

The Endocrine System: Structure and Pathology



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The Endocrine System: Structure and Pathology

By James Menz, LMT, CSCS

The Endocrine pathologies course establishes a foundational paradigm of the workings of the glands & associated structures. The health professional garners a genuine understanding of the roles of the major endocrine glands. From this foundation is built an appreciation for the causes of disease and common resources used to manage and remedy to most prevalent endocrine system challenges.

This course is **2 contact hours** in length (check your state's approval status in the state specific [course catalog](#) for your profession).

Target Audience: Physical Therapist, Physical Therapist Assistant, Occupational Therapist, Occupational Therapist Assistant, Massage Therapists, Licensed Massage Therapist, Nurses

Instructional Level: Intermediate

Course Goals: This course is intended to instruct the professional on establishing a foundation paradigm of the workings of the human heart.

Course Objectives: At the end of this course the participant will be able to:

1. Define the role of the endocrine system
2. Recognize the nature and function of hormones
3. Identify the role of the pituitary gland
4. List major glands of the endocrine system
5. Recognize the interaction between the endocrine
6. Differentiate Type I from Type II Diabetes
7. List the cause and signs of Cushing's Syndrome
8. Identify the cause and manifestations of Graves Disease
9. List major causes of goiter
10. Recognize the results of excess or deficient pituitary production of Human Growth Hormone
11. List the cause and symptoms of Multiple Sclerosis
12. Identify non-surgical interventions for neuro-pathologies

Course Outline:

Hour 1

- Review of major anatomy and physiology of glands and how hormones function.

Hour 2

- Discussion of symptoms and etiology of major endocrine pathologies including hypoactive and hyperactive activity.

About the Instructor: James Menz, LMT, CSCS



Jim began his health & wellness career as a Certified Personal Trainer in 1992 and was certified in massage therapy the following year. In his career he has worked with a spectrum of clients in community, athletic and rehabilitative settings. He is a Certified Strength and Conditioning Specialist, a Corrective Exercise Specialist, holds a Master's Degree in Exercise Science and a Post Graduate Certificate in Rehabilitative Science.

Early in his education career, Jim created the curriculum used by the largest personal training school in the country. Jim has been a college instructor for 9 years and has constructed programs in Exercise Science and Massage Therapy for Salem and Cumberland County Colleges. He is an adjunct faculty member of Health and Exercise Science at Rowan University and recently completed a series of lectures for health professionals in New York, Philadelphia, Chicago, Dallas and throughout Florida. Jim has presented at a numerous continuing education events for trainers, therapists, coaches and nurses since 2004.

Instructors Disclosure:

Financial – James Menz is employed by University of Delaware and receives a salary. She receives payment from HomeCEU for the presentation of this course.

Nonfinancial - no relevant nonfinancial relationship exists.

Content Disclosure: This course does not focus solely on any specific product or service.

Criteria for Completion: A score of 70% or more is considered passing. Scores of less than 70% indicate a failure to understand the material and the test will need to be taken again until a passing score has been achieved.

Course Expiration: The participant will have 1 year from date of purchase or until the course expiration date

EXAM

The Endocrine System: Structure and Pathology

Directions: After viewing this course, answer the questions on this post-test. Then, login to your profile and record your answers in our online testing center for grading. Your test will be graded instantly, and if you score 70% or higher we will issue a certificate of completion immediately. You may utilize the learning materials to answer the questions.

