DEPARTMENT OF BIOLOGY
MEDGAR EVERS COLLEGE of the CITY UNIVERSITY OF NEW YORK

SYLLABUS
BIO 351*** ENDOCRINOLOGY

Lecture Text: Endocrine Physiology by Susan P. Porterfield. Second Edition
The Mosby Physiology Monograph Series. ISBN 0-323-01128-4
Publishers Mosby An Affiliate of Elseivier Science 2001.

Laboratory Text: A Laboratory Manual will be provided for you.
INSTRUCTOR: **Dr. Ebere U. Nduka. OFFICE: C324A. Tel.718 270 6211**
OFFICE HOURS: Mon. 12 noon- 1.00 pm ; 4.00-5.00 pm
Wed. 12 noon- 1.00 pm; 4.00-5.00pm.

COURSE DESCRIPTION;

Homeostatic regulation involves coordinating activities of organs and systems throughout the body. The function of the endocrine system involves complex interrelationships and interactions that maintain dynamic steady states. The course will study the endocrine system and its hormonal impact on metabolic activities of various tissues. The interrelationships between the endocrine system and the nervous system will be studied. The laboratory component will allow each student to have hands–on experience with techniques that include, Solution Preparations, Solution chemistry, Hormonal Assay Methods, Histology of Endocrine Glands, Experiments on Hormonal Actions.
PREREQUISITES: BIO 202 and CHEM 202 or by the permission of the department.

GRADING:

The Student's final grade will be determined as follows:

Class tests and quizzes	20%.
Lecture Exams	40%
Lab exams	40%
	100%

The Lecture will contain at least 3 tests, a number of quizzes and a term paper.
The Lab will contain a midterm, final and quizzes. Attendance is required in both lecture and lab. A dissection kit and lab coat are required for lab. **IT IS THE POLICY OF THE DEPARTMENT NOT TO OFFER MAKE-UP EXAMS OR QUIZZES.**

BIO 351 LECTURE TOPICS

LECTURE#	TOPICS	CHAPTER
1.	Introduction to Endocrinology. Organization of the Endocrine System-Overview of the Endocrine System. Endocrine Glands and Hormones. Structure and Classification.	1.
2.	Synthesis and Secretion of Hormones. -Hormones Synthesis. -Control of Hormone Secretion-Feedback mechanisms. -Hormone Delivery. -Hormone Circulation and Metabolism.	1.
3.	Physiological Roles of Hormones. -Functions. -General mechanisms of Hormone Action. -Hormonal Rhythms	1
4.	Assessment of Endocrine Function. Histological-Cytological Studies. -immunochemistry. -Surgical Methods. Hormone deficiency. -Hormone Replacement Therapy. -Immunological Neutralization of Hormone Activity. -Tissue Extracts and Purification. Hormone Measurements -Bioassays. -Chemical assays. -Immuno assays(Radioisotope Studies) -Radioimmunoassay(RIA). -Radioreceptor assays. -Radioisotope Enzyme assay.	
5.	Hormone Measurements and Assessment Contd. -Monoclonal Antibodies. -Enzymelinked-Immunosorbent Assays.	

6. The Pituitary Gland 2
-Anatomy.
-Hormones of the Anterior Pituitary.
-Control of the Adenohypophysis p.23
-Pulsatile Release of Hormones
-Classification of Endocrine disorders
-Growth Hormones
-Luteinizing Hormones/Follicle Stimulating Hormone
Prolactin
Posterior Pituitary Gland
Antidiuretic Hormone ADH
Oxytocin

7. Structure and Function of the Endocrine Hypothalamus.
The Hypophysiotropic Hormones.
-Thyrotropin-Releasing Hormone(TRH).
-Somatostatin (SST).
-Growth-Hormone-Releasing Hormone.
-Gonadotropin-Releasing Hormone(GnRH)
-Corticotropin-Releasing Hormone(CRH).
-Prolactin-Release-inhibitibg Factor(PIF).
-Prolactin-Releasing Factor(PRF)
-MSH Releasing-Inhibiting Factor(MIF).
Pathophysiology of Hypothalamic Dysfunction.

