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The Intricate Web Of Hormone Relationships

Dr. Ritamarie Loscalzo

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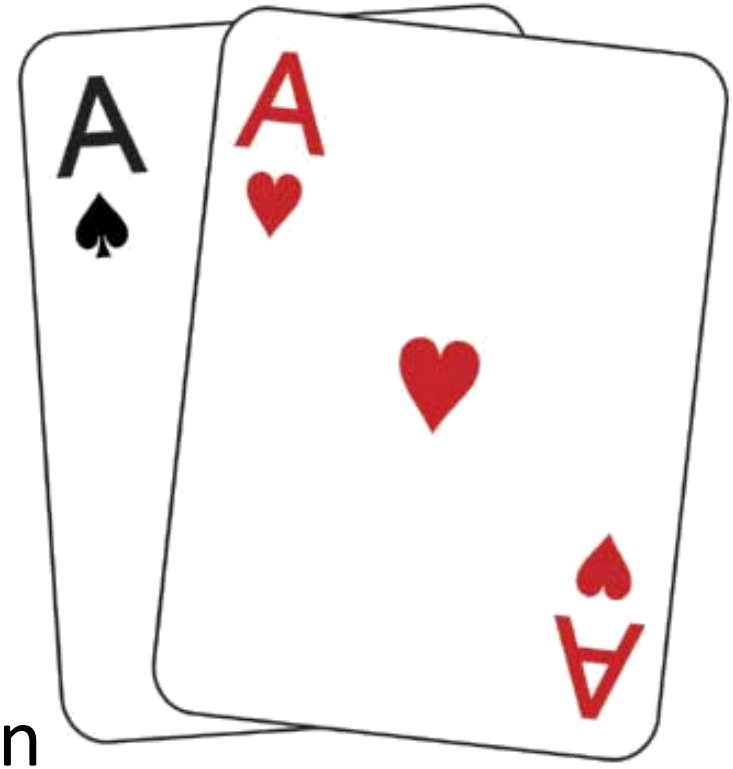
Important Hormone Pairs

- ✓ Insulin/Glucagon
- ✓ Cortisol/DHEA
- ✓ Leptin/Ghrelin
- ✓ Estrogen/Progesterone
- ✓ Testosterone/DHEA
- ✓ Growth Hormone/Somatostatin



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Hormone Families

- ✓Metabolic rate
- ✓Blood sugar balancing
- ✓Appetite and digestion
- ✓Stress
- ✓Sex and reproduction
- ✓Sleep, thoughts, and emotions
- ✓Organ functions

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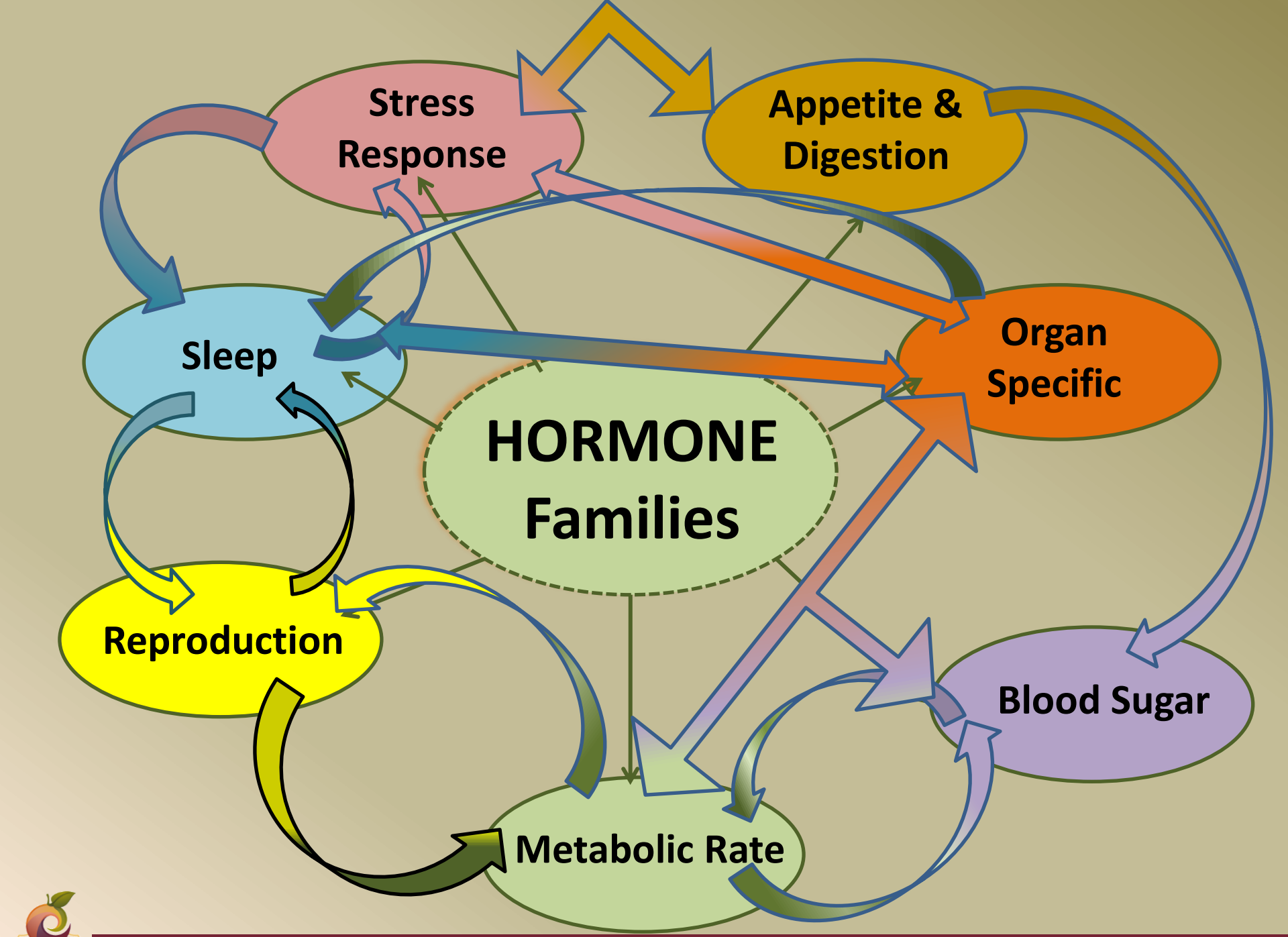

