Endocrine Glands and Hormones

- Pituitary gland
  - Anterior pituitary gland (adenohypophysis)
  - Posterior pituitary (neurohypophysis)
- Thyroid gland—responsible for growth, development, and metabolism
- Parathyroid glands—active in maintenance of calcium balance

Endocrine Glands and Hormones cont’d

- Adrenal glands
  - Adrenal cortex—releases mineralocorticoids, glucocorticoids, and sex hormones
  - Adrenal medulla—releases epinephrine and norepinephrine
- Pancreas—serves many functions, but is mainly known for insulin production
  - Is also responsible for the production of glucagon
**Endocrine Glands and Hormones cont’d**

- Female sex glands
  - Ovaries
    - Produce estrogen and progesterone
    - The placenta is a temporary endocrine gland
- Male sex glands
  - Testes
    - Produce testosterone

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**Endocrine Glands and Hormones cont’d**

- Thymus gland—plays an integral role in immune function
- Pineal glands—secrete melatonin

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**Negative Feedback**

- Information is constantly being exchanged between the target organs and the pituitary gland
- The amount of hormonal release is controlled by feedback
- Negative feedback means that an increase in the expected activity will lead to a decrease in the release of the hormone causing that effect
Effects of Hormones on Target Organs

- Anterior pituitary gland
  - Prolactin causes the mammary glands to produce milk

- Posterior pituitary gland
  - Oxytocin promotes the release of milk and stimulates uterine contractions during labor
  - Antidiuretic hormone (ADH) causes the kidneys to conserve water by decreasing the amount of urine produced.

- Thyroid gland
  - T3 and T4 serve to promote growth and development, maintain metabolism, and are involved in nervous function
  - Thyroid-stimulating hormone (TSH, secreted by the pituitary gland) controls the release of these two hormones
  - Calcitonin decreases calcium level by causing calcium to be stored in the bones

Effects of the Hormones on Target Organs cont’d

- Parathyroid glands
  - Parathyroid hormone (PTH) serves as an antagonist to calcitonin
  - PTH tends to increase calcium concentration in the blood
  - PTH also regulates the amount of phosphorus in the blood

Effects of the Hormones on Target Organs cont’d

- Adrenal cortex
  - Mineralocorticoids—“Salt”—primarily involved in water and electrolyte balance, which indirectly manages blood pressure
  - Glucocorticoids—“Sugar”—involved in glucose metabolism
  - Sex hormones—“Sex”—control male and female sex characteristics

- Adrenal medulla
  - Epinephrine
  - Norepinephrine
Effects of the Hormones on Target Organs cont’d

- Pancreas
  - Insulin—acts as the “key” that allows sugar into the cell
  - Glucagon—acts as the “key” to allow sugar back out of the cell
- Thymus gland
  - Thymosin plays an active role in immune development
- Pineal gland
  - Thought to affect mood and sleep

Hypothalamus

- Produces the hormones of the posterior pituitary

Acromegaly

- Caused by an overproduction of growth hormone
- Usually begins in the third to fourth decade of life
- Characterized by bulging forehead, bulbous nose, thick lips, and coarse facial features
- Patient’s ability to maintain normal body function and maintain quality of life should be closely assessed
- Diagnosis is based largely on medical history
- Treatment includes dopamine agonists, somatostatin analogs, and surgery
Gigantism

- Overproduction of growth hormone before close of growth plates
- Leads to great height and size
- Assessment is aimed at early detection
- Treatment usually involves medication or surgery

Dwarfism

- Hypopituitary dwarfism is caused by growth hormone deficiency
- Assessment is aimed at early detection
- Diagnostic exams include CT scan and MRI
- Medical management involves replacement of growth hormone
- Nursing interventions are aimed at early detection

Diabetes Insipidus

- Disorder of the posterior pituitary in which ADH is deficient
- A decrease in ADH results in electrolyte and fluid imbalances
- Diabetes insipidus is characterized by significant polyuria and intense polydipsia
- Patients with diabetes insipidus may have a urinary output exceeding 5-20 L per 24 hours
- The patient is weak, tired, and lethargic
- Specific gravity is altered and skin turgor is poor
**Diabetes Insipidus cont’d**

- Diagnosed with urine spectrometry and lab values, along with a careful history
- Medical management focuses on treatment ADH deficiency
- Nursing interventions are aimed at protecting the patient from injury
- Patient should be weighed daily and I&O should be monitored closely
- Encourage oral intake of fluids