1. Which best describes the function of the endocrine system:
 - a. Maintain homeostasis through secretion of hormones.
 - b. Deliver oxygen to working cells
 - c. Detect immediate stimuli occurring around our bodies
 - d. Create movement and heat
2. One of the crucial elements to the endocrine system is the presence of:
 - a. Sliding filament of actin and myosin
 - b. Signal conduction across the Nodes of Ranvier
 - c. Movement of substrates by muscular contractions termed Peristalsis
 - d. Receptor sites, aka Lock & Key Mechanism
3. Functions of the Pituitary Gland include:
 - a. Receiving instructions from the Hypothalamus
 - b. Produce Thyroid Stimulating Hormone (TSH)
 - c. Secrete epinephrine in response to perceived threat
 - d. Both A and B
4. Which is not a gland of the endocrine system:
 - a. Pineal Gland
 - b. Parathyroids
 - c. Large Intestine
 - d. Adrenals
5. With which of the body systems does the endocrine system interact:
 - a. Skeletal
 - b. Respiratory
 - c. Nervous
 - d. All of the above
6. Which is/are characteristics of Type I Diabetes:
 - a. Immune system destroys cells of the pancreas
 - b. Can be decreased or reversed through lifestyle changes
 - c. Dependence on exogenous insulin
 - d. Both A and C
7. Symptoms of Cushing's Syndrome include all except the following:
 - a. Fatty deposits around the belly
 - b. Increased bone mineral density
 - c. Drop in libido
 - d. Lethargy
8. Graves Disease is associated with which of the following:
 - a. Overstimulation of the thyroid
 - b. Extended hours of sleep
 - c. Increased mental acuity
 - d. Both A and B

9. Lack of iodine, Graves Disease, and Thyroid Cancers have all been associated with:
- a. Type I Diabetes
 - b. Gigantism
 - c. Goiter
 - d. Addison's Disease
10. Which is a result of a deficiency of Human Growth Hormone from the Pituitary gland:
- a. Adult height under 4' 10"
 - b. Gigantism
 - c. Increased levels of Insulin Like Growth Factor
 - d. Acromegaly



The Endocrine System: Structure and Pathology

Speaker:

James Menz, MS, CSCS

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Endocrine System

After this lesson, the student will be able to:

- Identify organs of the Endocrine system.
- Describe the nature and function of hormones.
- Discuss Receptor Site / Lock & Key Theory

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Endocrine System

The other Body System, along with Nervous
System responsible for maintaining

Homeostasis

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Endocrine System

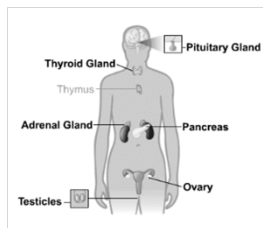
Compared to the Nervous System,
The Endocrine system is not as fast to act.

Effects may last weeks or even years.

Endo; Inner

Crine: Secrete

Endocrine System



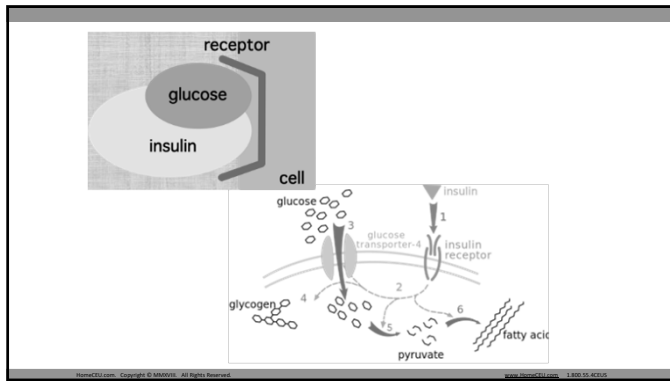
Hormones:

- Chemical Messengers
- Receptor Sites,
 - "Lock & Key" Theory

Endocrine System

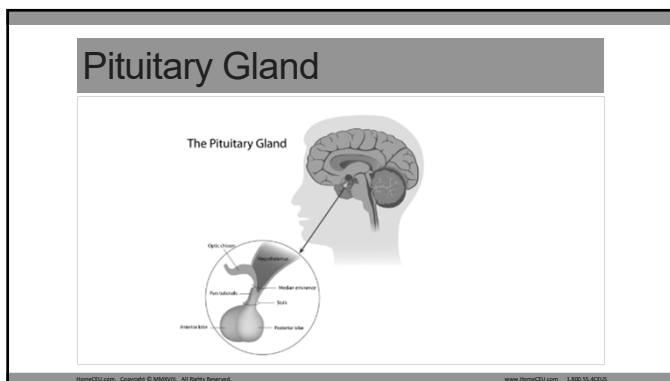
Overview of hormonal function

A. Receptor Site / Lock & Key
Theory



Endocrine System

Major glands and ancillary organs of the Endocrine System



Pituitary Gland

Often referred to as the “Master Gland”

Receives instruction from the
Hypothalamus,
Making the Hypothalamus the bridge
between the nervous and endocrine
systems.