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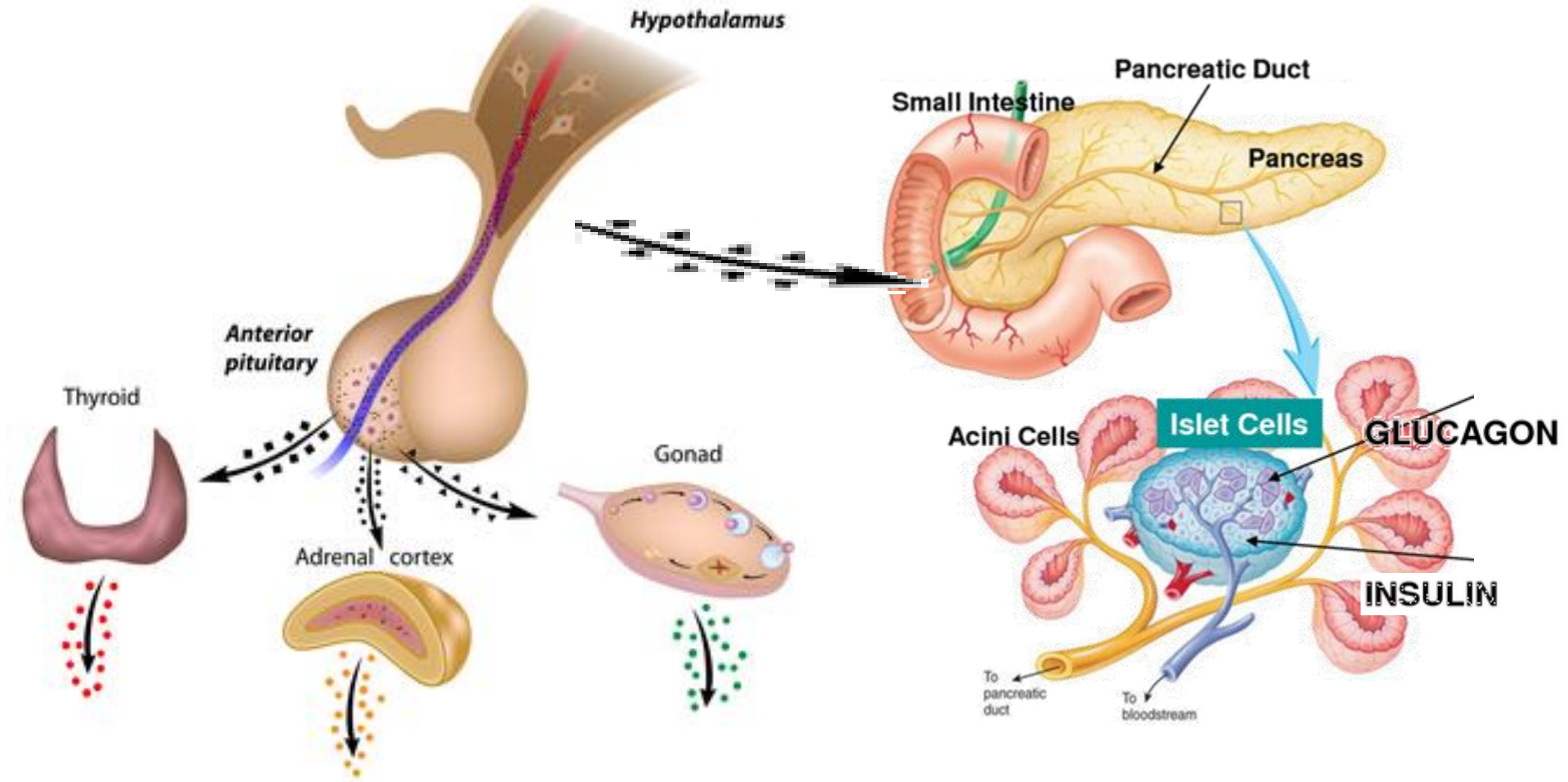
Hormones In Charge of Metabolic Rate



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Metabolic Rate Hormone Family

Hormone	Produced by	Action
Thyroxine (T4), Free T4	Thyroid	Converts to T3 which stimulates oxygen uptake by cells
Triiodothyronine (T3), Free T3	Thyroid	Most profound effect on increasing metabolic rate
Thyroid Stimulating Hormone (TSH)	Anterior pituitary	Stimulates release of T4 and T3
Thyrotropin Releasing Factor (TRH)	Hypothalamus	Stimulates release of TSH
Reverse T3	Thyroid	Inhibits T3 and decreases metabolic rate
Insulin	Pancreas – Islet cells	Enhances uptake of glucose into cells and subsequent ATP Production
Epinephrine (Adrenaline)	Adrenal medulla	Enhances metabolic rate and also insulin
Cortisol	Adrenal cortex	Enhances release of stored sugar and supplies additional fuel to cells

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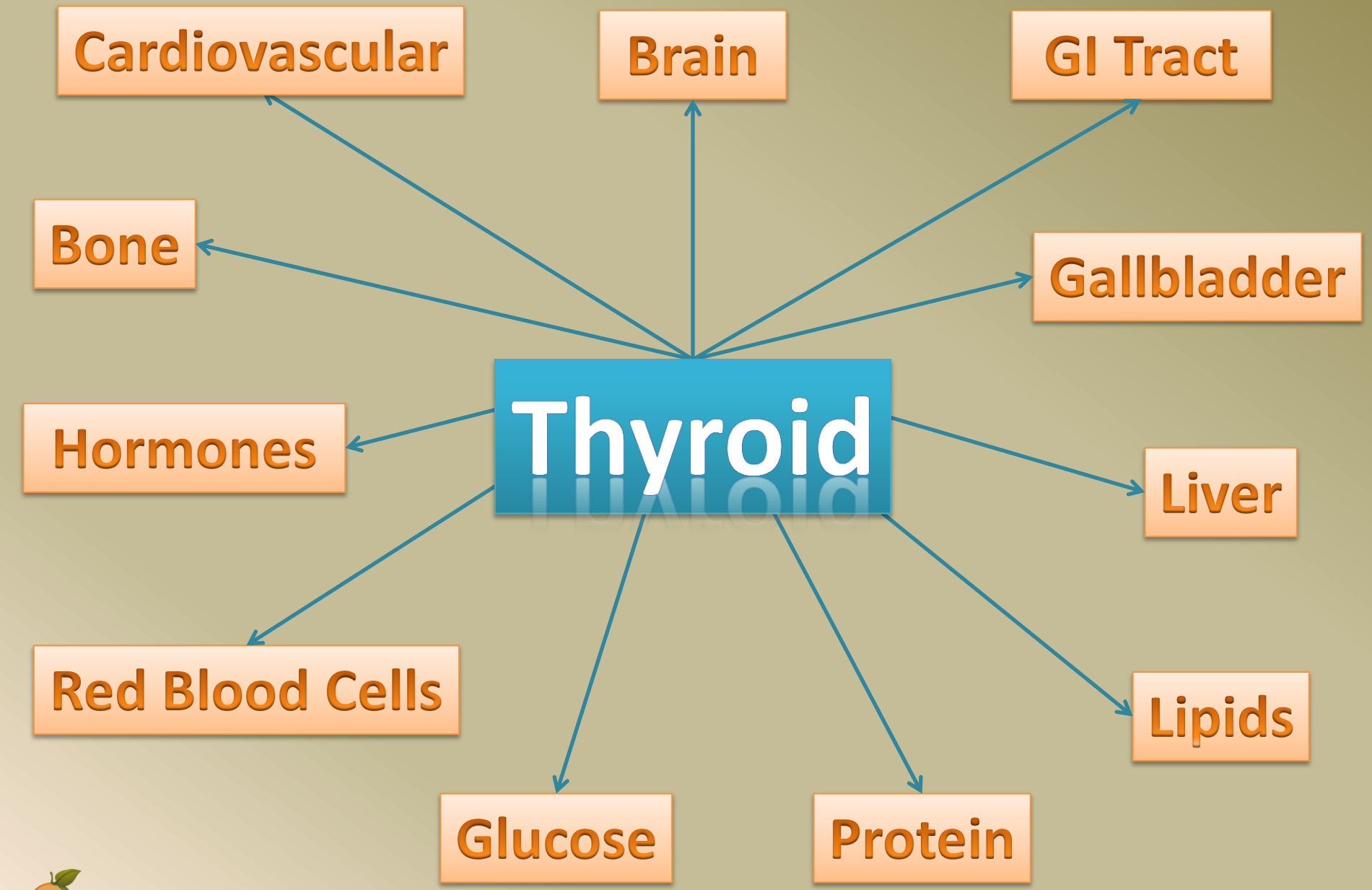

