



Endocrine System

Overview

Hormones

Endocrine Organs

Endocrine vs. Exocrine Gland

Secretes hormones

Ductless gland

Injects tissue



sweat & saliva

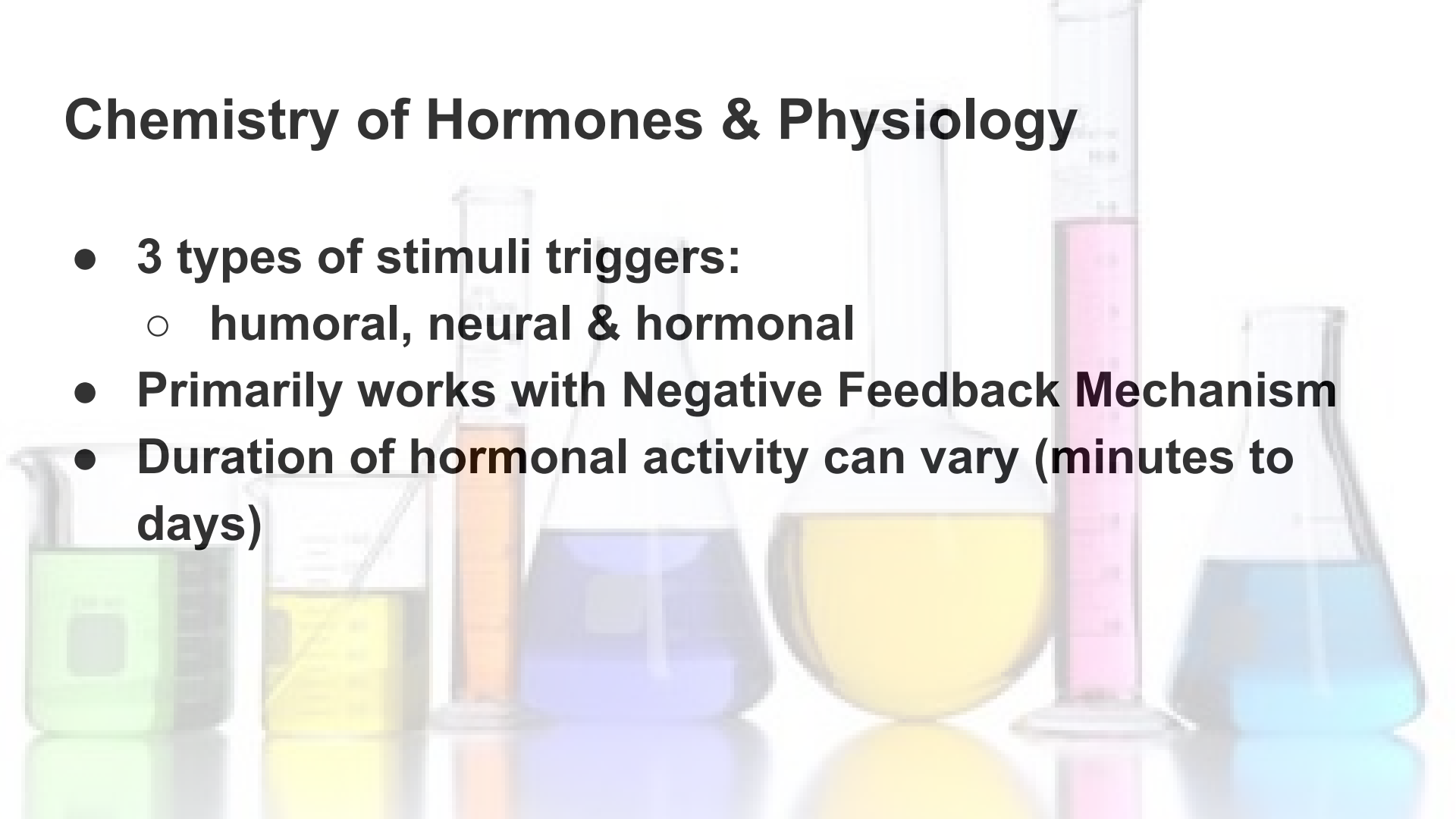
has ducts

duct is filled



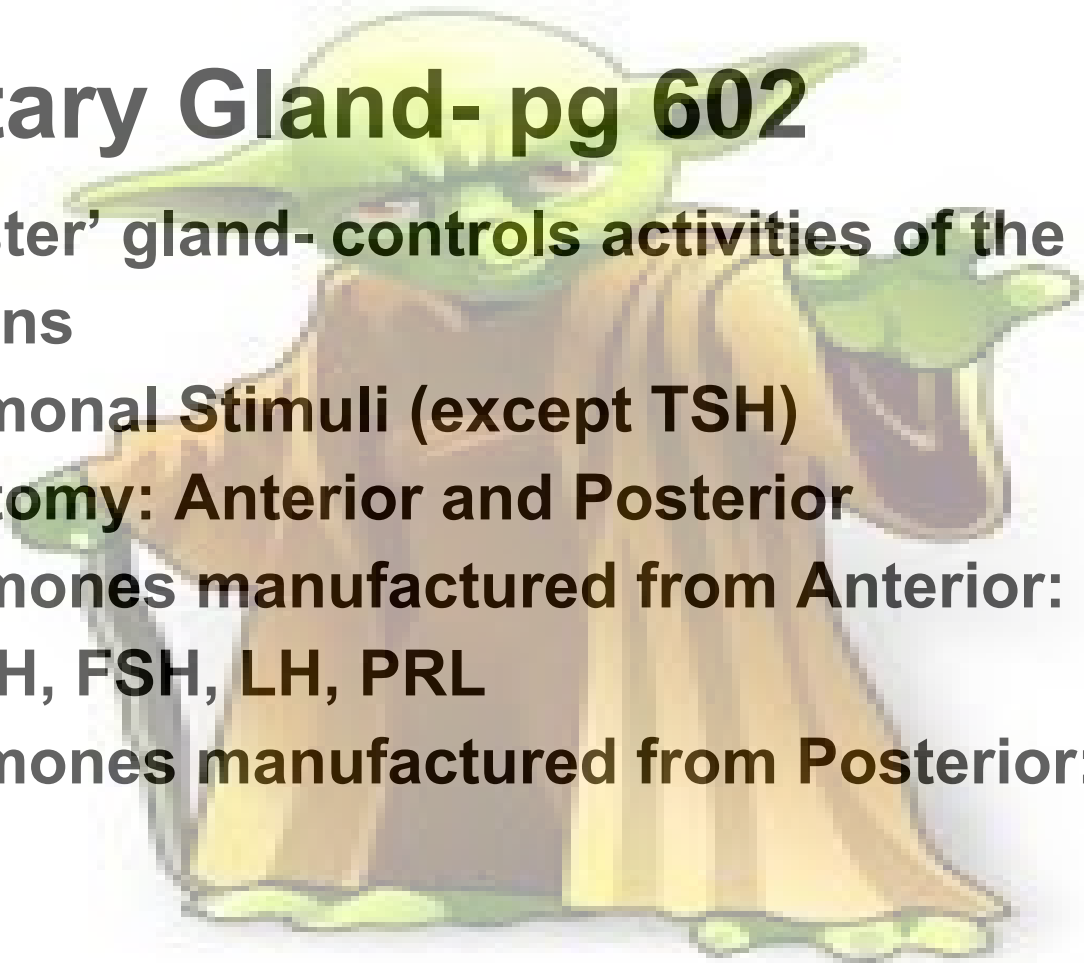
Chemistry of Hormones & Physiology

- **3 types of stimuli triggers:**
 - humoral, neural & hormonal
- **Primarily works with Negative Feedback Mechanism**
- **Duration of hormonal activity can vary (minutes to days)**



Pituitary Gland- pg 602

1. **'Master' gland- controls activities of the endocrine organs**
2. **Hormonal Stimuli (except TSH)**
3. **Anatomy: Anterior and Posterior**
4. **Hormones manufactured from Anterior: GH, TSH, ACTH, FSH, LH, PRL**
5. **Hormones manufactured from Posterior: oxytocin, ADH**



ANTERIOR PITUITARY

1. GH- growth hormone
 2. ACTH- adrenocorticotropic hormone (**stress**)
 3. LH- luteinizing hormones (**sex hormones & lactation preparation**)
- 

