic Outline below). The material includes the evolution, physiology, anatomy and behavior of reproduction. The available textbooks are limited, but the basic science of reproduction is covered well in the following textbook on human reproduction.

Lectures: Two 75-min lectures will be given Tuesdays and Thursdays, from 2:00-3:15 pm, in Science A-208.

Textbook: Ramon Pinon, Jr., "Biology of Human Reproduction" (1st edition) University Science Books, Sausalito CA. 2002. There will also be lecture handouts and PowerPoint presentations.

Supplemental reading: there will be articles assigned in class for class discussion.

Exams: The exams will be based on lecture material, which may include figures from the text cited in lecture. There will be four exams in the course, the first three will be held on Wednesday evenings. Special exam times can be arranged for those with work, class or special conflicts.

EXAM 1: WEDS, Feb. 20, 6:00-8:00 PM, Science A-208
EXAM 2: WEDS, Mar. 13, 6:00-8:00 PM, Science A-208
EXAM 3: WEDS, Apr. 17, 6:00-8:00 PM, Science A-208
EXAM 4 (final): TUES, May 14, 12:30-2:30 PM, Science A-208

I will be glad to discuss questions with you during exams.

Grades: Grading will follow a curve based on class performance, similar to the one at right. "A+" is 'honorary honors, unrecorded, but used in letters of recommendation.

Any form of *cheating* on exams will earn a grade of ***F*** . Student grievances are handled per the University of Wisconsin's administrative code, **"Student Academic Standards and Disciplinary Procedures,"** found at http://www.uwsp.edu/stuaffairs/Documents/RightsRespons/SRR-2010/rightsChap14.pdf .

GRADE	MINIMUM PERCENT FOR GRADE
A+	97.0%
A	90.0%
A-	86.7%
B+	83.3%
B	80.0%
B-	76.7%
C+	73.3%
C	70.0%
C-	66.7%
D+	63.3%
D	60.0%
F	0.0%

TOPIC OUTLINE: BIOLOGY OF REPRODUCTION

1. TYPES OF REPRODUCTION: COMPARATIVE REPRODUCTIVE BIOLOGY
    a. asexual reproduction (bacteria, plants)
    b. pseudo-asexual reproduction (insects, some vertebrates)
    c. sexual reproduction
        i. difference between "sex" and "gender"
        ii. bi-modal mating types
            dimorphic mating types (two phenotypes "male" & "female") in plants and animals
            isomorphic mating types (one phenotype) in bacteria, fungi, algae
    d. the sex chromosomes: structure, unique genes, special properties
        i. some characteristics of the proteins and DNA found in all chromosomes: centromere, telomeres, nucleosome
        ii. X chromosome inactivation in mammals
        iii. Y chromosome special features: telomeres, male-specific genes, gene copy number, palindromic sequences

2. MEIOSIS: mechanisms of homolog pairing, synapsis, crossing-over, reduction division.

3. THE MATING-MACHINERY: GONADS & REPRODUCTIVE TRACTS OF MAMMALS
    a. overview of male and female mammalian gonad & reproductive tract structures: gonads, gametogenesis, sex-specific hormone products; accessory tissues (reproductive tracts and glands, external genitalia).
    b. sexual determination and differentiation: genetic sex vs. "gender": (sex phenotype)
    c. development of the mammalian reproductive machinery: the bipotential gonad, twin duct systems, and genital fold structures
        i. disturbances to normal gender phenotype development: Adreno-Genital Syndrome (adrenal enzyme deficiency), Androgen Insensitivity Syndrome (receptor defect), Turner's Syndrome (XO), Kleinfelter's Syndrome (XXY), 5-Alpha Reductase Deficiency (no DHT)
    d. growth and maturation of reproductive tract structures, physiological adaptations

4. PITUITARY GLAND & HYPOTHALAMUS: ANATOMY, PHYSIOLOGY, EMBRYOLOGY
    a. anterior and posterior divisions of the pituitary gland
    b. the hypothalamus and the 3rd ventricle of the brain
    c. embryology of the pituitary and hypothalamus
    d. hormonal products related to reproduction
        i. FSH, LH, prolactin from the AP
        ii. oxytocin from the PP (and endometrium)
        iii. GnRH and PrIH from the hypothalamus
    e. **puberty**: role of the hypothalamus; influential factors

5. THE TESTIS & MALE REPRODUCTIVE TRACT STRUCTURES
    a. anatomy and histology of the testis: mechanism of descent, maturation
    b. temperature control in the testis
    c. spermatogenesis, spermiogenesis, specializations for fertilization, the machinery of sperm motility.
    d. meiosis in sperm formation
    e. hormones of the testis and their target tissues: testosterone, inhibin, MIS
    f. hypothalamus and pituitary control of testosterone and sperm production
        i. seasonal breeders

        ii. non-seasonal breeders
    g. testosterone effects on mating behavior in the fetus and the adult
    h. hypothalamic control of testis activity
    i. pheromone effects on male gonadal activity
    j. anatomy & physiology of the male reproductive tract: efferent duct, epididymis, vas deferens, prostate gland, seminal vesicles, bulbourethral glands, penis

6. THE OVARY & FEMALE REPRODUCTIVE TRACT STRUCTURES
    a. anatomy and histology of the ovary: stroma, follicles, corpus luteum
    b. oogenesis and the life of the ovum before fertilization
        i. meiosis in the ovum
    c. hormones of the ovary and their target tissues: estrogens, progestins, inhibin, prostaglandins, oxytocin
    d. anatomy & physiology of the female reproductive tract: fimbria, fallopian tube, uterus (myometrium & endometrium), cervix, vagina, Bartolin glands, labia, clitoris

