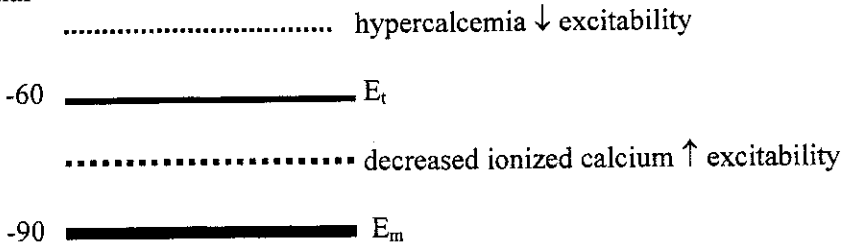
TOP SECRET

Pathology High Yield:

- **Formula to calculate percent chance that a test result will be outside the normal range**: • $1 - 0.95^n$, e.g., chance for 1 of 2 tests being outside reference interval is $1 - 0.95^2 = 1.0 - 0.90 = 10\%$, • chance for 1 of 6 tests being outside reference interval is $1 - 0.95^6 = 1.0 - 0.74 = 26\%$
- **Schematic of hair follicle**: • identify site involved in piloerection– arrector pili muscle attached to connective tissue sheath around hair follicle), • identify site for androgen stimulation– sebaceous gland, which are clear cells representing an outgrowth of the external root sheath that secrete lipid–rich sebum that may be broken down by lipases secreted by *Propionibacterium acnes* to produce an inflammatory reaction
- **Oncogenes of importance**: see Path neoplasia notes– ras, erb/Her-2-neu (breast cancer), p-53 suppressor gene, Rb suppressor gene, BRCA-1 and BRCA-2, APC suppressor gene
- **Know osteoarthritis and rheumatoid arthritis**: study comparison chart in Musculoskeletal in Path notes
- **Fibroadenoma**: benign stromal tumor, moveable mass in breast, woman <35 ys
- **Picture of psoriasis on elbow and back**: sometimes use black person
- **Kid staring into space that has broken bones**: probable absence seizures
- **Enlarged third ventricle in brain of adult**: Alzheimer's disease
- **Hirschsprung's disease**: • ganglion cells in rectum absent in Auerbach's myenteric plexus and Meissner's submucosal plexus, • proximally dilated bowel does have peristalsis and ganglion cells
- **Histamine**: • released from mast cells/basophils, • type I hypersensitivity reactions, • vasodilator and increases vessel permeability, • releasing agents– allergen reacts with membrane bound IgE on above cells, morphine, tubocurarine, anaphylatoxins, cold/warm temperatures, • H_1 receptors involved with allergic reactions (bronchoconstriction, nasal stuffiness, cough, angioedema, anaphylactic shock), • H_2 receptors involved in increased gastric acid secretion
- **Know Goodpasture's syndrome:** • young man with hemoptysis followed by renal failure– begins in lungs and ends in kidney (crescentic GN), • antibasement membrane antibodies against pulmonary capillaries and glomerular capillaries, • type II hypersensitivity reaction
- **Vasoactive amines**: histamine, serotonin, vasointestinal peptide
- **Relationships with adult polycystic kidney disease**: berry aneurysms, mitral valve prolapse, diverticulosis
- **MCC of GI bleed**: duodenal ulcer
- **MCC of massive lower GI bleed**: diverticulosis (not it is) followed by angiodysplasia in cecum
- **Intestinal obstruction**: colicky pain, obstipation, air/fluid levels on x-ray
- **Testicles in hernia sac**: • they are not translucent, • translucency implies a hydrocele
- **Know MOA of acetaminophen injury**: • FR injury, • see Cell Injury notes
- **Stomach cancer**: smoking is risk factor but not the major risk factor (*H. pylori* is major risk factor)
- **Burkitt's lymphoma**: t;8:14 translocation of myc oncogene

- **Know following heart murmurs**: • see Cardiac notes, • mitral and tricuspid regurgitation pansystolic, aortic stenosis is ejection type, mitral valve prolapse with click followed by murmur, mitral stenosis with opening snap and mid-diastolic rumble
- **Know all the congenital heart diseases**: • see Cardiac notes, • PDA can cause pulmonary hypertension like all the other left to right shunts, • SaO_2 highest in left atrium in Tetralogy and transposition of great vessels, • SaO_2 high in all left sided chambers in PDA as well as aorta
- **Causes of endocarditis**: • causes– valvular diseases (e.g., rheumatic fever, congenital heart disease), septicemia (e.g., *Staphylococcus aureus*), cancer– sterile marantic vegetations (can embolize) in patients with mucin secreting colon cancers, • *S. aureus* MCC in IVDU, • *Streptococcus viridans* MC overall cause, • tricuspid regurgitation in endocarditis from IVDU
- **Tram tracking in EM of glomerulus**: type I membranoproliferative more commonly than type II
- **Subendothelial deposits in EM of glomerulus**: • subendothelial– type IV GN in SLE (primarily nephritic) and type I membranoproliferative GN (nephrotic), • subepithelial deposits– poststreptococcal GN (nephritic) and membranous GN (nephrotic)
- **Dock worker for 20 yrs with lung mass**: mesothelioma secondary to asbestos exposure
- **Mechanism of Chvostek's sign**: • low ionized calcium level causes partial depolarization of nerves and muscle by lowering the threshold potential (E_t) so that it comes closer to the resting membrane potential (E_m)– therefore, a smaller stimulus is required to initiate an action potential