Pituitary Gland: Anterior

4. PRL- prolactin (**lactation**)

5. FSH-follicle-stimulating hormone (**sperm/egg**)

6. TSH- thyroid-stimulating hormone (**regulate Ca in blood & metabolism**)



Posterior Pituitary Hormone

7. Oxytocin (milk letdown & contraction)

8. ADH- anti-diuretic hormone aka vasopressin (water balance)

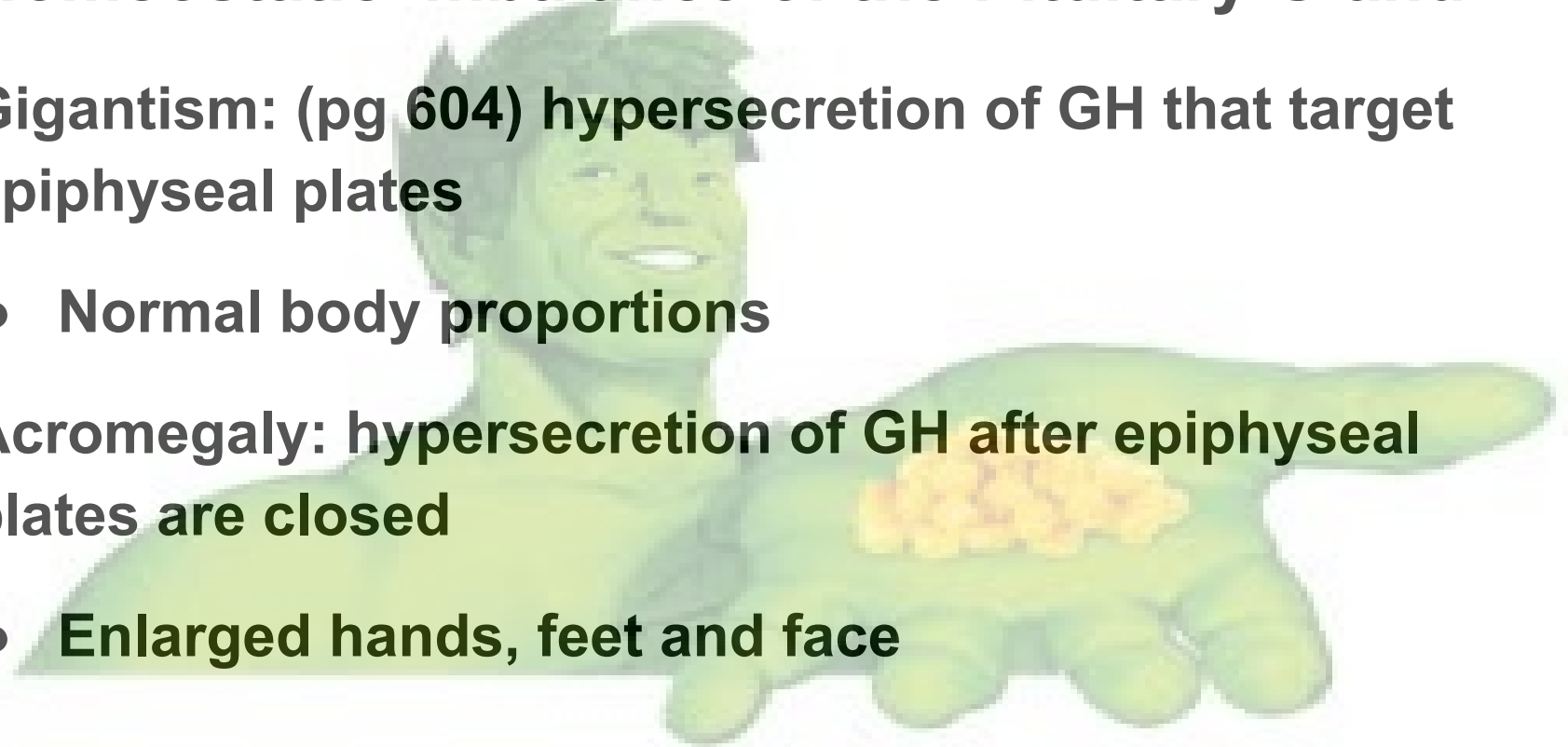
Homeostatic Imbalance of the Pituitary Gland

Gigantism: (pg 604) hypersecretion of GH that target epiphyseal plates

- **Normal body proportions**

Acromegaly: hypersecretion of GH after epiphyseal plates are closed

- **Enlarged hands, feet and face**



Homeostatic Imbalance of Pituitary Gland

Dwarfism: hyposecretion of GH; slow bone growth

- **4 ft tall**
- **Normal body proportions**
- **Some cases, $\text{<GH} \rightarrow \text{<TSH} \ \& \ \text{<Gonadotropins}$**
 - **Malproportioned & limited pubescent stages**