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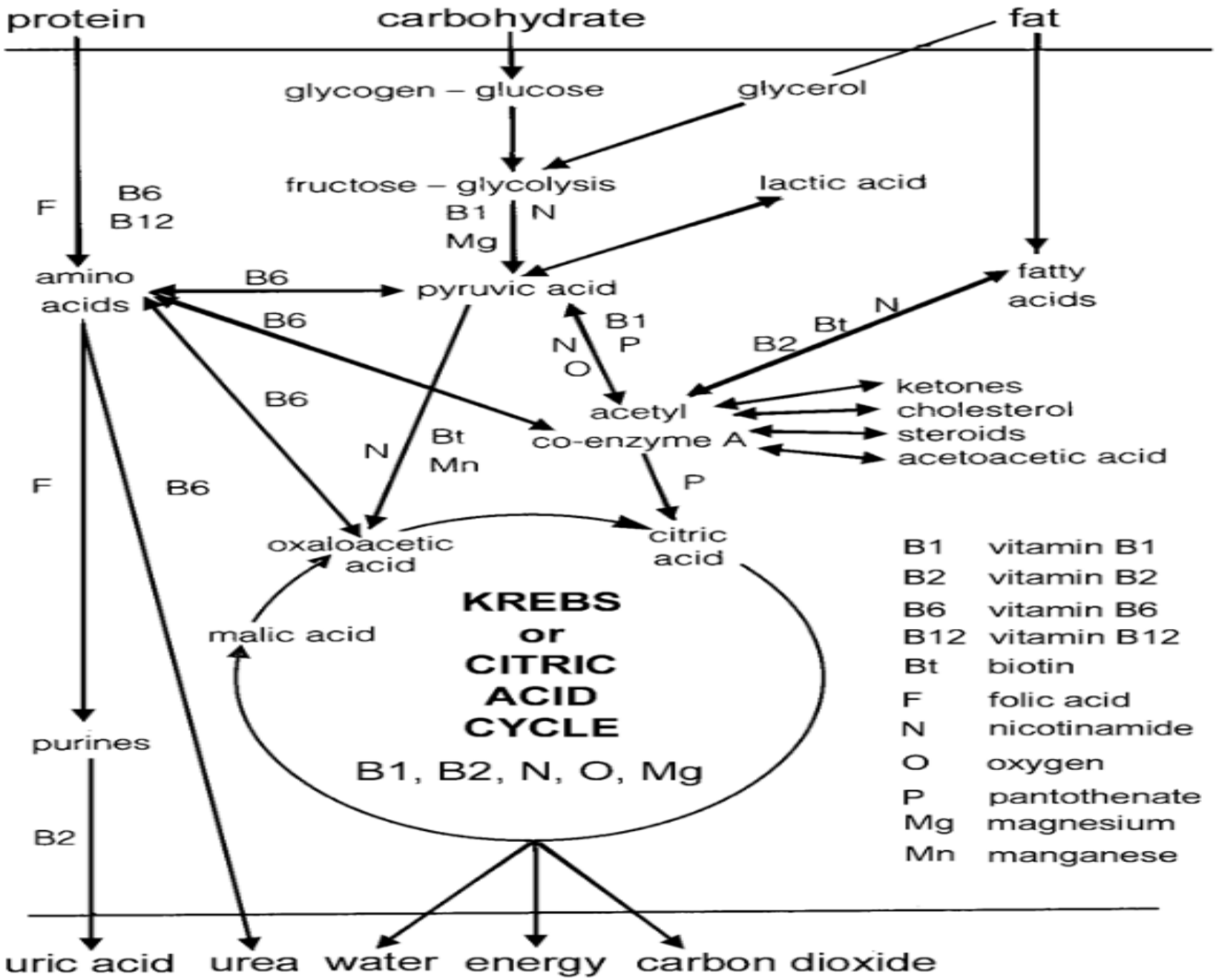

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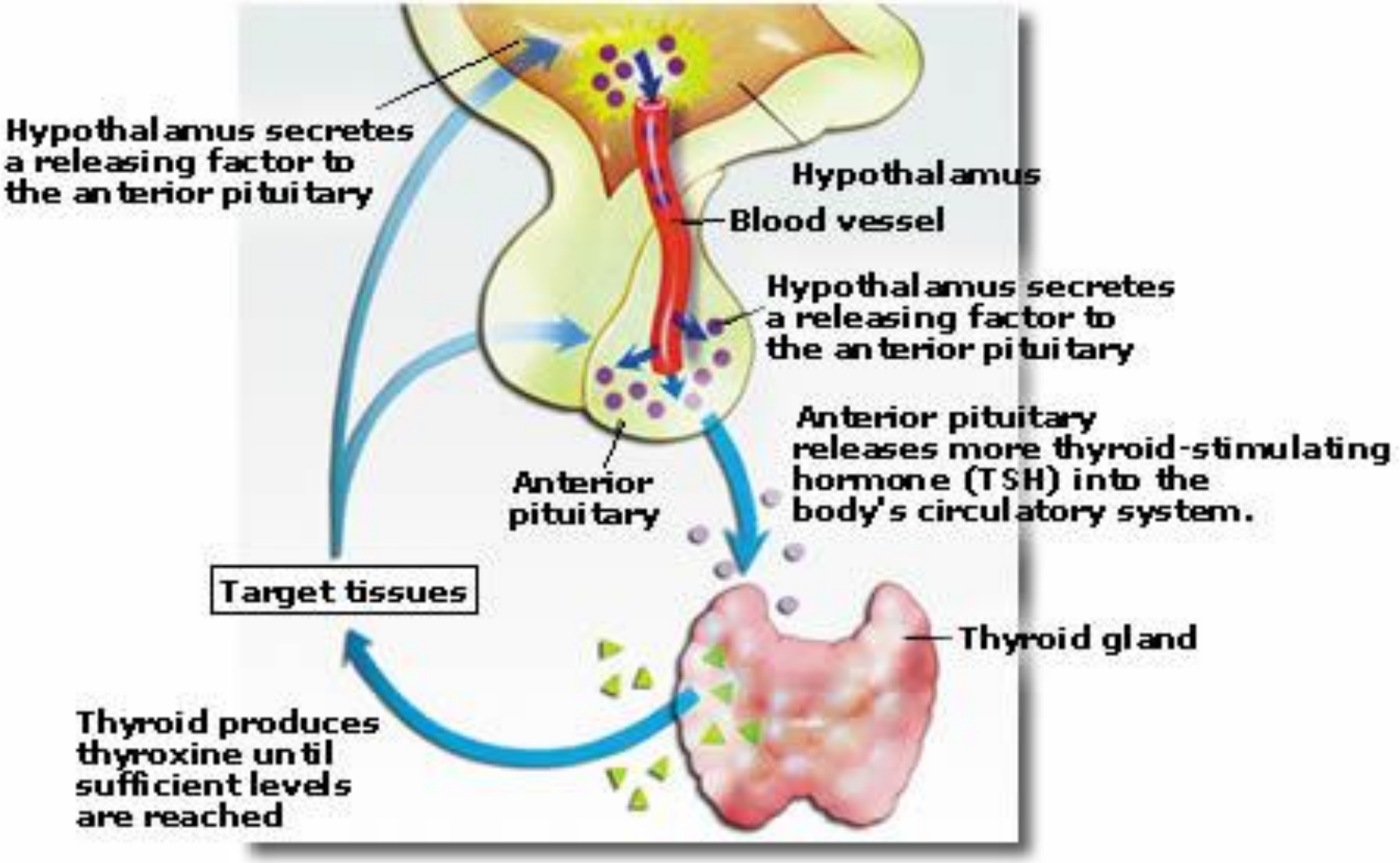
Thyroid Control



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Blood Sugar Hormone Family

Hormone	Produced by	Action
Insulin	Pancreas – Beta cells	Stimulates glucose uptake into cells and reduces blood glucose
Glucagon	Pancreas – Alpha cells	Stimulates glucose release from glycogen and synthesis from amino acids and fats
Somatostatin	Stomach, intestine, and pancreas	Suppresses glucagon and insulin, gastric hormones, GH, TSH, and prolactin
Growth Hormone	Anterior pituitary	Antagonizes insulin
Epinephrine (Adrenaline)	Adrenal medulla	Enhances glucose release from glycogen and fat
Cortisol	Adrenal cortex	Antagonizes insulin and stimulate gluconeogenesis and increases glucose
Thyroxine (T4)	Thyroid	Enhances release of glucose from glycogen and absorption of sugars from intestine
ACTH	Anterior pituitary	Enhances release of cortisol and fatty acids from adipose tissue
Incretin	Small intestine	Increases insulin even before glucose enters bloodstream