8. -Thyroid Gland
-Anatomy and Histology of the thyroid
-Thyroid Hormones
-Thyroid Hormones Secretion
-Thyroid Hormone Transport
-Pathologic Conditions Involving The Thyroid

9. Endocrine Pancreas
Anatomy
Pancreas Pathologies
Diabetes- Insulin-Dependent and Non-Insulin Dependent

10. Adrenal Gland
Anatomy
Catecholamines
Pathologies of Adrenal Medulla
Pathologies of Adrenal Cortex

11 . Hormones and Female Reproductive Physiology. 9.

-Anatomy of the Female Reproductive System.
-Ovarian Steroid Hormones.
-Estrogen Biosynthesis.
-Progesterone Biosynthesis.
-Menstrual Cycle.
Environment and Reproduction.
Pathophysiology.

12. Endocrinology of Pregnancy. 10

-Parturition and Lactation.
-Oviparity, Ovoviparity, and Viviparity.
-Pregnancy.
-Fertilization and Implantation.
-The Corpus Luteum.
-The Fetal-Placental Unit.
-Parturition.
-Neuroendocrine Control of Parturition.
-Lactation.
-Hormonal Contraception.
-Menopause.
-Pathophysiology.

13. Hormones and Male Reproductive Physiology. 8.

-Anatomy of The Male Reproductive System.
-The Testis.
-Sources, Synthesis, Chemistry, and Metabolism of Androgens.
-Endocrine Control of Testicular Function.
-GnRH and Pituitary Gonadotropins.
-Inhibin.
-Prolactin.
-Physiological Roles of Androgens.
-Spermatogenesis.
-Hormones and Homosexuality.
-Secondary Sex Characteristics.
-Anabolic Actions.
-Aging.
Physiological Roles of Estrogen.
-Fertility.
-Male Behavior.
-Mechanisms of Androgen Action.
Antiandrogens.
Pathophysiology.
.

LABORATORY TOPICS BIOL 351.

LABORATORY SESSION 1.

Laboratory Safety, The Location of Endocrine Glands.----------Exercise 1.

LABORATORY SESSION 2.

Basic Laboratory Procedures----------Exercise 2
Preparation of Solutions.
Preparation of Dilutions.
Making a single Dilution.
Preparing a Dilution Series.
Linear Dilution Series.

LABORATORY SESSION 3----------Exercise 3.

Logarithmic Dilution Series.
Harmonic Dilution Series.
Mixing Solutions and Suspensions.
Storing Chemicals and Solutions.
Using Chemical Balances.

LABORATORY SESSION 4----------Exercise 4.

Histology of Endocrine Glands.
Thyroid, Parathyroid, Adrenal and Pancreas.

LABORATORY SESSION 5----------Exercise 5.

Experiments on Hormonal Action.
Determining The Effect of Thyroid Hormone on
Metabolic Rate./Testing The Effect of Epinephrine on The Heart.

LABORATORY SESSION 6----------Exercise 6.

Assay of Hormones.

LABORATORY SESSION 7.----------Exercise 7
Assay of Hormones .

LABORATORY SESSION 8.----------Exercise 8.

Histology of The Pituitary Gland.
Experiment :Determining The Effect of Pituitary Hormones on The Ovary.

MID-TERM

LABORATORY SESSION 9----------Exercise 9.

Experiment on Hormonal Action.
Observing The Effects of Hyperinsulinism.

LABORATORY SESSION 10----------Exercise 10

Histology of The Ovary.

LABORATORY SESSION 11----------Exercise 11

Hormonal Assays/Measurements
Pregnancy Testing.

LABORATORY SESSION 12----------Exercise 12

Histology of The Testis.

FINAL EXAM.

EXERCISE 1.

