

UZO-455

Endocrinology

Cr. (2)

Course Objectives:

1. To discuss the definition of hormone in terms of its general properties.
2. To differentiate among endocrine, paracrine and autocrine system.
3. To describe different classes and chemical structure of hormone.
4. To explain the roles of the endocrine system in maintain homeostasis, integrating growth and development, responding to environmental insult and promote successful reproduction.

5. To identify the glands, organs, tissues and cell that synthesize and secrete hormones, hormone precursors and associated compounds.
6. To describe synthesis and mode of secretion of hormone, regulation of hormone secretion of hormone, including the principles of negative and positive feedback mechanism.
7. To explain the importance of patterns of hormone secretion such as pulsatile, diurnal, cyclic and how hormones are transported in the blood and consequences of reversible binding of many hormones by plasma proteins
8. To explain the basis of hormone assays and assessment of biological activity
9. To discuss the metabolism, clearance and excretion of hormones and their metabolic derivatives
10. To define and discuss the physiological actions of hormone relating them whenever possible to human disorders
11. To explain the consequences of under and overproduction of hormones to determine the pathophysiological basis and consequences of specific endocrine disorders.
12. To compare and contrast the different mechanism of action of hormones: i.e. those exerted by modulation of gene expression, those activated by changes in protein activity.

Course Learning Outcome:

At the end of course the students are able to:

1. Explain the roles of the endocrine system in maintain homeostasis, integrating growth and development, responding to environmental insult and promote successful reproduction.
2. Discuss the definition of hormone in terms of its general properties.
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6. Describe synthesis and mode of secretion of hormone.
7. Explain how the secretion of hormone is regulated, including the principles of negative and positive feedback mechanism.
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12. Explain the consequences of under and overproduction of hormones to determine the pathophysiological basis and consequences of specific endocrine disorders.
13. Compare and contrast the different mechanism of action of hormones: i.e. those exerted by modulation of gene expression, those activated by changes in protein activity.
14. Evaluate and assess scientific literature about endocrine function and pathology.

Course Contents:

1. An overview of general concepts and principles of endocrinology:

- The endocrine system; Type of hormones; Endocrine and nervous system relationship;
- General principles in function, interaction, nature, synthesis, transport of hormones;
- General concept of feedback, biorhythms, pathology and assessment of endocrine function;
- Evolution of endocrine system. RIA, RIMA, ELISA, bioassay and receptor assay

2. Hypothalamus and pituitary:

- Hypothalamic hormones: Origin, chemistry and actions and mechanism of action;
- Anterior pituitary & hormones: Hypothalamic pituitary regulation,
- General chemistry, Physiological action, mechanism of action and metabolism of prolactin-growth hormone family,
- Glycoprotein hormone family, corticotrophins and other pro- opiomelanocortin peptides;
- Posterior pituitary: Release, regulation and actions of vasopressin and oxytocin.
- Causes and effect of over and under production of hypothalamic and pituitary hormones
- Hypothalamic, pituitary and thyroid, adrenocortical, gonadal and other axis.

3. Thyroid gland:

- Anatomy and histology of gland; Formation and secretion of thyroid hormones; Thyroid hormones in peripheral tissues, Function of thyroid hormone,
- Mechanism of action; regulation and factors affecting thyroid function.
- Causes and effect of Hypothyroidism and hyperthyroidism

4. Calcitropic and Mineral Metabolism Hormones:

- Chemistry, physiological actions, mechanism of action and
- metabolism of parathyroid hormone,
- Causes and effect of over and under production of hormone
- Calcitonin and calciferols; action and mechanism of action
- Homeostasis of calcium, phosphate and magnesium.

5. Pancreatic Hormones and Regulatory Peptides of the Gut:

- Anatomy and histology for sources of the hormones; Chemistry,
- Physiological roles and mechanism of action of insulin and glucagon;
- Physiological roles of gut peptides.
- Causes and effect of over and under secretion of pancreatic hormones
- Glucose homeostasis

6. Adrenal Medulla and Catecholamines:

- Chromaffin cell and organization; Structure of adrenal medulla;
- Biosynthesis, storage, release and metabolism;
- Adrenergic receptors and mechanism of action;
- Disorder of Adrenal medulla (pheochromocytoma)