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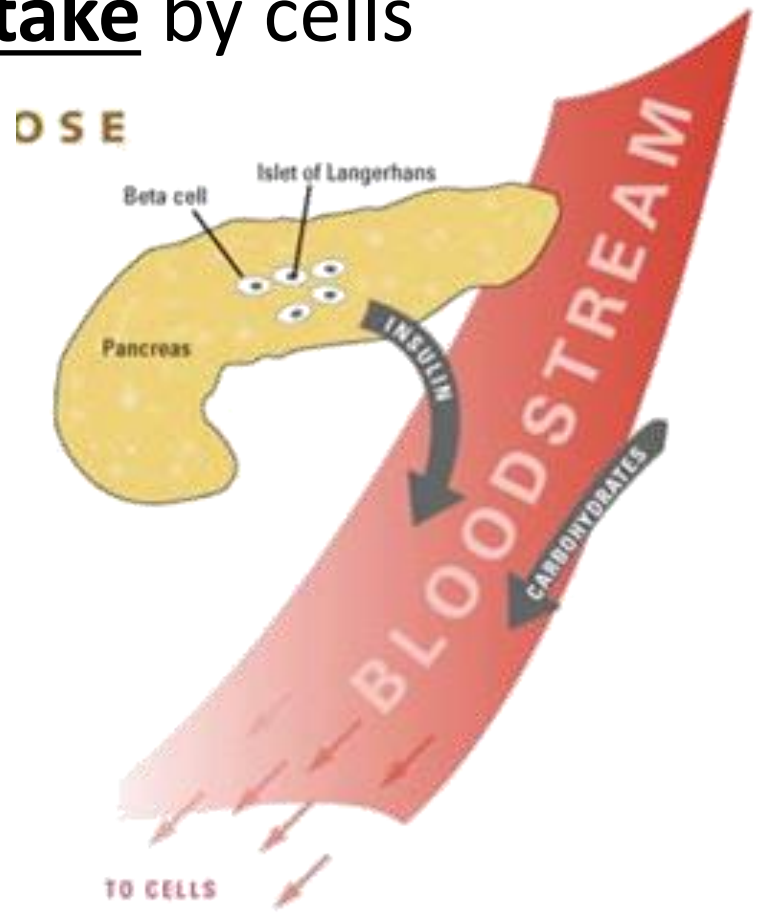
Effects of Thyroid Dysfunction on Glucose Metabolism

- ✓ Decreased rate of **glucose uptake** by cells
- ✓ Decreased rate of **glucose absorption** in the gut
- ✓ **Slower response of insulin** to elevated blood sugar
- ✓ **Slower clearance** of insulin from the blood



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Insulin And Glucagon Imbalance

- ✓ **Blood sugar imbalances weaken and imbalance:**
  - gut
  - lungs
  - brain
  - hormone levels
  - adrenal glands
  - detoxification pathways
- ✓ **This leads to**
  - impaired metabolism
  - weakened thyroid function
- ✓ As long as there is blood sugar dysregulation, **whatever you do to fix the thyroid isn't going to work.**

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Appetite and Digestion Hormone Family

Hormone	Produced by	Action
Leptin	Fat cells	Signals satiety
Ghrelin	Stomach lining	Signals hunger
Gastrin	Stomach	Production of stomach acid
Cholecystokinin (CCK)	Small intestine	Production of pancreatic juices and emptying of gall bladder
Secretin	Duodenum	Stimulates bicarbonate production by pancreas, bile production by liver, and pepsin by stomach
Peptide YY	Mainly ileum and colon, but a little in other parts of GI tract	Inhibits gastric motility, increases water and electrolyte absorption in colon, may suppress pancreatic secretion, increases efficiency of digestion
Incretins: GIP: Gastric Inhibitory Peptide and GLP: Glucagon-Like Peptide	Small intestine	Increases insulin, inhibits glucagon release, slows rate of absorption of nutrients by reducing gastric emptying
Somatostatin	Stomach, intestine, pancreas	Inhibits gastrin, CCK, secretin, GIP and also growth hormone, TSH, glucagon and insulin
Dopamine	Brain and GI mucosa	Reduces motility and protects mucosa
Serotonin	Brain and GI mucosa	Inhibits gastric acid and stimulates mucus

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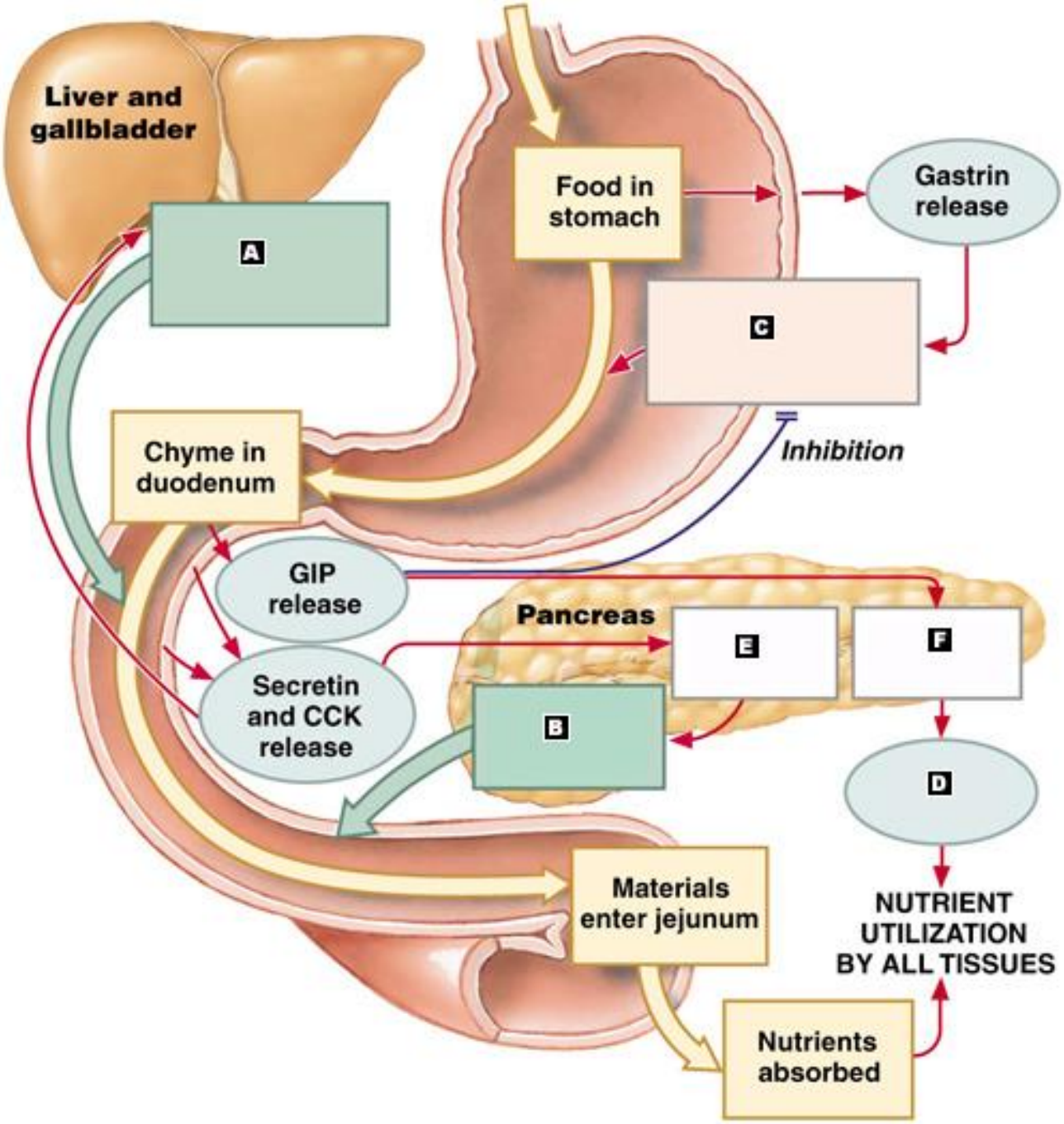

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Stress Hormone Family

Hormone	Produced by	Action
Adrenaline (Epinephrine)	Adrenal medulla	Allows for fight/flight – increases heart rate, pulse, blood pressure
Cortisol	Adrenal cortex	Stimulates glucose release from glycogen, amino acids, and fats; shunts energy to extremities for fight/flight
Aldosterone	Adrenal cortex	Aids in retention of fluid and electrolytes – conserves sodium, secretes potassium
DHEA	Adrenal cortex	Precursor to male and female hormones, muscle growth, and protein repair
Norepinephrine	Adrenal medulla	Sympathetic response, sharpens focus, antagonizes insulin and stimulate gluconeogenesis
Thyroxine (T4)	Thyroid	Increases metabolic rate, decreased function with high amounts of stress
ACTH (Adrenocorticotropic hormone)	Anterior pituitary	Enhances release of cortisol and fatty acids from adipose tissue