THE LOCATION OF ENDOCRINE GLANDS

1. LOCATION OF THE GLANDS.
2. PRINCIPAL HORMONES SECRETED BY THE GLANDS.
3. FUNCTIONS OF THE HORMONES.

ENDOCRINE GLANDS: are organs that secrete chemical messengers(regulators) known as HORMONES, into the body's circulatory system. The release of hormones directly into the blood circulatory system does not require ducts-so it is a ductless secretion.. Other glands that secrete their materials through tubules or ducts, e.g. Salivary or sweat glands are known as EXOCRINE GLANDS.
Some glands have both endocrine and exocrine cells. A good example is the PANCREAS In the Pancreas the ISLETS OF LANGERHANS secrete the hormone INSULIN, while ACINI CELLS secrete PANCREATIC JUICE, which travels via the pancreatic duct to the small intestine as a digestive enzyme to take part in food digestion. Some refer to it as A HETEROCRINE GLAND.
Some organs whose primary function may not be the secretion of hormones may contain endocrine tissue, e.g. Heart and Kidney.
This Exercise will involve mainly the Location of the Endocrine Glands.
You will be handed a Diagram in this exercise that will indicate the major endocrine glands, organs containing endocrine tissue and some structures associated with some endocrine glands.
During this laboratory exercise you will be provided with charts showing Human Endocrine Glands Locations, and if available Human Torso Models.
Using the charts and models, complete the labels on the diagram provided.

1 PINEAL GLAND.(EPIPHYSIS CEREBRI)

The pineal gland is part of the epithalamus(Look in the area of the Diencephalon). It is located in the roof of the third ventricle. It is a cone-shaped body lying between the corpora quadrigemina and the posterior portion of the corpus callosum.
The pineal gland begins as a relatively large structure but atrophys(shrinks) as puberty approaches and by adult becomes less glandular in appearance.

Using your Textbook as a reference, give the major functions of the hormones listed below.

MELATONIN.

-

SEROTONIN

2. THYMUS GLAND.

The Thymus gland is a bilobed gland located in the upper mediastinum posterior to the sternun and anterior to the heart and lungs. The gland is conspicuous in infants, reaching its maximum size at puberty and by old age it is relatively inconspicuous. The Thymus is also part of the lymphatic system.

Using your textbook as a reference, give the major function of the hormone THYMOSIN.

3. PITUITARY GLAND. (HYPOPHYSIS).

The pituitary gland is located at the base of the brain, within the hypophysial fossa of the sella turcica of the sphenoid bone. It is attached to the hypothalamus of the brain by a stalk-like structure the infundibulum.

The pituitary is divided structurally and functionally into an ANTERIOR PITUITARY also known as ADENOHYPOPHYSIS and a POSTERIOR PITUITARY also known as NEUROHYPOPHYSIS.

The Hypothalamus I not only an important regulatory center in the nervous system it is also an important endocrine gland. Cells in the hypothalamus synthesize at least nine different hormones, and the pituitary gland secretes seven more. All these hormones together play important roles in regulation of virtually all aspects of growth, development, metabolism and homeostasis.

Using your textbook as a reference, give the major functions of the hormones listed below that are secreted by the Pituitary gland.

A. Pituitary Hormones Secreted by The Anterior Pituitary

Following stimulation from the hypothalamus by releasing hormones or releasing factors. The anterior pituitary gland secretes the following Hormones:

(i) Adrencorticotropic Hormone(ACTH).
(ii) Follicle-Stimulating Hormone(FSH).
(iii) Human Growth Hormone(hCG) also known as Somatotropin and Somatotrophic hormone(STH).
(iv) Luteinizing Hormone(LH).
(v) Melanocyte_Stimulating Hormone(MSH).
(vi) Prolactin(PRL) also known as Lactogenic Hormone.
(vii) Thyroid-Stimulating Hormone(TSH) also known as Thyrotropin.

A. Hormones stored in the Posterior Pituiatry.

(i) Antidiuretic Hormone(ADH) also known as Vasopressin.
(ii) Oxytocin(OT).

4. THYROID GLAND.

The Thyroid gland is located just below the larynx. The right and left lateral lobes lie on either side of the trachea and are connected by a mass of tissue called an isthmus, that lies in front of the trachea just below the cricoid cartilage. When present the pyramidal lobe extends upward from the isthmus.

Using your textbook as reference give the major functions of hormones secreted by the thyroid gland.

(i) Thyroxine(T4).
(ii) Triidothyronine(T3)
(iii) Calcitonin(CT).

5. PARATHYROID GLANDS.

These glands are usually four in number and are located on the posterior surface Of the thyroid glands., two on each lobe.