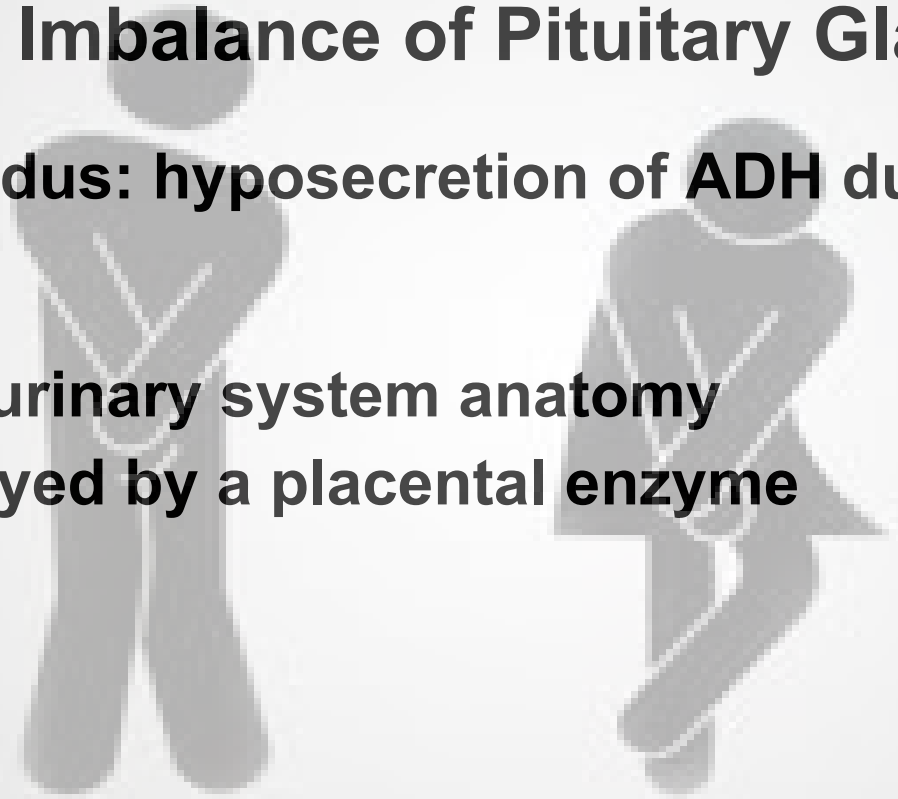
TREATMENT: hormone replacement



Homeostatic Imbalance of Pituitary Gland

Diabetes Insipidus: hyposecretion of ADH due to:

- 1. Head injury**
- 2. Malformed urinary system anatomy**
- 3. ADH destroyed by a placental enzyme**



The dark-eyed junco

Excessive testosterone leads to:

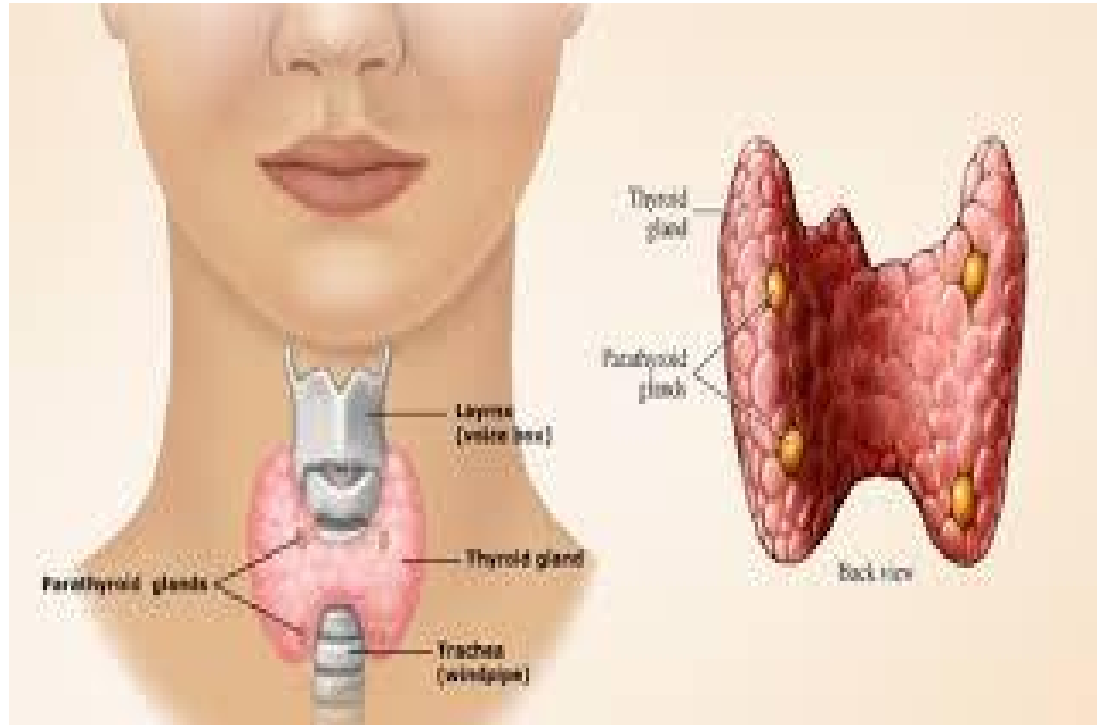
- Older females attraction
- Extra-marital affairs
- More predators
- Decrease in immunity