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Anterior Pituitary Hormones

Thyroid Stimulating Hormone (TSH)
Regulates Thyroid Gland

Adrenocorticotrophic Hormone (ACTH)
Regulates some Adrenal Cortex hormones

Human Growth Hormone (HGH)
Stimulates growth throughout the body

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Anterior Pituitary Hormones

Gonadotrophins
Follicle-Stimulating Hormone
Lutenizing Hormone
Stimulate Gonads

Melanocyte Stimulating Hormone
Production of Pigment Melanin

Prolactin Milk Production

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Posterior Pituitary Hormones

Antidiuretic Hormone

Reabsorption of Water by Kidneys

Oxytocin

Uterine contraction, release of milk

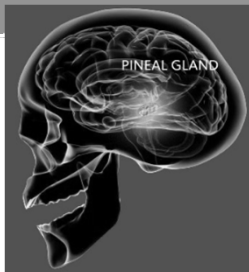
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Pineal Gland

Melatonin

Circadian Rhythm

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Thyroid Gland

Thyroxine

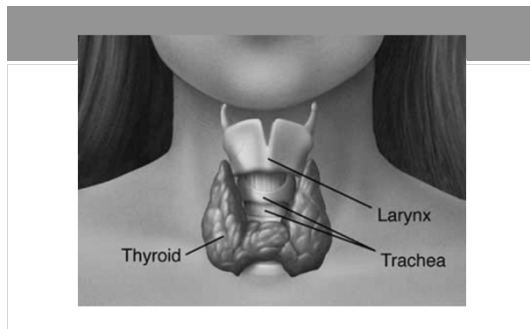
Metabolism in nearly all cells

Triiodothyronine

Metabolism in nearly all cells

Calcitonin

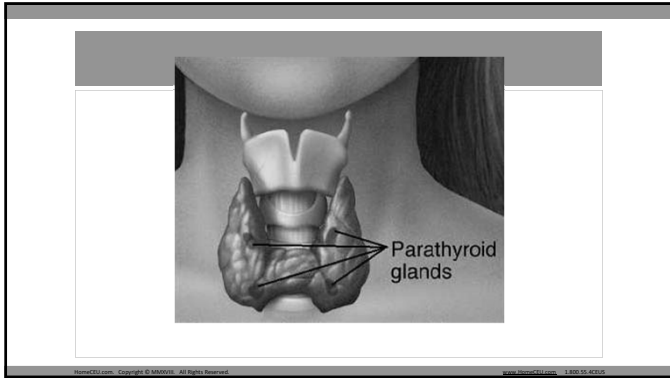
Calcium deposits into bone



Parathyroid Glands

Parathyroid Hormone (PTH)