7. OVARIAN CYCLES (ESTRUS & MENSTRUAL CYCLES): INTRODUCTION
    a. control of oogenesis and reproductive tract physiology
        i. timing of follicle growth and ovulation, hormonal regulation
        ii. hypothalamus-pituitary hormone relationships
        iii. pheromones and nervous system inputs to the ovarian cycle
        iv. timing of mating behavior
        v. cycle variations among mammals
        vi. polyestrus and monestrus cycles
        vii. estrogen-primed mating behaviors

8. REPRODUCTIVE BEHAVIORS
    a. hormone-driven sexual behavior in males and females
    b. male and female physiological responses during copulation

9. THE BIG EVENTS: FERTILIZATION, PREGNANCY, EMBRYOGENESIS, THE PLACENTA
    a. fertilization and formation of the zygote
        i. mechanisms of fertilization: barriers to fertilization in the ovum
        ii. the cell biology/physiology of sperm-ovum fusion
        iii. the cellular events of pronuclear formation and fusion: formation of the zygote
    b. the life of the embryo: endocrinology and physiology of its development and survival in the uterus
    c. variations: delayed fertilization, delayed embryogenesis
    d. migration and implantation of the embryo: new research
    e. formation, development and physiology of the placenta: blood supply, hormonal capacities
    f. early embryogenesis

10. PREGNANCY: PHYSIOLOGY OF MOTHER AND FETUS
    a. changes in blood flow, blood pressure, dietary demands

11. PARTURITION: DELIVERY OF FETUS AND PLACENTA
    a. embryo signals to maternal reproductive tract
    b. events of labor from onset to hard contractions
    c. hormonal and physiological changes in mother and fetus at the time of birth
    d. problems of delivery (guest lecture)

12. LACTATION
    a. anatomy & histology of the breast

b. breast development before, during and after pregnancy
c. hormonal control of milk production after pregnancy
d. contraceptive effects of lactation post-partum.
e. colustrum: source of passive immunization for neonate
f. milk composition: differences among different mammalian species

13. ARTIFICIAL CONTROL OF FERTILIZATION IN DOMESTICATED MAMMALS IN HUMANS
    a. chemical and physical contraception methods: steroid contraceptives, peptide contraceptives, barrier methods, IUD's, surgical contraception
    b. pro-reproductive technologies: AI, GIFT, IVF, embryo transfer
14. CLONING
    a. embryonic cloning, somatic cloning
    b. ethics and future technologies: Bokanofskification?

15. SPECIAL TOPICS: YOUR CHOICE
    a. For example: anabolic steroids? venereal diseases? Viagra mode of action? Estrus in women? Pheromones and aphrodisiacs in humans?

16. GUEST LECTURES (evenings)

TENTATIVE LECTURE SCHEDULE

lect. no.	date	title	reading in Pinon
1	1/22	comparative reproductive biology	lecture only
2	1/24	comparative reproductive biology	lecture only
3	1/29	meiosis	pp 34-36 ff
4	1/31	mammalian male/female reproductive tracts overview	pp. 153-160
5	2/5	embryology of gonads and reproductive tracts in mammals	pp 79-84
6	2/7	sexual differentiation: in mammals	pp 84-99
7	2/12	abnormalities of sexual differentiation	Chapter 14
8	2/14	anatomy & embryology of the pituitary gland and hypothalamus; hormones of reproduction	Chapter 7; Chapter 3
9	2/19	puberty, the testis and spermatogenesis	Chapter 8; Chapter 6; Fig. 2.14;
	2/20	***EXAM 1, 6-8 pm, Science A-208 [Lectures 1-7]***	
10	2/21	male reproductive tract structures and functions	[lecture]
11	2/26	puberty, the ovary and oogenesis	[Chapter 8]; Chapter 5; Fig. 2.13;
12	2/28	female reproductive tract structures and functions	[lecture]
13	3/5	ovarian cycles (estrus and menstruation)	Chapter 5
14	3/7	ovarian cycles (estrus and menstruation)	Chapter 5
15	3/12	reproductive behavior	Chapter 19
	3/13	***EXAM 2, 6-8 pm, Science A-208 [Lectures 8-14]***	
16	3/14	fertilization	Chapter 11, pp 271-86
17	3/26	implantation and placental development	Chapter 11; pp 287-94
18	3/28	early embryonic life	Chapter 12, pp 298-309
19	4/2	mid-late pregnancy: physiology of mother and fetus	" "
20	4/4	Placental physiology and the limits of gestation	
21	4/9	Parturition mechanisms	Chapter 12, pp 309-314
22	4/12	Artificial induction of parturition, repression of labor	
23	4/16	lactation & maternal behavior	Chapter 12, pp 315-321
	4/17	***EXAM 3, 6-8 pm, Science A-208 [Lectures 15-22]***	
24	4/18	menopause, osteoporosis and HRT	Chapter 10
25	4/23	influences of stress on reproduction	Chapter 9
26	4/25	artificial control of fertility; contraception 1	Chapter 15
27	4/30	artificial control of fertility; contraception 2	Chapter 15
28	5/2	assisted fertilization/conception: AI, GIFT, IVF, ET	Chapter 16
29	5/7	cloning: embryonic and somatic	Chapter 20
30	5/9	optional topic: class choice	
Final Exam	**5/14**	***EXAM 4 (final), Tues., 12:30-2:30 pm, Science A-208 [Lectures 23-30]***	