***EVOLUTION at work!**



Thyroid

- Butterfly-shaped
- Cervical region
- 2 lateral lobes connected by *isthmus*
- Largest pure endocrine gland



Thyroid and Parathyroid, pp 609-613

T4: (4 iodine atoms)Thyroxin & T3: Tri-iodothyronine-
(metabolism)

Calcitonin (lowers calcium in blood)

PTH: Parathormone (increases calcium in blood)

HUMORAL STIMULUS

- Released in response to blood level changes

Calcitonin&PTH: calcium is found in BONE; essential for:

1. **Bones & teeth**
2. **Nerve function**
3. **Muscle contraction**
4. **Blood clot**
5. **Cardiac muscle contraction**

Homeostatic Imbalance of the Thyroid Gland

- **Myxedema: full-blown hypothyroid syndrome in adults**



- **Endemic goiter: myxedema results from lack of iodine (doesn't use T3&T4) creating an atrophied gland**
 - **Treatment: iodine supplements or hormone replacement therapy**



Homeostatic Imbalance of the Thyroid Gland

- **Cretinism: hypothyroidism in infants; causes mental retardation, thick tongue & neck**



- **Grave's disease: hyperthyroid autoimmune disease. Protruding eyeballs**
 - **Treatment: Thyroidectomy**



Homeostatic Imbalance of the Parathyroid Gland

- **Hyperparathyroidism: Ca^{+} leached from bone which susceptible to fractures; $>\text{Ca}^{+}$ in blood results in:**
 - **Weak skeletal muscles & nervous system**
 - **Kidney stones**
 - **Metastic calcification: Ca^{+} in soft tissue impairs vital organ function**
- **Hypoparathyroidism: tetany (loss of sensation, muscle twitches & convulsions); without treatment → resp paralysis → fatal**

Adrenal Gland, pg 615

- **Aka suprarenal gland (supra=above)**
- **hat -like structure for kidney**
- **Is made up of 2 endocrine glands:**
 - **Adrenal cortex**
 - **Adrenal medulla**
 - **1 function: help cope with stressful situations**

Adrenal Cor(tico)tex-

3 types of CORTICOSTEROID hormones:

- A. Mineralcorticoi(d): (electrolyte balance) reabsorbs Na^+ in kidney, perspiration & saliva
- water influences bp
 - LOW BP = >aldosterone
 - HUMORAL stimulus



B. **Glucocorticoid**: help cope w/ stress

- Keeps blood glucose levels constant, maintaining bp
- >glucocorticosteroids= hemorrhage, infection, trauma
- Ex. of glucocorticoids: cortisol, cortisone
- Works w/ ACTH
- Cortisol levels similar to metabolism
(hi= am and decreases=pm)



dear stress,
let's break up.

C. Gonadocorticoid: weak androgens & estrogens

- > during puberty
- in males and females
- Females: affect libido and estrogen source >menopause
- Males: n/a



Homeostatic Imbalance of Adrenal Cortex

Aldosteronism: hypersecretion results from adrenal tumors; symptoms- hypertension, edema

Addison's disease: hyposecretory disease of the gluco & mineralcorticoids; symptoms- weight loss, dehydration, hypotension (bp= $<90/60$)

Homeostatic Imbalance of the Adrenal Cortex

Cushing's Syndrome: hypersecretion from tumor or being prescribed high doses of glucocorticoids

symptoms- muscle & bone loss, high blood glucose levels (steroid diabetes) edema, hypertension, swollen face and buffalo hump traits

Treatment: remove tumor and stop using meds

Adrenal M(iddle)edulla

- Neural Stimuli
 - Sympathetic NS
- 2 types of catecholamines
 - Epinephrine
 - Norepinephrine



Other Endocrine Glands

- **Pineal Gland**

- Located in the brain
- Secretes melatonin



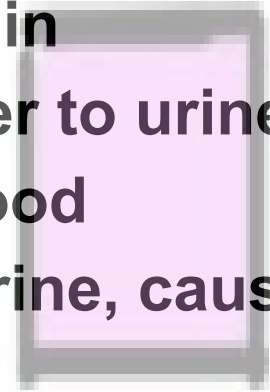
- **Pancreas**

- endo/exo-ocrine gland
- Regulates blood glucose levels by secreting
 - Alpha cells (glucagon)
 - Beta cells (insulin)



