

Hormones and Exercise

Endocrine System

- 3 Components:
 - Host organ
 - Hormones
 - Target (receptor) cells or organs

Types of Glands

- Endocrine gland–secrete hormones that diffuse into the bloodstream
- Exocrine gland–have secretory ducts that lead directly to specific compartment or surface that requires the hormone; e.g. sweat glands and glands of upper digestive tract

Hormones & Function

- Hormones–chemical substances that carry messages to regulate growth, metabolism and reproduction. It enhance body's ability to respond to physical and psychological stress

Anterior Pituitary Hormones and Exercise

- Growth Hormone–stimulates tissue growth, mobilizes fat for energy, and inhibits CHO metabolism; ↑ with exercise
- Prolactin–inhibits testosterone, and mobilizes fat for energy; ↑ with exercise
- Endorphins–block pain and promote euphoria; ↑ with long-duration exercise

Posterior Pituitary Hormones and Exercise

- Vasopressin (ADH)–controls water excretion by kidneys; ↑ with exercise

Adrenal Cortex Hormones and Exercise

- Cortisol–promotes fat and protein catabolism, conserves blood sugar; ↑ with intense exercise
- Aldosterone–promote sodium, potassium and water retention by the kidneys; ↑ with exercise

Adrenal Medulla Hormones and Exercise

- Epinephrine (Adrenaline)–facilitates sympathetic activity, increases heart activity, regulates blood vessels, increases glycogen catabolism and fat release; ↑ with intense exercise

- Nor-epinephrine—similar functions as epinephrine; ↑ with exercise

Thyroid Hormones and Exercise

- Thyroxin (T₄) & Triiodothyronine (T₃)—stimulate metabolism and regulate cell growth and activity; ↑ with exercise

Pancreatic Hormones and Exercise

- Insulin—promotes glucose transport into cells and promotes fatty acid and amino acid transport into cells; ↓ with exercise
- Glucagon—promotes release of glucose from liver to blood, increases fat metabolism and reduces amino acid levels; ↑ with exercise

Parathyroid Hormone and Exercise

- Parathyroid hormone—raises blood calcium and lowers blood phosphate; ↑ with long-term exercise

Ovary Hormones and Exercise

- Estrogen and Progesterone—control menstrual cycle, increase fat deposition, and promote female gender characteristics; ↑ with exercise depending on phase of menstrual cycle

Testicular Hormones and Exercise

- Testosterone—controls muscle size, increases red blood cells, decreases body fat, and promotes male gender characteristics; ↑ with exercise

Hormonal Problems

- Aldosterone
 - Increased production of this hormone is associated with high blood pressure; often times in obese teenagers
- Associated with:
 - ↓ salt sensitivity (increased body water)
 - ↑ sodium intake
 - ↓ sensitivity to insulin's effects

Hormonal Problems

- Diabetes Mellitus
 - Type I diabetes—lack of or no secretion of insulin from pancreas
 - Dependence on exogenous insulin

- Type II diabetes—cells resist insulin's effects
 - May need exogenous insulin or must exercise to improve body's ability of glucose uptake

Diabetes and Exercise

- Type I Diabetes
 - Problems:
 - Hypoglycemia- can result with exercise if insulin has been taken recently
 - Hyperglycemia- can result with exercise if no insulin taken for long period of time

Exercise Guidelines for:

Type I Diabetes

- Monitor blood glucose before, during, and after exercise
- Ingest 15-30 grams of CHO for each 30 min of intense exercise
- Consume CHO snack after exercise
- Decrease insulin dose
- Avoid exercising the muscles where insulin injection was given for 1 hour
- Avoid exercising in late evening

Exercise Guidelines for:

Type II Diabetes

- Similar to Type I

Exercise Benefits for Individuals with Diabetes:

- Improved glycemic control (increased sensitivity of tissues to insulin so better uptake of glucose)
- Decreases cardiovascular risk factors
- Promotes weight loss
- Decreases anxiety levels

When should exercise be Avoided in Diabetics:

- Retinal hemorrhage or recent eye surgery
- Fever or infection is present
- Blood glucose < 80 mg/dl
 - Eat extra CHO until glucose is above 120 mg/dl before exercising
- Blood glucose > 250 mg/dl and urine ketones are present
 - Decrease blood glucose with insulin injection

Hormonal Response to Exercise Training

- After training, exercise at same absolute intensity will result in a lower hormonal

response in most cases

Specific hormone responses to Training

- Human growth hormone-↓ response with exercise; higher resting values
- Prolactin-↓ resting values
- Testosterone-↓ resting values in women but possible ↑ in men with resistance training
- Vasopressin (ADH)-↓ response with exercise

Specific hormone responses to Training

- Cortisol- slight ↑ with exercise in trained
- Epinephrine & Norepinephrine -↓ response with exercise
- Insulin-↓ response with exercise due to increase in sensitivity
- Glucagon-↓ response with exercise