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**Syndrome of Inappropriate Antidiuretic Hormone**

- Syndrome of inappropriate ADH (SIADH) occurs when the pituitary gland releases too much ADH
- As a result, excess water is reabsorbed by the kidneys
- Characterized by hyponatremia, hemodilution, and fluid overload
- Signs and symptoms include nausea, vomiting, irritability, confusion, tremors, seizures, stupor, and coma
- Diagnosed through urine spectrometry and lab values, with careful history
- Treatment includes strict fluid restriction

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**SIADH cont’d**

- Patient may be limited to as little as 500 mL of fluid per day
- Treatment is aimed at resolving underlying conditions
- Nursing interventions are aimed at fluid restriction and electrolyte replacement
- I&O should be closely monitored
Disorders of the Thyroid Gland

- Hyperthyroidism
- Hypothyroidism
- Thyroid cancer
- Goiter

Hyperthyroidism

- Also called Graves’ disease
- Results in an increased production of T₃ and T₄, which leads to exaggerated metabolic processes
- Symptoms include weight loss, nervousness, insomnia, shortness of breath
- Objective data includes VS changes, increased BP, tachycardia, hair becomes fine and brittle, diarrhea
- T₃ and T₄ levels are measured to diagnose

Hyperthyroidism cont’d

- Ablation therapy using radioactive iodine is the gold standard for treating hyperthyroidism
- Treated medically with propylthiouracil or Tapazole
- Surgery may also be used to treat
- Nursing interventions include
  - Diet therapy
  - Increase vitamin intake
  - Teaching foods that aid in easing the burden of Graves’ disease
  - Provide preoperative and postoperative care
Thyroidectomy

- Removal of the thyroid
- Postoperatively, the nurse should
  - Monitor the airway
  - Monitor carpopedal spasms, Chvostek’s sign, and Trousseau’s sign
  - Monitor for thyroid storm

Signs of Hypocalcemia

- As a result of thyroidectomy, one or more parathyroid glands may be inadvertently removed
- This can result in hypocalcemia
- Signs of hypocalcemia include
  - Carpopedal spasms—muscle spasms of the wrist and feet
  - Chvostek’s sign
  - Trousseau’s sign

Hypothyroidism

- A state that occurs when the thyroid fails to secrete sufficient hormones
- Signs and symptoms include weight gain, fluid gain, mood swings, infertility, depression
- Diagnosed by assessing TSH, T₃, T₄, and FT₄ levels
- Medical management is aimed at replacing thyroid hormones
- Nursing interventions are aimed at keeping the patient comfortable and preventing complications
Simple Goiter

- Enlarged thyroid gland
- Characterized by overt thyroid dysfunction
- Symptoms include dysphagia, hoarseness, and dyspnea
- Objective data includes increased goiter size, voice changes, decreased food intake
- Diagnosis is made through lab values of T₃, T₄, and TSH
- Medical management is aimed at replacing iodine
- Nursing interventions are aimed at patient teaching and postoperative care for the patient who undergoes thyroidectomy

Cancer of the Thyroid

- Relatively rare malignancy
- Affects about 25 per 1,000,000 people
- Risk factors include diets low in iodine, women in their 40s and 50s, and radiation exposure
- Characterized by a firm, fixed, small, rounded, painless mass or nodule that is felt over the thyroid gland
- Diagnosed when a thyroid scan shows a “cold” nodule
- Treatment is usually a total thyroidectomy

Hyperparathyroidism

- Overactivity of the parathyroid glands, which increases production of PTH
- The primary clinical manifestation is hypercalcemia
- Assessment findings include skeletal pain, fatigue, weakness, drowsiness, pathologic fractures, dysrhythmias
- Assessed via radiography, lab levels, and history
- Usually treated via surgical intervention
- Nursing interventions are aimed at restoring and maintaining fluid and electrolyte balance
Hypoparathyroidism cont’d

- Occurs when PTH is decreased
- Characterized by a decreased serum calcium level and increased serum phosphorus level
- May be characterized by
  - Laryngeal stridor
  - Muscle spasms
  - Chvostek’s sign
  - Hypocalcemic tetany

Hypoparathyroidism cont’d

- Diagnosis is made by assessing laboratory calcium, PTH, and phosphorus levels
- Medical management is aimed at replacing calcium
- Vitamin D is also given orally
- Patient should be provided education about eating foods that are high in calcium

Cushing’s Syndrome
(Adrenal Hyperfunction)