Using your textbook as a reference give the major function of the Hormone produced by the Parathyroid Gland.
The hormone is Parathormone, or Parathyroid Hormone (PTH).

6. ADRENAL (SUPERENAL) GLANDS

The two adrenal (Superenal) glands are superior to each kidney and each is structurally and functionally differentiated into two regions; the outer adrenal cortex, which forms the bulk of the gland, and the inner adrenal medulla . Covering the gland are a thick layer of fatty tissue and an outer, thin fibrous connective capsule.

Using your textbook as a reference give the major functions of the Hormones of the Adrenal Cortex. These include:

(i) MINERALOCORTICOIDS:
Aldosterone.

(ii) GLUCOCORTICOIDS:
Cortisol(hydrocortisone).
Corticosterone.
and Cortisone.

(iii) GONADOCORTICOIDS:
Estrogens(in female).
Adrogens (in Male).

Hormones secreted by the Adrenal Medulla include

(i) Epinephrine.
(ii) Norepinephrine (NE).

7. PANCREAS

The pancreas is a single organ located posterior to the stomach and between the stomach and the duodenum. It is both an exocrine and an endocrine gland.
The hormones are secreted by clusters of specialized cells, called the ISLETS OF LANGERHANS, located outside the pancreatic tubules. They contain four types of cells.

(i) Alpha cells----------secrete glucagon.
(ii) Beta cells----------secrete insulin.
(iii) Delta cells----------secrete growth hormone-inhibiting hormone factor(GHIH) or Somatostatin.
(iv) F-cells----------secrete pancreatic polypeptide.

The pancreatic islets are surrounded by blood capillaries and by the cells called ACINI that form the exocrine part of the gland.

Using your textbook as reference give the major functions of hormone secreted by the Pancreas.

(i) GLUCAGON.
(ii) INSULIN.
(iii) GROWTH HORMONE INHIBITING HORMONE.
(iv) PANCREATIC POLYPEPTIDE.

8. GONADS.

OVARIES:

The paired ovaries are the primary reproductive organs of the female and are located in the pelvic region of the body cavity. They have two types of hormone-producing tissue. The hormone Estrogen is secreted by the cells of the Graafian follicle and Progesterone by the cells of the corpus luteum.

Using your textbook as reference give the major functions of the Ovary.

Graafian Follicle secretes	Estrogens.
Corpus Luteun secretes	Progesterone, Estrogens, Relaxin, and Inhibin.

TESTES :

The paired testes are the primary reproductive organs of the male. They lie outside the body cavity within a pouch of skin called the scrotum. They develop in the embryo's pelvic region and descend into the scrotum before birth. The lower temperature in the scrotum facilitates sperm development.
The hormone- producing cells of the testis are located outside the seminiferous tubules and are called interstitial(Leydig)cells.
The endocrine function of the testis is testosterone production and the exocrine Exocrine function is the production of spermatozoa.

ORGANS THAT ARE NOT PRIMARY ENDOCRINE BUT HAVE ENDOCRINE FUNCTIONS:

1. HEART: The atria of the heart secretes a hormone .
   Hormone produced –Atrial Natriuretic Peptide(ANP).

2. KIDNEYS (AND LIVER TO A LESSER EXTENT).
   Release an enzyme called RENAL ERYTHROPOIETIC FACTOR. This is secreted into the blood where it acts on a plasma protein produced in the liver to form a hormone called ERYTHROPOIETIN, which stimulates red bone marrow to produce more red blood cells.

3. SKIN:
   Vitamin D produced by the skin in the presence of sunlight, is converted to its active hormone, CALCITRIOL , in the kidneys and liver.

4. THE GASTROINTESTINAL TRACT:
   The gastrointestinal tract(GIT) synthesizes several hormones that regulate digestion in the stomach and small intestine.
   Hormones secreted include Gastrin, Secretin, Cholecystokinin(CCK), and Gastric Inhibitory Peptide(GIP).

5. THE PLACENTA;
   The placenta produces human chorionic gonadotropin(hCG), estrogens, progesterone, relaxin, and human chorionic somatomammotrophin(hCS) all of which are related to pregnancy.