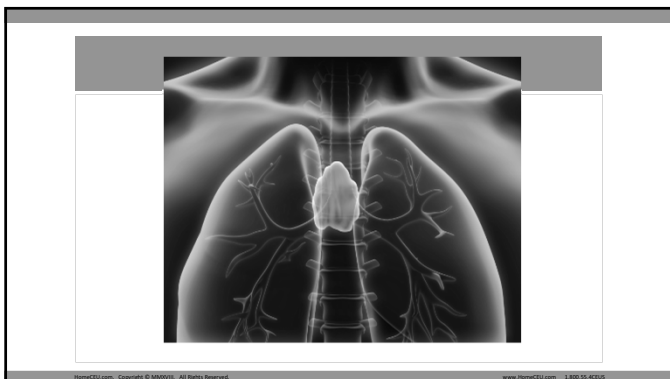
Bone breakdown,
Calcium in blood



Thymus

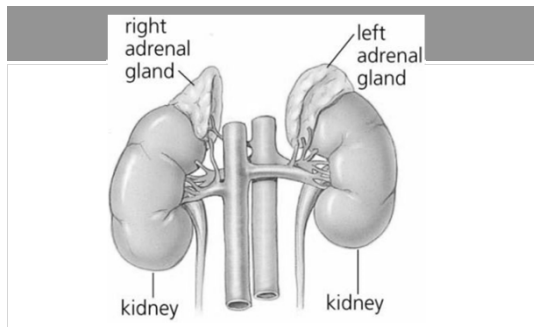
Thymosin

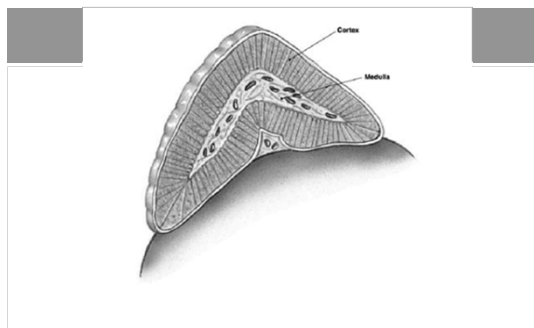
Cell development in Immune System



Adrenal Glands

Divided into
Outer Cortex
Inner Medulla





Adrenal Cortex

Glucocorticoids, including Cortisol
Carbohydrate levels throughout the body

Mineralcorticoids, ex aldosterone
Electrolytes and fluid levels in the body

Steroid Sex Hormones, ex Androgen (>estrogen)
Secondary sex characteristics

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Adrenal Medulla

Epinephrine

Sympathetic, aka Fight or Flight response

Norepinephrine

Vasoconstrictor

also a neurotransmitter !!

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Pancreas

Insulin

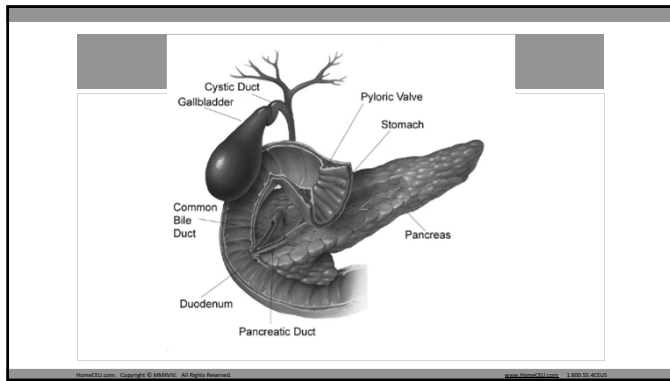
Promotes entry of Glucose into cells

Glucagon

Stimulates liver to release Glucose

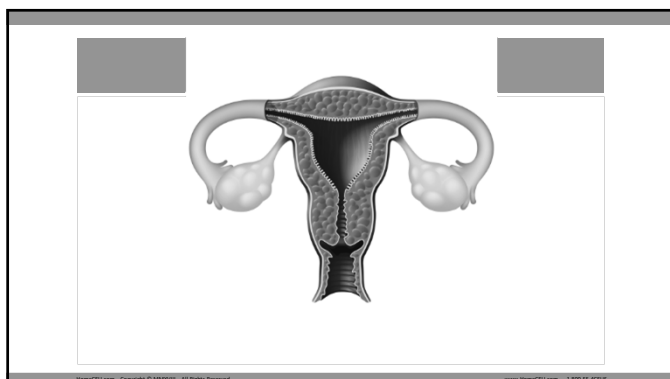
Pancreas is also a Digestive Organ

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Ovaries in Women

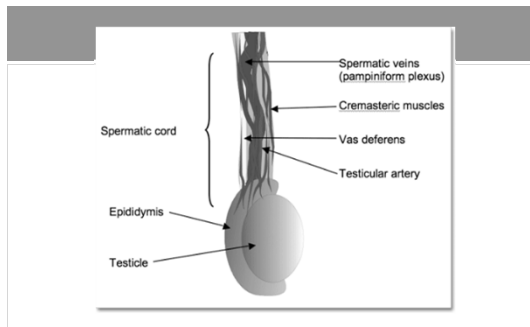
Estrogen
Secondary sex characteristics,
menstrual cycle



Testicles in Men

Testosterone

Secondary sex characteristics,
Sperm development



So How Does it All Work ??