Homeostatic Imbalance of the pancreas

- **Diabetes Mellitus- hyposecretion of insulin**
 - **Glycosuria- Excess glucose spills over to urine**
 - **Lipidemia- high fatty acid levels in blood**
 - **Ketones form and deposit in the urine, cause electrolyte imbalance**



Glucast

3 signs of diabetes mellitus

1. **Polyuria**- urine output → **<blood volume + dehydration**
2. **Polydipsia**- excessive thirst is stimulated by dehydration
3. **Polyphagia**- **excessive hunger**; body will use fat & protein

Diabetes

Diabetes 1

vs

Diabetes 2

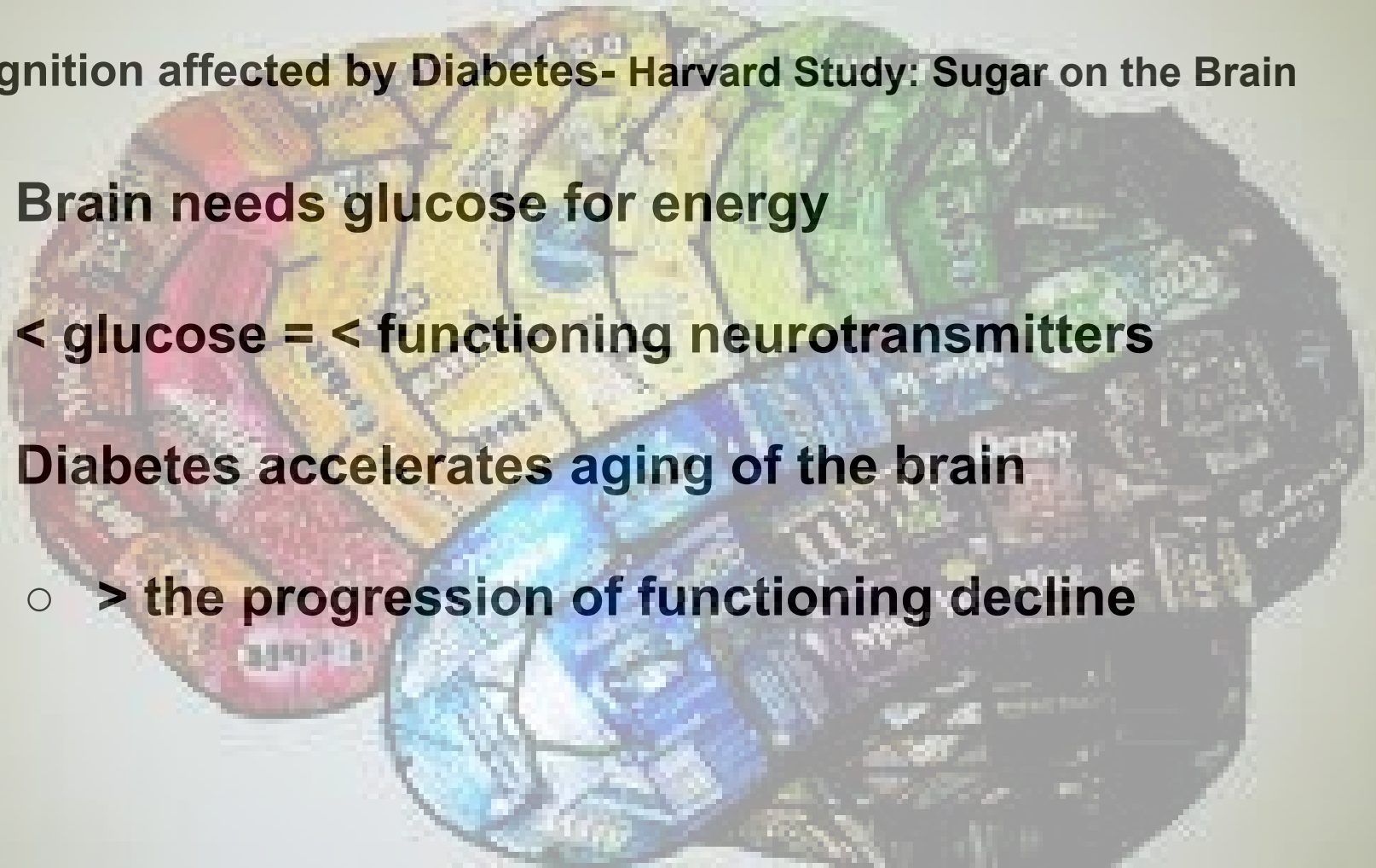
- Diagnosed in childhood
- Body doesn't produce insulin
- Insulin & other injectables

- *Diagnosed in adulthood
- * body doesn't provide enough insulin
- * Bariatric surgery



Cognition affected by Diabetes- Harvard Study: Sugar on the Brain

- **Brain needs glucose for energy**
- **< glucose = < functioning neurotransmitters**
- **Diabetes accelerates aging of the brain**
 - **> the progression of functioning decline**



How does Diabetes affect blood flow?