- Caused by increased corticosteroids, especially glucocorticoids
- Signs and symptoms include
  - Weight gain
  - Accumulation of adipose tissue in the trunk, face, and cervical spine
  - Hypokalemia
  - Hyperglycemia
Addison’s Disease (Adrenal Hypofunction)

- Most commonly caused by an autoimmune response
- The patient should be assessed for weakness, vertigo, syncope, and postural hypotension
- The patient also usually experiences weight loss, vomiting, and diarrhea
- Medical therapy is aimed at replacing steroids, usually with hydrocortisone
- Nursing interventions are aimed at improving circulatory status, maintaining accurate I&O, and daily weights

Diabetes Mellitus (DM)

- DM Type I: Most commonly referred to as *insulin-dependent diabetes*
- DM Type II: More commonly linked to sedentary lifestyle and lack of activity
- Insulin sensitivity may be decreased, the patient may not produce enough insulin, or a combination of both

Signs and Symptoms of DM

- DM is characterized by three cardinal signs and symptoms
  - Polydipsia
  - Polyphagia
  - Polyuria
Assessment of the Patient with DM

- **Subjective data**
  - The three Ps
  - Nocturia
  - Weakness
  - Fatigue
  - Blurred vision

- **Objective data**
  - Slow wound healing
  - Hyperglycemia
  - Weight loss
  - Muscle wasting

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Diagnostic Exams for DM

- Any random blood glucose greater than 200
- Fasting blood glucose greater than 126
- Elevated results on an oral glucose tolerance test (OGTT)

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Treatment Triad for DM

- Diet
- Exercise
- Medications
Nursing Interventions and Patient Teaching

- Nursing interventions and patient teaching are aimed at
  - Diet education
  - Exercise education
  - Medication for dosage, type, route

Hyperglycemia

- Condition of elevated blood glucose associated with DM
- Fasting blood glucose >126
- Random blood glucose >200

Hypoglycemia

- Blood glucose level less than normal
- Caused by administration of excessive insulin, excessive secretion of insulin, or dietary deficiency
- Signs and symptoms include faintness, hunger, excessive perspiration, irritability, trembling
- Treatment is aimed at replacing glucose in the body by
  - Oral intake
  - IV intake
  - IM injection
Diabetic Ketoacidosis
- Associated with type I DM
- Caused by lack of insulin and/or increased sugar intake
- Onset is hours to days
- Patient is hot, dry, and flushed and has fruity breath
- Kussmaul's respirations
- Treated with insulin and limited intake

Hyperglycemic Hyperosmolar Nonketotic Coma
- Caused by inadequate insulin or oral hypoglycemic intake
- Onset is days
- Usually occurs in type 2 diabetes
- Patient is hot and dry
- Characterized by lethargy and decreased LOC
- Treatment includes large amounts of IV fluid and insulin

DM Triad of Treatment
- Diet
- Exercise
- Nutrition
Diet

- Low concentrated sweets
- Moderate carbs
- Low fat
- High protein
- Small meals with frequent snacks

Exercise

- Improves insulin sensitivity
- Improves insulin production
- Improves cardiovascular health

Medications

- Insulin
- Oral hypoglycemic agents
Oral Hypoglycemic Agents

- Sulfonylureas, Meglitinide, and thiazolidinediones improve insulin production and increase insulin sensitivity
- Biguanides decrease hepatic glucose production and increase insulin sensitivity
- Alpha-glucosidase inhibitors delay carbohydrate absorption

Insulin

- Rapid- or short-acting has a short onset and peak of action
- Mixed is a combination of short-acting and long-acting
- Intermediate acting generally has an onset of about 30 minutes and a 6-12 hour effect
- Long-acting has a long duration

Insulin Administration

Preparation of Insulin
- Wash hands
- Assemble equipment
- Turn insulin vial in hands
- Clean rubber stopper with alcohol
- Insert air into vial
- Withdraw insulin
- Inspect for air bubbles
Insulin Administration cont’d

Two Insulins
- Following procedure described earlier.
  - First withdraw regular insulin
  - Then withdraw longer-acting insulin

Insulin Injection
- Don gloves
- Clean injection site
- Quickly insert needle in subcutaneous tissue
- Inject insulin slowly
- Dispose of syringe appropriately

Short-Term DM Complications
- Hypoglycemia
- HHNC
- DKA
Long-Term DM Complications

- Blindness
- Kidney disease
- Heart disease
- Poor circulation