Stimulus

- >> Perceived by Sensory Neurons
 - >> Delivered to CNS
 - >> Processed in Interneurons
 - >> Hypothalamus relays directions to Brain & Pituitary Gland
 - >> Pituitary Stimulates other glands
 - >> Glands to more glands...

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Another Example:

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Remember

Hormones are often released into the blood, so they are slower to take effect and slower to dissipate

Endocrine system overlaps with nervous, digestive, skeletal, reproductive, immune systems...

Many of the Pathologies related to the Endocrine System can be attributed to having Too Much (*Hyper-*) or Too Little (*Hypo-*) of a hormone or a resultant imbalance of a substance

Examples:

Hyper or Hypothyroidism
High low thyroid

Hypercalcemia
High blood calcium

Hyperkalemia
High blood potassium

Hypoglycemia
Low blood sugar

Hyposecretion

Polyuria

Endocrine System Pathologies

A Brief Survey

Forms of Diabetes

Type I Diabetes Mellitus

Type II Diabetes

Type I Diabetes Mellitus

Immune system damages the Beta Cells in the Pancreas

- The Islands of Langerhans
- Islands... off by themselves... ***Insulated***

Type I Diabetes Mellitus

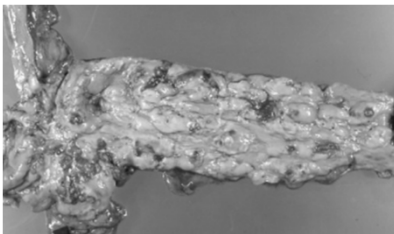
Also called Juvenile Diabetes
or
Insulin Dependent Diabetes Mellitus (IDDM)

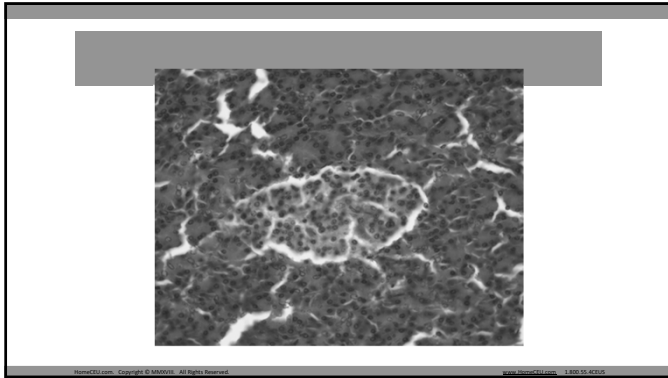
- Usually diagnosed before age 10
- No cure as of now

Type II Diabetes Mellitus

Also called Adult Onset, Insulin Resistant
or
Non-Insulin Dependent Diabetes Mellitus (NIDDM)

- Associated with obesity, lack of activity
- Often reversible
- 90% of cases in America





Complications from Diabetes

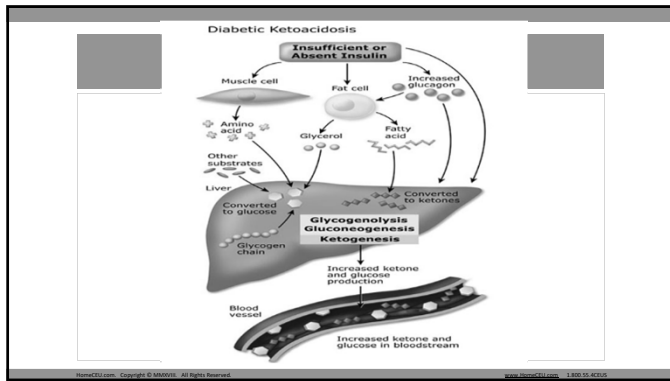
Low Blood Sugar:
Fatigue, loss of mental acuity

