

Various endocrine organs and functions of each		
Hypoth- alamus (control/- integr- ator)	releasing hormones to the anterior pituitary (blood communication) and direct connection to posterior pituitary (nerve communication)	
Pineal gland	sleep	
Pituitary gland	1st hormones to body organs	
Pancreas	Insulin and glucagon	
Thyroid gland	Parafollicular cells, high blood calcium, storage of calcium in bone	
Parath- yroid gland	low blood calcium, parathyroid hormone (pth), release calcium into blood from bone	

Pituitary gland		
Adrenal glands	stress response, blood pressure response, blood osmolarity, sex hormones	
Thyroid gland	follicular cells, release thyroid hormone (t3 and t4) to increase metabolism and body temperature	
Mammary gland	secretion of milk for offspring	

Pituitary gla	and (cont)
Testes	make and release testosterone
Ovaries	make and release estrogen and progesterone
Melano- cytes	makes melanin, protection from UV rays
Ductus deferens	orgasm response, semen
Uterine and vaginal muscles	orgasm response, childbirth
Liver	blood sugar regulation and storage, growth hormone signaling to muscle and bone
Bone	growth hormone cycle
Muscle	growth hormone cycle, glucose storage
Kidneys	water and blood pressure
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Steroid and non-steroid hormone mechanisms

What are characteristics of steroid hormones?

lipid so they enter the cell and go into the nucleus and target DNA to make new proteins

What are characteristics of a non-steroid hormone?

do not enter cell, interact with surface proteins -> secondary messenger internally in the cell to cause response (signaling cascade)

T3T4 production for thyroid gland (hypothalamus)

Temp/metabolism feedback loop

Low metabolism - low T3T4, low body temp

T3T4 production for thyroid gland (hypothalamus) (cont)

TRH -> TSH -> follicular cells release the follicle containing T3 and T4 -> increase metabolism

Thyroid Follicular Cells and Parafollicular Cells	
Parafolli- cular	High calcium
Follicular	Low metabolism (T3 and T4)

Layers of Adrenal Gland		
Cortex		
	Zona glomer ulosa	stress response - cortisol
	Zona fascic- ulata	low blood volume - aldosterone
	Zona reticu- laris	DHEA and androsten- edione, precursors to sex hormones
Medulla		sponse - epinephrine

Basic Knowledge for Multiple Choice

Know the effects of the renin-angiotensinaldosterone system and how it regulates blood volume and blood pressure in detail

Know how ACE inhibitors work

Know how ADH works and how it regulates blood osmolarity and blood pressure



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Diabetes mellitus (I and II) effects on bg

Type I no production of insulin

Type II we may or may not make insulin and body cells no longer respond to insulin - insulin resistance

Insulin beta cells use glucose so we can't control high glucose

levels

Low levels can cause diabetic coma

Endocrine Pathology

Hypert- High thyroid activity - weight hyr- loss, etc., cushing's syndrome, oidism insomnia, hyperactivity

Hypoth- A lack of temp. control, weight yroidsim gain, hair loss, lethargy, etc.

Diabetes sugar in urine (sweet urine)

Insipidus Kidneys processing too quickly, water goes through too fast, excessive urination, dehydr-

ation

Mellitus insulin issues

Endocrine System

What are the similarities of the endocrine and nervous systems?

Both control systems (homeostasis and other)

What are some differences of the nervous and endocrine systems?

Mode of communication (endohormones nerv- electrial signals) Speed of response (endo- slow nervfast)

Duration of change/response (endolongish term nerv- gone fast)

Blood Glucose Feedback Loop

Stimulus	Increased blood glucose
Sensor/In tegrator	Pancreatic Beta cells
Hormone Released	Insulin
Effector	Liver and skeletal muscle
Response	Liver and skeletal muscle uptake glucose -> glycogen
Result	Decrease In blood glucose and return to homeostasis

Growth Hormone Feedback Loop

Growan rioinion	o i ocaback zoop
Stimulus	Low blood glucose, sleep, or stress
Sensor/Integ- rator	Hypothalamus
Hormone Released	GHRH
Target	Anterior Pituitary Somato- tropes

Growth Hormone Feedback Loop (cont)

Hormone GH
Released

Effector Liver, bones, muscles, fat cells

Response Increase blood glucose, cell growth and proliferation, bone length, muscle mass, lipolysis.