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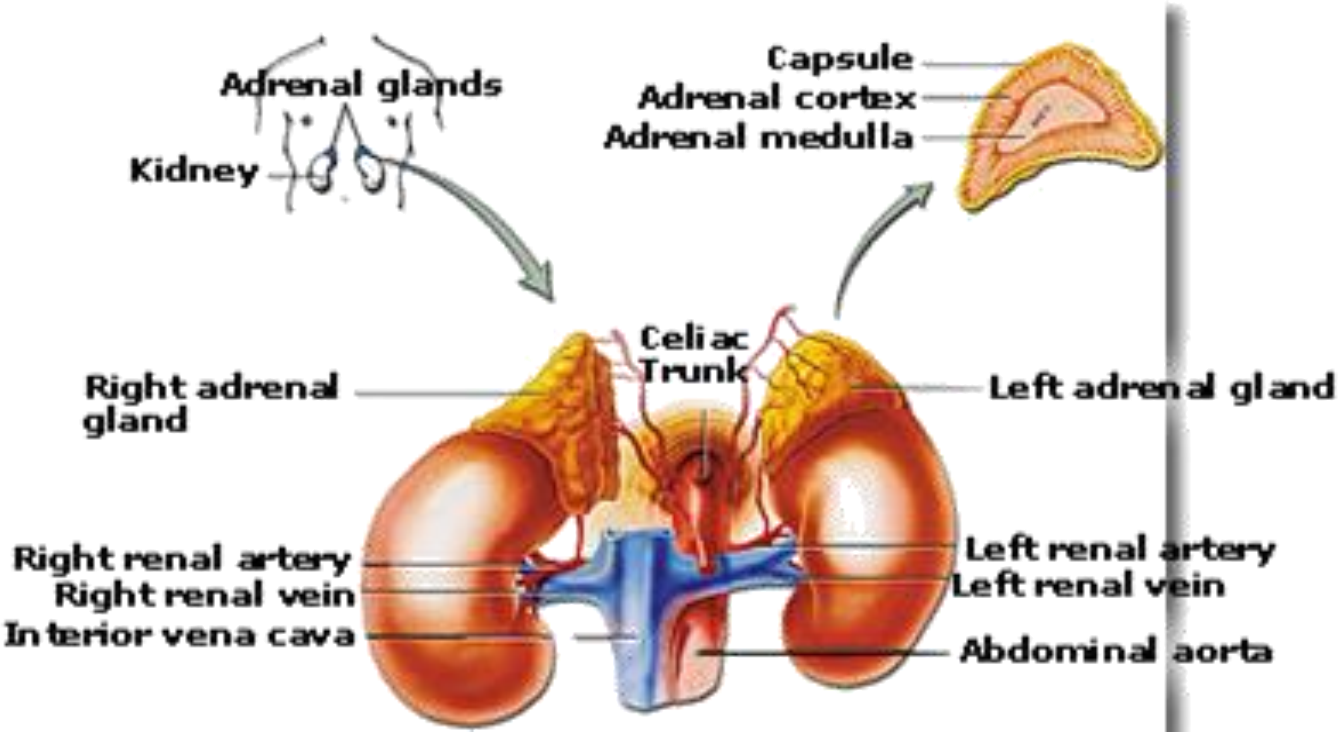
Adrenal Hormone Secretions



Inner Zone (Medulla)

- Adrenaline aka Epinephrine
- Noradrenaline aka Norepinephrine
- Androgens

Outer Zone (Cortex)

- Cortisol
- DHEA
- Aldosterone

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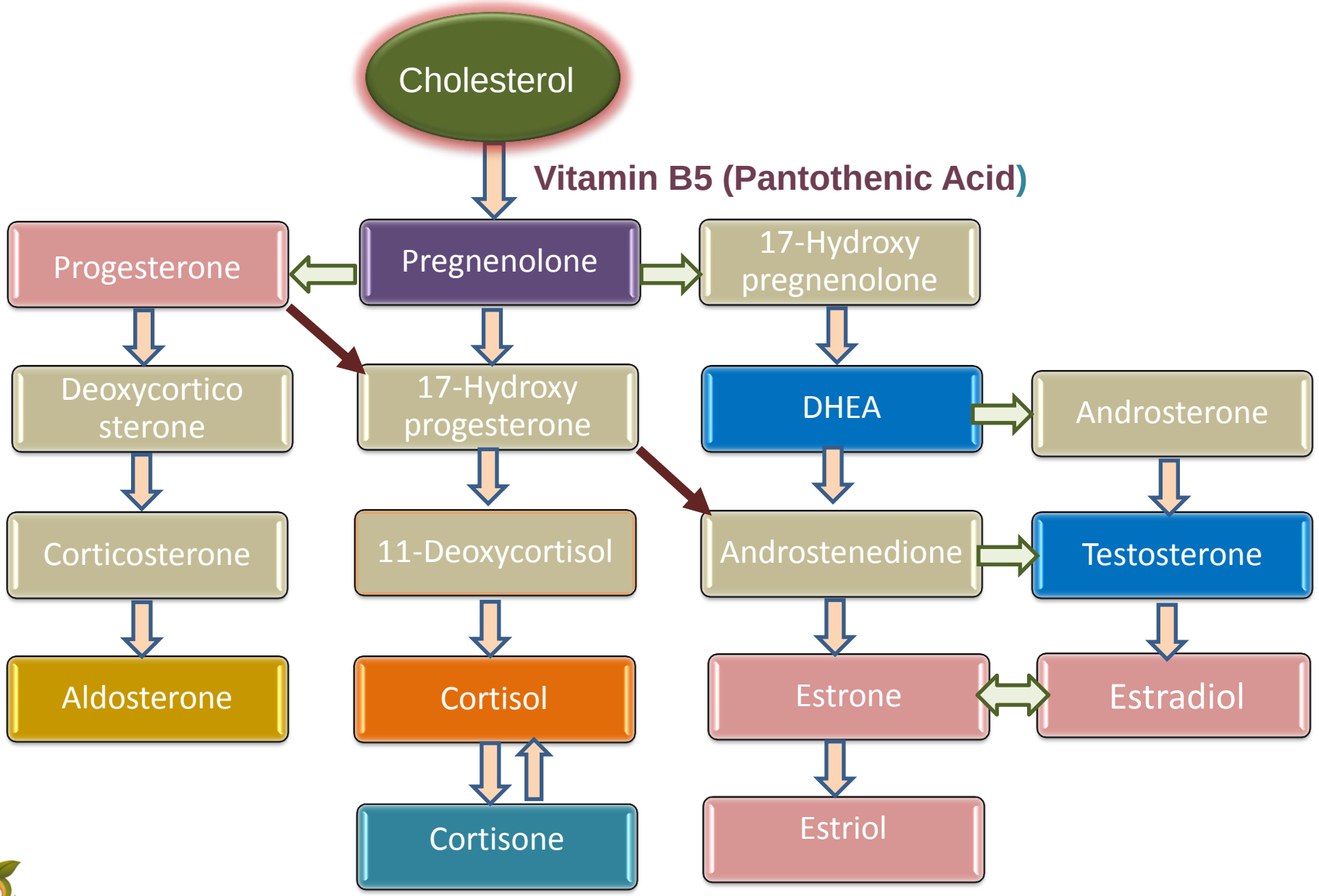
Adrenal Hormone Pathways