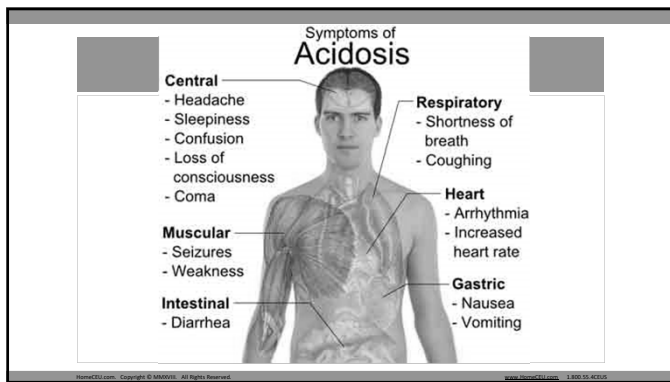
High Blood Sugar:
Compromised circulation, cyanosis, tissue necrosis, memory issues, eye trouble, sexual dysfunction

Ketoacidosis

Build up of Ketones from the break down of fats as fuel.

Can be complication of Diabetes or other causes





Cushing's Syndrome

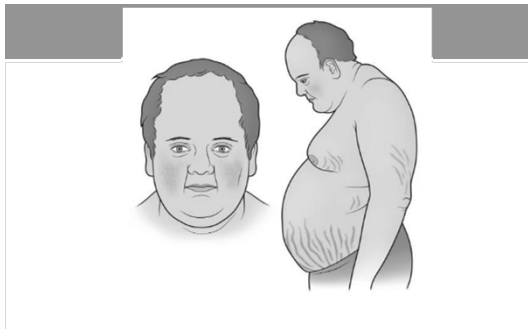
Overproduction of Cortisol

- Pituitary > Adrenal axis
- Primary Adrenal dysfunction
- Overuse of corticosteroid medications

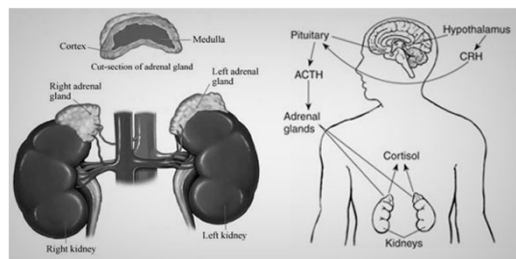
Cushing's Syndrome

Fatty deposits near/around

- Face
- Mid Back
- Belly
- Lethargy
- Drop in libido
- Osteoporosis
- Type II Diabetes



An Example:



Addison Disease

- aka Adrenal Insufficiency

- Too little Cortisol
- Too little aldosterone

Addison Disease

Can onset gradually or suddenly

Weakness, fatigue, low glucose, low sodium, unconsciousness, muscle and joint pain, depression, vomiting, skin discoloration

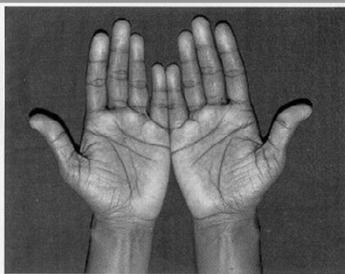


Fig. 2 Addison's disease – hyperpigmentation involving the palms of the hand.

Graves Disease

Begins with Immune dysfunction, an antibody (TSI) attaches to receptors in the Thyroid and simulate TSH, causing the Thyroid to be overactive

Sleeplessness

Weight Loss

Sweating

Weakness

Bulging Eyes

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Graves Disease



Exophthalmos

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Myxedema

Hypothyroidism

Fatigue
Increased sensitivity to cold
Constipation
Dry skin
Weight gain
Puffy face
Hoarseness
Muscle weakness
Elevated blood cholesterol level
Muscle aches, tenderness and stiffness
Pain, stiffness or swelling in your joints