Decrease glucose uptake

Result Return to homeostatic blood glucose levels and growth and repair of the body

Calcium Feedback Loop (High)

Stimulus	Increased blood Ca ²⁺
Sensor/In-	Parafollicular cells in thyroid
tegrator	gland
Hormone	Calctionin
released	
Effectors	Osteoblasts
Responses	Osteoblasts activity increases = put calcium into bone
Result	Blood calcium level decreases back to normal

Calcium Feedback Loop (Low)

Stimulus	Decreased blood Ca ²⁺
Sensor/Integrator	Parathyroid glands
Hormone released	PTH



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Decrease in T3 and T4

concentrations

Metabolism Feedback Loop

Stimulus

Calcium Feedback Loop (Low) (cont) Effectors Osteoclasts, kidneys, intestines Responses Osteoclasts degrade bone matrix which releases calcium into blood, kidney (reabsorb Ca) targets liver which releases Vit. D. Vit D to intestines absorb more calcium Result Calcium blood return to normal range

Calcium Fee	dback Loop (Low)
Stimulus	Decreased blood Ca ²⁺
Sensor/In- tegrator	Parathyroid glands
Hormone released	PTH
Effectors	Osteoclasts, kidneys, intestines
Responses	Osteoclasts degrade bone matrix which releases calcium into blood, kidney (reabsorb Ca) targets liver which releases Vit. D. Vit D to intestines absorb more calcium
Result	Calcium blood return to normal range

	oonoon trations
Sensor/In tegrator	Chemo and temp receptors, Hypothalamus
Hormone Released	Hypothalamus releases TRH
Target	Anterior pituitary
Hormone released	TSH
Target	Thyroid gland (follicular cells)
Hormone released	Thyroid gland released T3 and T4
Effector	Body tissues
Response	Increased metabolic activity
Result	Return to homeostatic body temperature, increase in energy
Lymphatic S	System
What are characterist	Vessels, nodes, and ics accessory organs filled

	. 97
Lymphatic Syster	m
What are characteristics of the lymphatic system?	Vessels, nodes, and accessory organs filled with water like fluid
What is the purpose of the lymphatic system?	To return free fluid in the body back to the blood, houses and matures the WBC

Function of Lymphatic sys. & Accessory		
Vessels	Vessels, trunks, ducts	Absorption of interstitial fluid and transportation of lymph
Nodes	Structures that house and allow for storage of an maturation of lymphocytes	Monitor lymph fluid for pathogens
Thymus	where T cells matu	ire
Spleen	Were we send red blood cells to be recycled, storage of WBC	
Lacteals	in the intestine microvilli fat absorption	
MALT	nodules to monitor solutes for pathoge mucosa	ŭ

Right	right lymphatic vessels of the
lymphatic	right facde, right neck, right
duct	arm, right axillary and cervice
	lymph nodes



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Lymph Drainage (cont)

Left All remaining lymph vessels lymphatic and nodes of the upper body duct aka and the total lower body. Left thoracic cervical, left axillary, l+r iliac, l+r duct inguinal lymph nodes

Role of the lymphatic sys. in immune response

House and mature many white blood cells, we transport WBC from tissues back into circulation, nodes monitor cells and pathogens that travel through

Erythrocyte recycling

Break down old RBC with the spleen and liver, dispose of bilirubin as bile, reuse iron to make new RBC

Dlood

What are general characteristics of blood?

Fluid, proteins, cells

Functions of blood

Trans Gases, nutrients, hormons, WBCs port- (immune response throughout the ation body)

Blood recipient prob and erythroblastosis fetalis

Agglutination with the wrong type blood - destroy blood, death

Blood recipient prob and erythroblastosis fetalis (cont)

Mother is Rh- and has been exposed to positive blood/antigen, has made antibodies against Rh+, will attack fetus

Clotting Disorders

Lack of platelet production = no clot = thrombocytopenia

Hemophilia - genetic disorder that stops/-lacks conversion of clotting factors

Thrombus and Embolus

Thrombus	Clot forming where it does not belong, usually in an artery with cholesterol crystal deposits
Embolus	Thrombus dislodging from the clot, can block a vessel somewhere else in the body, I.e. pulmonary embolus