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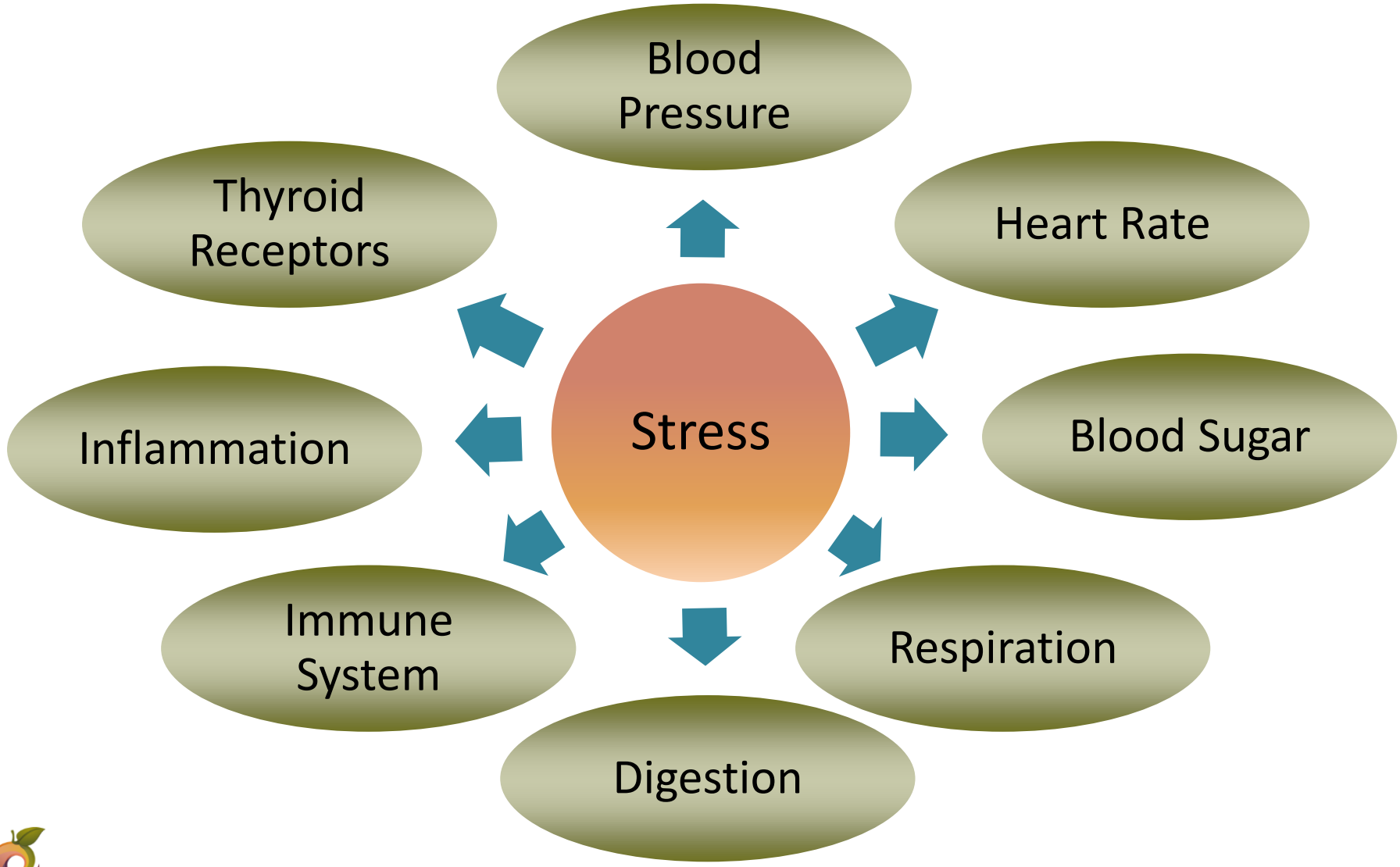
Stress (Cortisol) Affects



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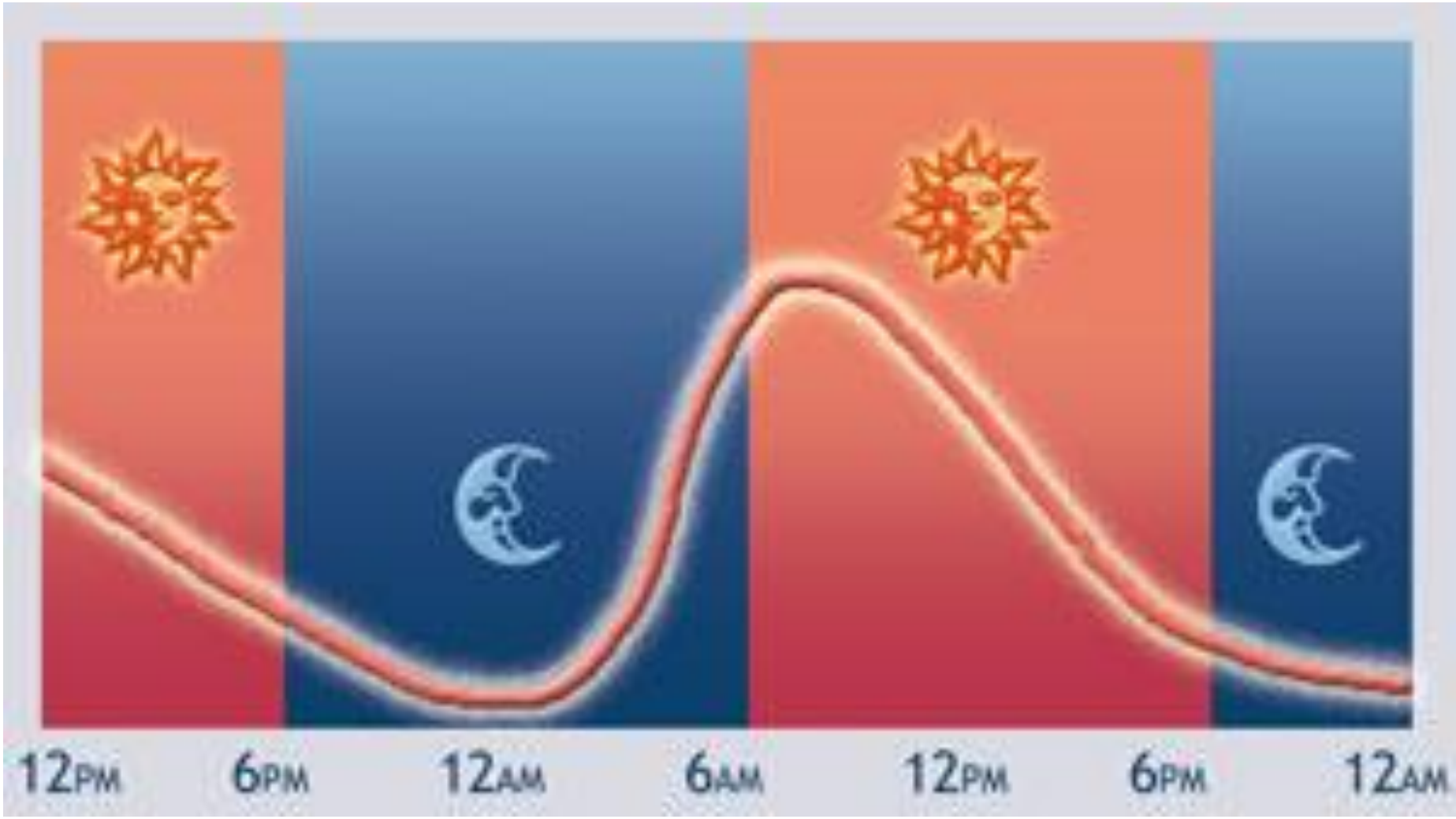
Circadian Rhythm