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Goiter

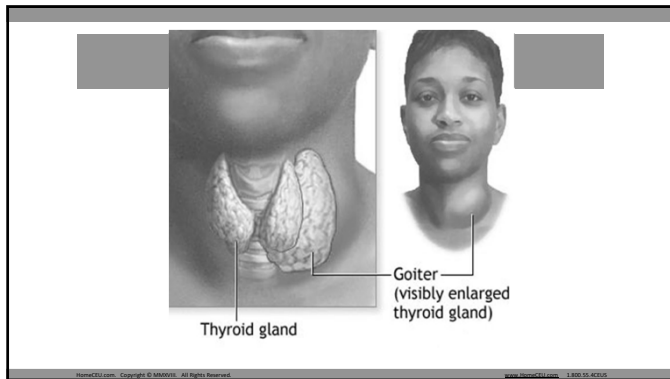
Causes Include:

- Lack of Iodine
- Grave's Disease
- Hashimoto's Disease
- Nodular Goiters
- Thyroid Cancers

Goiter

Enlargement of the Thyroid

May or may not interfere with Thyroid Function



Recklinghausen Syndrome

Excessive production of Parathyroid hormone
Leading to degeneration of bones

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Recklinghausen Disease

aka Neurofibromatosis

- Genetic condition
- Tumors grow on nerves

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Gynomastia

Development of breast tissue and "breast buds" in males. Due to excess estrogen and/or insufficient testosterone.

- At birth
- Puberty
- Numerous causes with age

Causes in Adults

- Liver diseases/alcohol abuse
- Chemotherapy
- Antidepressants
- Heart meds/digitalis
- Corticosteroids/prednisone
- Steroid abuse in athletes

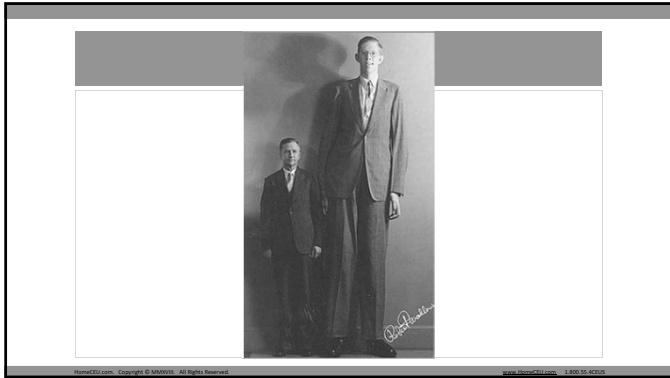




Gigantism/Dwarfism

Excessive or Deficient secretion of Human Growth Hormone from the Pituitary

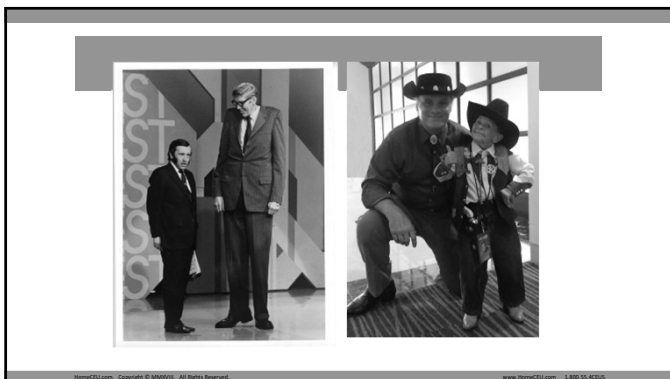
Gigantism	Dwarfism
Acromegaly	4' 10" or under
Insulin like Growth Factor ILGF-1	Proportional or Disproportional




Tallest man ever
according to the
Guinness Book of World
Records was

Rober Wadlow of Alton
Illinois
(1918-1940)

At 8ft, 11 inches at time
of his death
... and Still Growing





Sultan Kösen of Turkey 21.5" Tall	Chandra Bahadur Dangi of Nepa 8 ft, 3 in
--------------------------------------	--

Body System Interaction

List and Discuss how the Endocrine System interacts, and overlaps, with other systems of the Human Body

Parting Shot

Time flies like the wind, fruit flies like bananas.

-Paul Menz

Completion

You have completed the course

**The Endocrine System:
Structure and Pathology**

THANK YOU.

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