Steps of Hemostasis (basic steps)

Vascular let a ton of blood in the area to

spasms	provide platelets
Platelet plug	platelets start to stick together and adhere to endothelium and CT
Coagul- ation	Prothrombin activator released by damage PA converts prothrombin into thrombin Thrombin converts fibrinogen into fibrin (insoluble - not dissolvable)

	Anemia and	Polycythemia
	Anemia	low O2 to tissues
	Hemorr- hagic anemia	caused by blood loss
	Hemolytic anemia	excessive RBC destruction with low hematopoiesis
	Aplastic anemia	bone marrow is not functioning enough (during and after chemo)
	Iron deficient	not enough iron to make hemoglobin
	Sickle Cell anemia	inherited Hb mutation
	Polycy- themia	high RBC - blood is too viscous/thick dec. O2 delivery to

Components of blood and plasma

Plasma	proteins (albumins [most
	abundant], globulins, fibrin-
	ogen), water, solutes (ions,
	waste, gases, regulation
	molecules/hormones)
Formed elements	cells and others
Erythrocyte	transportation of gases
Leukocytes	Immune response
Platelets	Blood clotting

tissues. lead to clots



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RBC Count	t
Low RBC	Tired/lethargy, dizziness/light headedness, increased heart rate, headaches, shortness of breath, pale skin
Extra RBC but not too high	Blood doping, inc. O2 carrying capacity, decreases fatigue, inc. performance
High RBC (low plasma - dehydr- ation)	Fatigue, shortness of breath, insomnia, itchy skin

Hematocrit

% of formed elements specifically RBC Estimate of oxygen carrying capacity

Hematopoiesis Feedback Loop		
Decreased O2 to tissues		
Kidney		
Erythropoietin		
Spongy bone - red bone marrow		
Make RBC		
Inc. delivery of O2 to tissues back to homeostasis		

Hematopoesis		
Making of	Myeloid stem cells (makes	
blood	RBC, platelets, basophils,	
cells -	eosinophils, neutrophils,	
different-	monocytes). Lymphoid stem	
iation of	cells (lymphocytes)	
stem cells		
Red hone	in spongy bone	

Structure of Hb Subunits

Alpha chains x2

marrow

Beta chains x2

Each chain forms around an iron molecule (Fe) (1 Heme = chain + Fe)

4 heme = hemoglobin

1 heme carries 1 O2

1 hemoglobin - carries 4 O2

Hb binding affinity for O2 and CO2			
Lungs	pH -	Temp -	Partial
	high pH	cold ->	Pressure -
	-> inc.	inc. O2	lots of O2 ->
	O2	affinity	inc. O2
	affinity	and	affinity and
	and	binding	binding
	binding		

Hb binding affinity for O2 and CO2 (cont)			
Body	pH -	Temp - lots	Partial
tissues	low pH	of	Pressure
	-> dec.	metabolism	- lots of
	02	inc. heat ->	CO2 ->
	affinity	dec. O2	dec. O2
	and	affinity and	affinity
	binding	binding	and
	allow	allow CO2	bonding
	CO2	binding	
	binding		

Facts for RBCs

About 44% of blood

4-7million/mm³ in an adult

Live for about 120 days

Anucleate at maturity

Purpose of RBC Shape

Biconcav	e increases surface area to increase diffusion fro transportation
How does sickle cell	the cell, changes the Hb
anemia	folding, holding/transporting less material, the hook shape
shape?	can get stuck together more easily causing clots



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Lymphocytes

B antibody making memory cells, cells pathogens we have come across before (bacteria, virus, etc.)

T memory cells that target the cells or cells other pathogens that are foreign directly

NK cancer killers, destroy abnormal cells cells

	α	122	YAL	1100	
-	(47.0	ıko	Yan,	440	0

innate immunity, bacterial Neutrophils infection adaptive immunity Lymphocytes Monocytes innate immunity, but will follow b cell orders or antibody flags, macrophage, usually stay in peripheral tissues innate immunity, parasites Eosinophils Basophils damage identifying cells, increase inflammation and



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bleeding areas

blood flow to damaged but not

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