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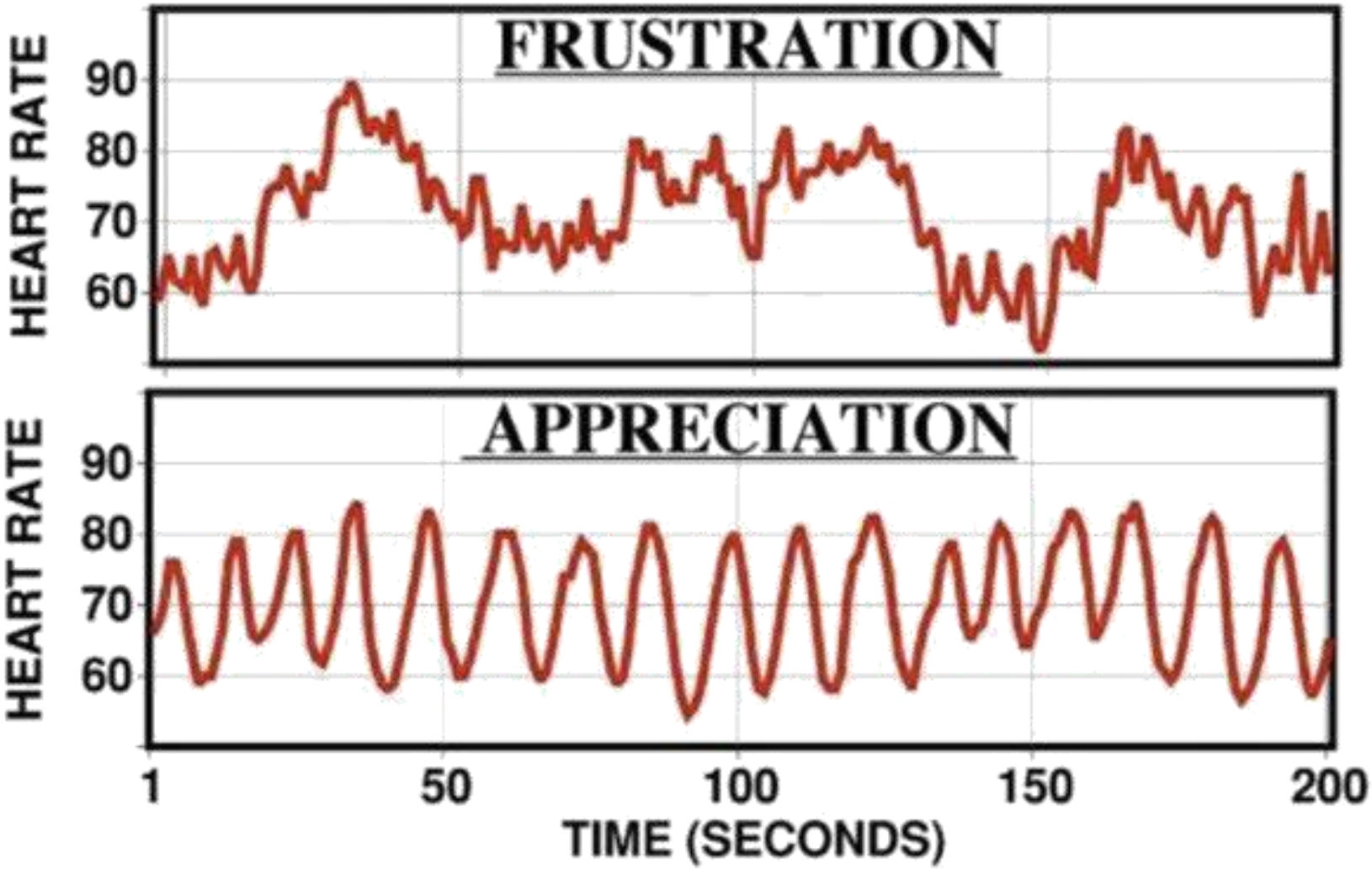
Effect of Stress on Heart Rhythm



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How Stress Affects Immune System

Autonomic System Imbalance Caused by Emotional Stress Inhibits SIgA Release

HeartMath Institute

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Sleep Hormone Family

Hormone	Produced by	Action
Melatonin	Pineal	Promotes deep sleep, immune support
Growth Hormone	Anterior pituitary	Promotes growth and repair and fat burning
Cortisol	Adrenal cortex	High levels at night disrupt sleep
Leptin	Fat cells	Peaks in middle of night to promote fat burning
Progesterone	Ovaries, Adrenal cortex	Promotes sleep
Estrogen	Ovaries, Adrenal cortex	Improves quality of sleep
Testosterone	Gonads, Adrenal cortex	Lack of sleep lowers it
Insulin	Pancreas	Disrupts growth hormone and sleep pattern
Glucagon	Pancreas	Keeps blood sugar steady while sleeping

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Hormones and Sleep

- ✓ Insulin/Glucagon
- ✓ Cortisol/DHEA
- ✓ Growth Hormone
- ✓ Leptin/Ghrelin
- ✓ Melatonin
- ✓ Estrogen/Progesterone
- ✓ Testosterone

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Reproductive Hormone Family

Hormone	Produced by	Action
Pregnenolone	Adrenal cortex	Precursor to all sex hormones
Progesterone	Ovaries, Adrenal cortex	Promotes sleep, maintains uterine lining, corpus luteum pregnancy, strengthens bones, protects estrogen
Estrogen	Ovaries, Adrenal cortex	Female traits, proliferation of breasts, ovulation
Testosterone	Gonads, Adrenal cortex	Male traits, sex drive
FSH	Anterior pituitary	Follicle maturation in females, sperm maturation in males
LH	Anterior pituitary	Triggers ovulation in females, testosterone in males
GnRH	Hypothalamus	Stimulates anterior pituitary production of LH and FSH
Thyroid	Thyroid	Involved in egg maturation
Cortisol	Adrenal cortex	Chronic excess cortisol depletes sex hormone precursors
HCG	Placenta	Maintains pregnancy
Prolactin	Anterior pituitary	Lactation
Oxytocin	Posterior pituitary	Milk letdown, uterine contraction, bonding

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Male/Female Hormones/Stress Interaction

Cholesterol

Vitamin B5 (Pantothenic Acid)

Pregnenolone

Progesterone

17-Hydroxy pregnenolone

Deoxycortico sterone

17-Hydroxy progesterone

DHEA

Androsterone

Corticosterone

11-Deoxycortisol

Androstenedione

Testosterone

Aldosterone

Cortisol

Estrone

Estradiol

Cortisone

Estriol

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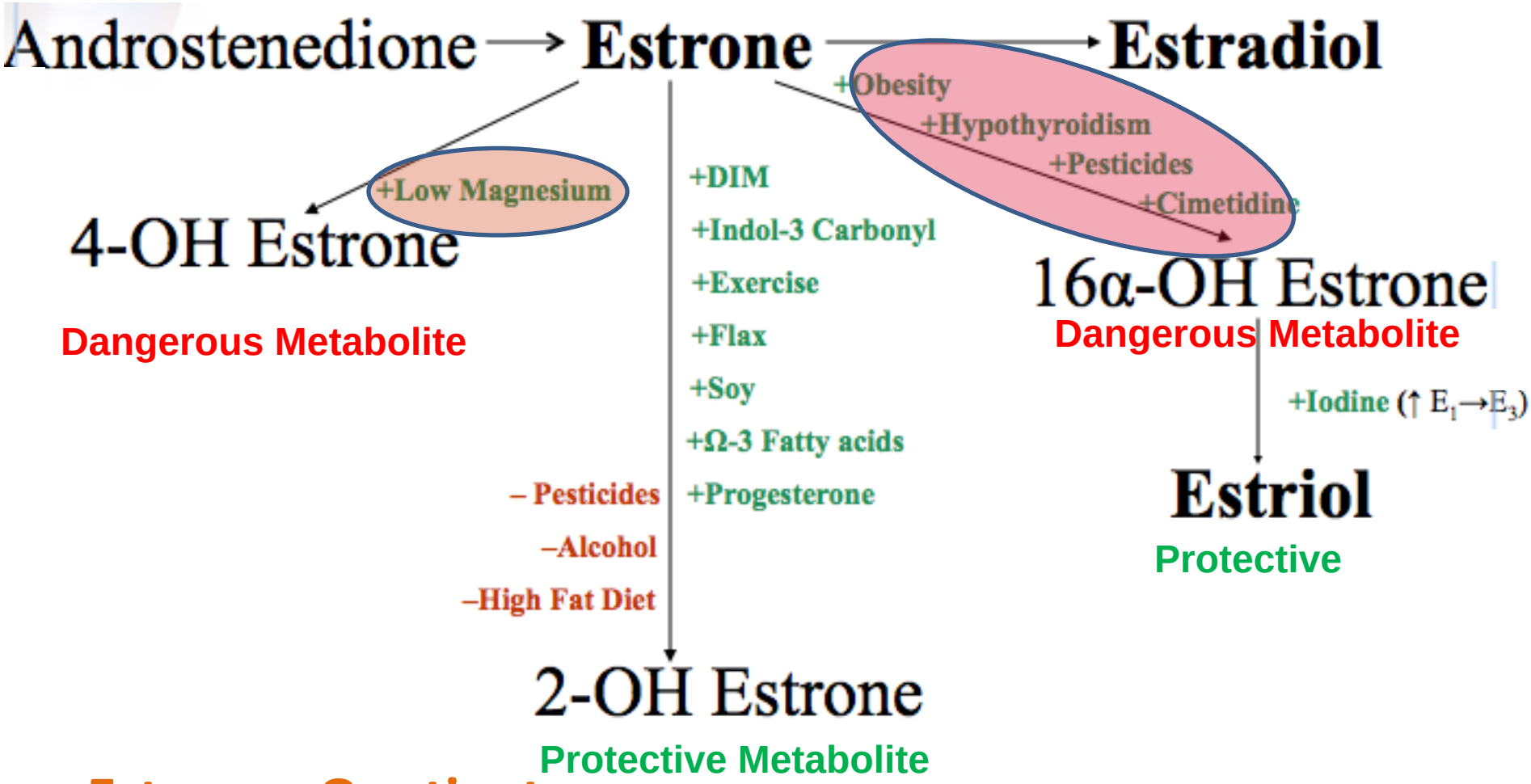
Estrogen Metabolism