7. Adrenal Cortex:

- Anatomy and Steroid biochemistry;
- Physiological actions of corticoid hormones and mechanism of action;
- Regulation and metabolism of glucocorticoids,
- Mineralocorticoids and adrenal sex steroids.
- Disorder of adrenal cortex hormones

8. Testes: Androgenic tissue:

- Anatomy, structure, chemistry, synthesis and transport of hormone,
- Metabolism, action and mechanism of action.
- Testicular disorder

9. Ovaries:

- Ovarian Anatomy, hormones: Steroid biochemistry and biosynthesis;
- Transport, metabolism, action and mechanism of action.
- Cyclic changes, menopause
- Ovarian disorder

10. Endocrinology of Pregnancy:

- Hormones in conception and implantation;
- Hormonal actions and
- Adaptation in pregnancy and parturition.

11. Fetus Endocrinology

- Endocrinology of developing fetus

12. Endocrinology of Lactation:

- Hormones in lactation.

13. Endocrinology of development of growth

- Growth and Puberty
- Disorders of growth and puberty

14. Endocrinology of

- Heart, Kidney,
- Immune system:
- Growth and pineal gland.

15. Functional diversity of vertebrate hormones

- Functional diversity of hormones in different vertebrates

16. Overview of Endocrine Mechanisms in Invertebrates

- Hormones of invertebrates

17. Geriatric Endocrinology

- Endocrine and Associated Metabolism in aging: Specifically thyroid, glucose and calcium homeostasis

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos /films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work:	25 marks
Midterm Exam:	35 marks
Final term Exam:	40 marks

Text Books:

1. Greenspan, F.S. and Strewler, G.J., 2011. Basic and clinical endocrinology, 9th Edition. Prentice Hall International Inc., London.
2. Bentley, P.J., 1998. Comparative Vertebrate Endocrinology 3rd Ed. Cambridge University Press, Cambridge.
3. Sam A., Meeran K. Endocrinology and Diabetes. Lecture notes. Wiley- Blackwell (2009) (basic science and clinical context).
4. Laycock J, Meeran K. Integrative Endocrinology. Wiley-Blackwell (2013).
5. Rang H, Dale M and Ritter, J: Pharmacology, 4th ed., (1999). (relevant for drug information) 2nd Edition. The Oxford Textbook of Endocrinology and Diabetes DOI: 10.1093/med/9780199235292.003.0134
6. Yen & Jaffe's Reproductive Endocrinology: Physiology, Pathophysiology, and Clinical Management. Saunders – all editions are excellent (even the older editions)
7. Johnson MH. Essential Reproduction. 7th Ed. Wiley-Blackwell (2013) (relevant for some general background info on reproduction pitched for undergraduate students).
8. Chandra S. Negi, introduction to endocrinology
9. Charles Brook, Nicholas Marshall, essential endocrinology
10. Noris, vertebrate endocrinology

Additional Readings:

1. Wilson, J.D., Foster, D.W., Kronenberg, H.M. and Larsen, P.R., 1998. Williams textbook of endocrinology, 9th Edition. W.D. Saunders Company, Philadelphia.
2. DeGroot, L.J., Jameson, J.L. et al., 2012 Endocrinology, Vol.I, II & III, th Edition. W.B. Saunders, Philadelphia.
3. Giffin, J.E. and Ojeda, S.R., 2000. 4th Edition. Textbook of Endocrine Physiology. Oxford University Press, Oxford.
4. Neal, J.M., 2000. Basic Endocrinology: An interactive approach. Blackwell Science Inc., London.

UZO-456 Endocrinology (Lab.)

Cr. (1)

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Course Contents:

- Demonstration of endocrine glands and associated structures in dissections, transparencies, computer projection etc;
- Histological and ultrastructure features of endocrine glands;
- Experiments to demonstrate physiological roles of hormones of different endocrine glands;
- Experiments to demonstrate regulation of hormones' releases.
- Experiments to demonstrate functional diversity of hormones in different vertebrates.
- Experiments on endocrine mechanism invertebrates.
- Experiment on recognition and response of receptors
- Studies of disorders of pituitary by observing anatomical and histological features
- Studies of thyroid status in deficient and excess hormone functions
- Studies of type 1 and type 2 diabetes mellitus: Epidemiology of the types in population, studies of management of the type 2;

- Model studies of Ovarian and Testicular disorders;
- Model studies of obesity and anorexia;
- Studies of hormonal status in puberty and aging

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