- Glucose-rich blood = high viscosity
- Blood flow is decreased
- Circulation problems
- Neuropathy (nerve damage)



Activity- Viscous Blood Simulation

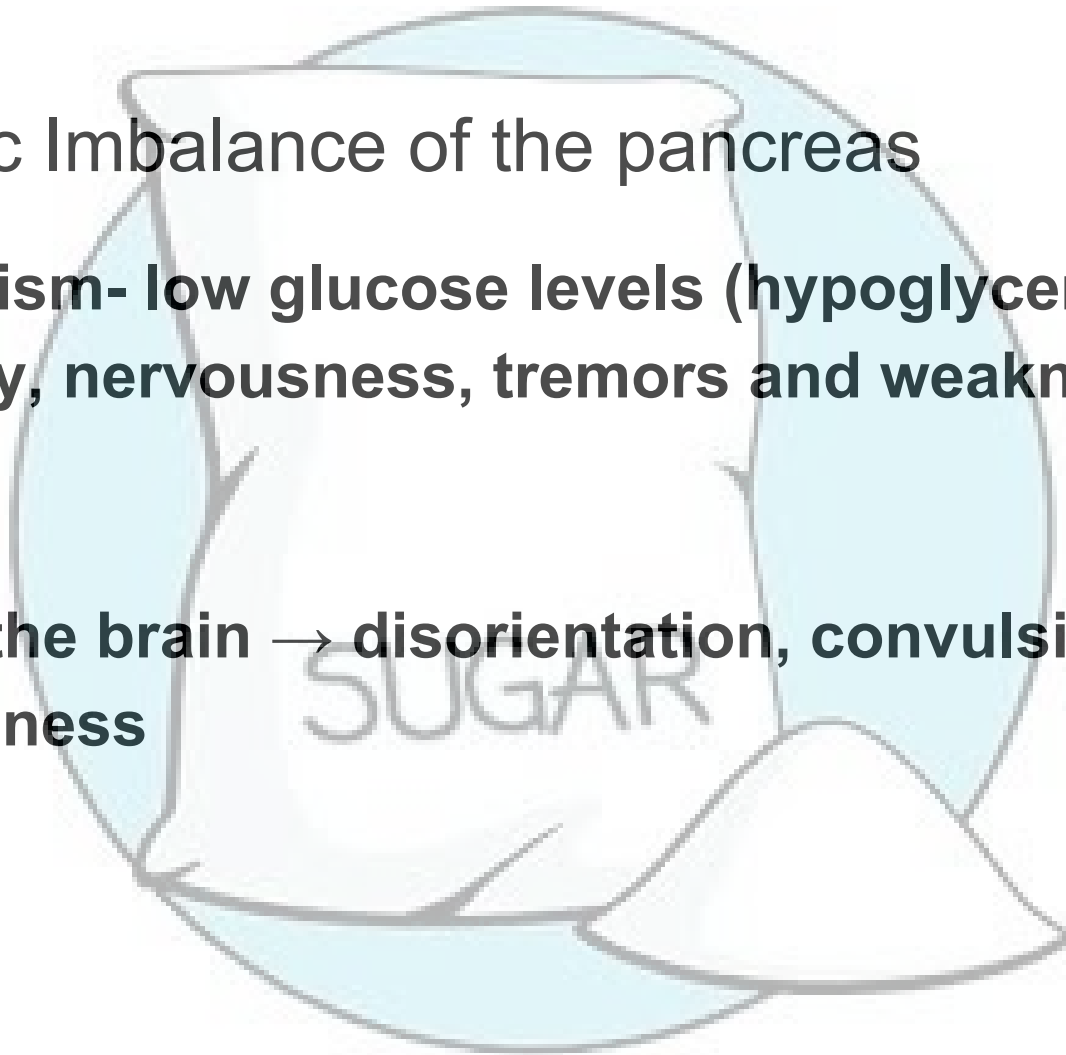
- **Work in groups of 4**
- **Complete the activity**
 - **Follow procedures**
 - **Complete data**
 - **Answer questions**