Estrogen Quotient: E3/ (E1 + E2)

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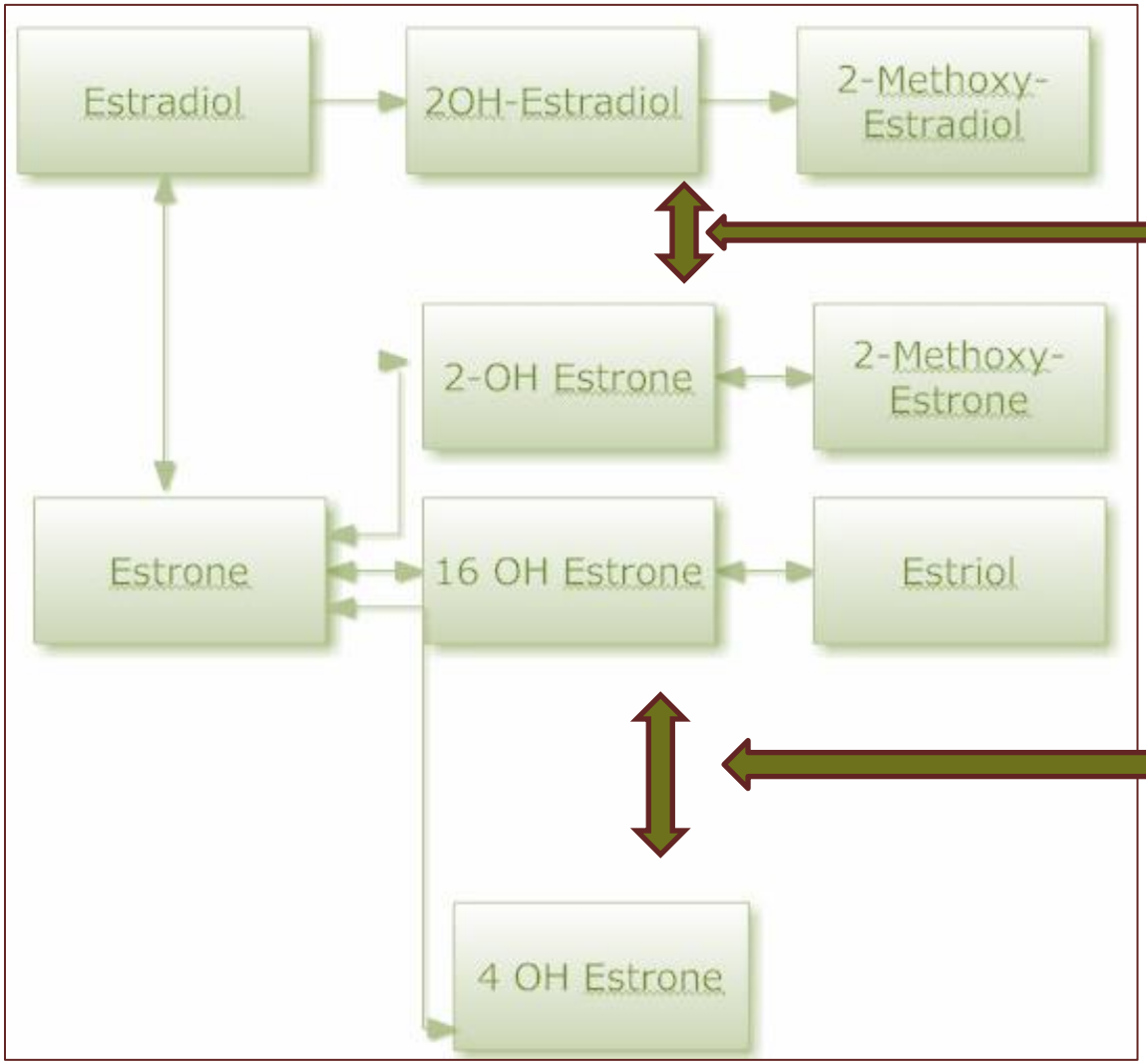
Estrogen Metabolism



Protective
- Cruciferous
- Soy

2:16 ratios <2 increased cancer risk

Toxic
- Barbecue
- Toxins

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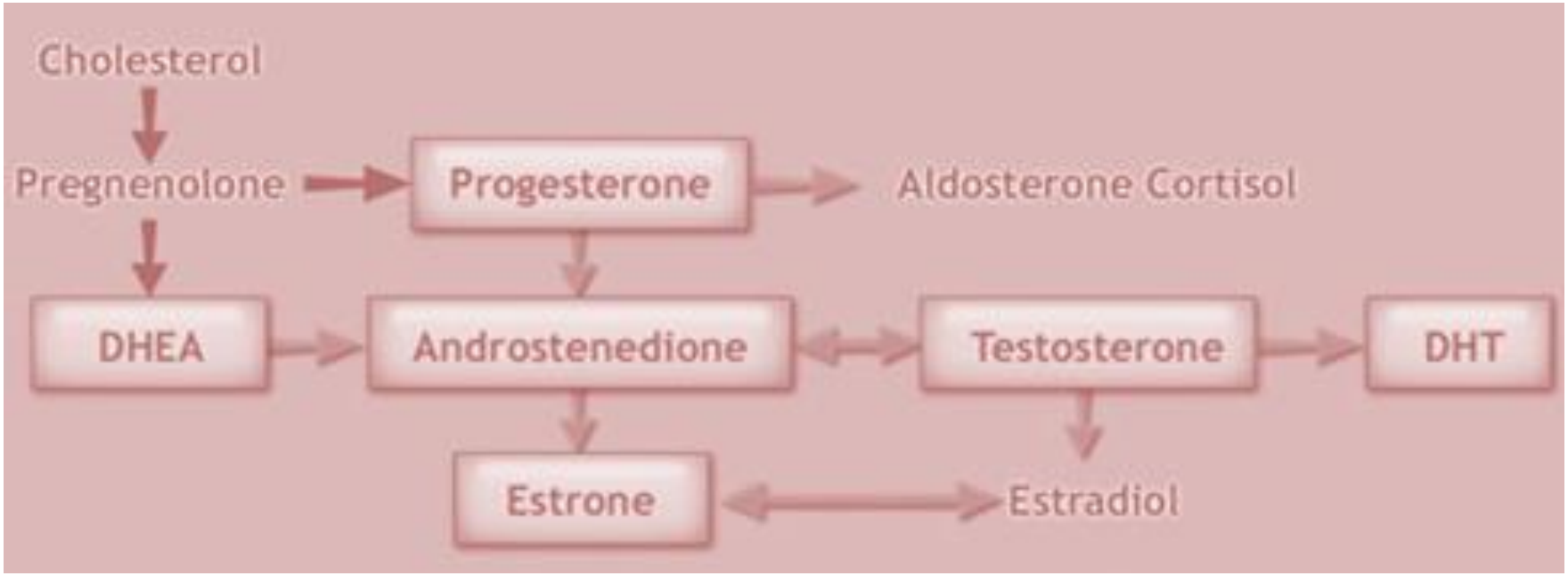
Male Hormone Flowchart



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Organ Specific Hormone Family

Hormone	Produced by	Action
Erythropoietin	Kidney	Stimulates red blood cell production
Thymosin	Thymus	Stimulates glucose release from glycogen and synthesis from amino acids and fats
Parathyroid hormone	Parathyroid gland	Increases blood calcium, decreases calcium in bones
Calcitonin	Thyroid	Decreases blood calcium, increases calcium in bones
Antidiuretic hormone	Posterior pituitary	Retention of fluid
Natriuretic peptide	Heart-blood vessels	Induces release of sodium in urine
Angiotensin	Liver	Vasoconstriction, release of aldosterone
Brain natriuretic peptide	Heart	Reduces blood pressure
Thrombopoietin	Liver, kidney, striated muscle, bone marrow	Produces platelets

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