Homeostatic Imbalance of the pancreas

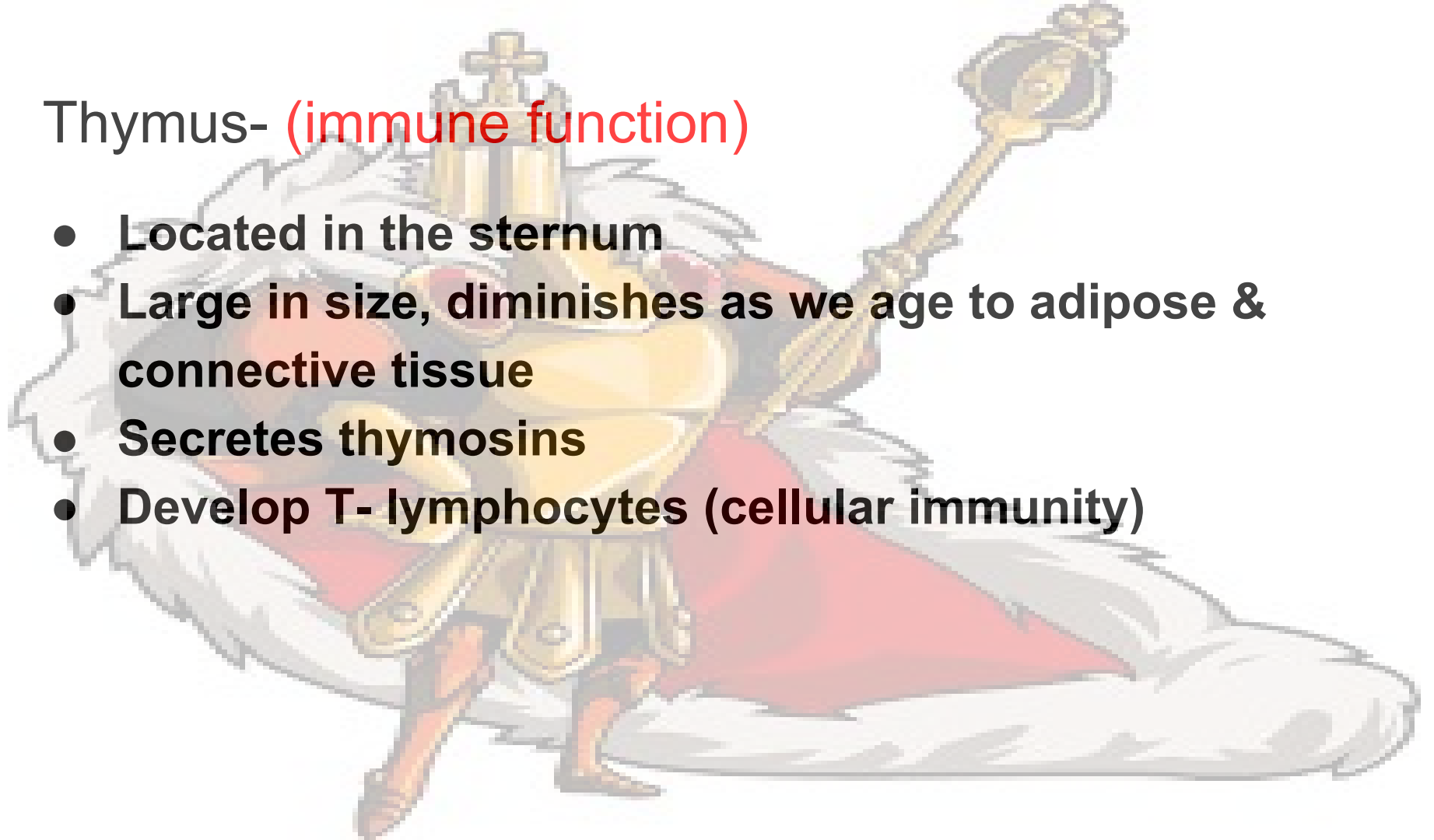
Hyperinsulinism- low glucose levels (hypoglycemia) cause anxiety, nervousness, tremors and weakness.

<glucose to the brain → disorientation, convulsion, unconsciousness



Thymus- (immune function)

- **Located in the sternum**
- **Large in size, diminishes as we age to adipose & connective tissue**
- **Secretes thymosins**
- **Develop T- lymphocytes (cellular immunity)**



More endocrine glands.....

- **Gonads**
 - **male&female steroid sex hormones released by gonadotropins**
 - **Female: estrogens and progesterone**
 - **Male: testosterone**
- **Placenta**
 - **Temporary organ**
 - **Secretes hormones thru pregnancy**