- **Scarred (blunting) renal calyceal system**: • chronic pyelonephritis, • cortical scars overlie blunted calyces
- **Belly full of scars**: • acute intermittent porphyria, • see Skin notes
- **Straw colored ascites in congestive heart failure**: example of a transudate due to increased hydrostatic pressure
- **Flame hemorrhage in the retina**: hypertensive retinopathy
- **Kayser-Fleischer ring in eye**: • Wilson's disease, • low ceruloplasmin, • low total copper levels
- **Lysyl oxidase enzyme**: • bridging collagen fibrils, • uses copper as cofactor
- **Know functions of vitamins very well**: see Nutrition notes
- **Gross picture of heart with concentric hypertrophy of left ventricle**: essential hypertension MCC
- **Patient with Crohn's disease has terminal ileal resection**: B_{12} deficiency, bile salt deficiency
- **Gross picture of ruptured interventricular septum in patient with an acute myocardial infarction**: rupture in site of coagulation necrosis
- **High output cardiac failure**: • see Cardiovascular notes, • examples– thyrotoxicosis, endotoxic shock, thiamine deficiency, arteriovenous fistula

- **Visual field defect with craniopharyngioma**: bitemporal hemianopsia (impinges on optic chiasm)
- **Stacks of hemoglobin when it is deoxygenated**: HbS
- **Know blood typing**: review Immunohematology (blood bank) notes and no how to forward and back type to identify A, B, AB, and O
- **Know differences between ABO hemolytic disease of newborn and Rh hemolytic disease of newborn**: • see immunohematology notes, • remember that ABO incompatibility protects against mother being sensitized to Rh antigen
- **Organophosphate poisoning**: • give atropine in acute poisoning and pralidoxime after condition stabilized, • see Environmental path notes
- **Fetal circulation**: right to left shunt through the foramen ovale from blood returning via the inferior vena cava is normal in the fetus
- **Forced expiratory volume 1 sec / Forced vital capacity ratio**: • normal ratio is 4 liters/5 liters = 0.80, • decreased ratio in COPD (e.g., 1 liter/3 liter = 0.33), compliance increased in COPD but elasticity is decreased (obstruction on expiration)
- **Forced expiratory volume 1 sec / Forced vital capacity ratio**: • normal ratio is 4 liters/5 liters = 0.80, • increased in restrictive lung disease (e.g., 3 liter/3 liter = 2.0) due to increased elasticity
- **hCG**: has luteinizing hormone activity, keeps corpus luteum of pregnancy synthesizing progesterone until 8–10 wks and then placenta takes over that function
- **Central diabetes insipidus**: injecting vasopressin causes an increase in urine concentration (POsm) and decrease in urine volume
- **Location of angiotensin converting enzyme**: • pulmonary capillaries, • increased in sarcoidosis, • non-competitive inhibition by ACE inhibitors
- **Vitamin D type in kidneys**: • 1,25 $(OH)_2D_3$, • kidney has 1α-hydroxylase in proximal tubules (PTH stimulates synthesis), • renal disease MCC of hypovitaminosis D
- **Effect of thyroid hormone excess on bone**: osteoporosis– increases bone turnover resulting in loss of bone mass
- **Cause of decrease in jugular venous pulse on inspiration**: • decrease in lung compliance (e.g., sarcoidosis), • decreased volume of air in the alveoli leads to less compression of vessels in the interstitial tissue, hence they fill up better and drain blood off easier
- **Risk factors for endometrial carcinoma**: • see gynecology notes, • unopposed estrogen– early menarche/late menopause, taking estrogen without progesterone, obesity (increased aromatization of androgens), nulliparity (no benefit of progesterone), polycystic ovarian syndrome
- **Vasculitis in patient with hepatitis B**: • polyarteritis nodosa, • relates to immunocomplexes involving surface antigen
- **Know about SLE**: review notes in Musculoskeletal
- **Picture of mitral valve destruction by vegetations**: Staphylococcus aureus most likely cause, cause mitral regurgitation (insufficiency)
- **Fetal alcohol syndrome**: • atrial septal defect relationship, • least common association (mental retardation MC association)
- **Patient with normal PT, PTT, bleeds after surgery even after receiving fresh frozen plasma**: probable platelet problem– e.g., thrombocytopenia, patient on NSAIDs
- **Pleural effusion with increased protein and cell count**: • exudate due to increased vessel permeability from inflammation, • not a transudate, which is an alteration in Starling's forces (increased hydrostatic pressure or decreased oncotic pressure) leading to a protein poor, cell poor fluid

- **Gross picture of cavitary lesion in upper lobe**: • MCC is reactivation TB (not primary), • histoplasmosis, • *Klebsiella pneumoniae*, • squamous carcinoma
- **Physical findings of lung consolidation (e.g., lobar pneumonia, atelectasis):** • increased tactile fremitus, • decreased percussion, • E to A sign, • crepitant rales
- **MCC of spontaneous pneumothorax in tall, slender person**: rupture of subpleural bleb
- **Picture of well-differentiated squamous cell carcinoma of lung**: • keratin is red, • look for squamous pearls
- **Hypersensitivity pneumonitis**: • see Respiratory notes on Farmer's lung, silo filler's disease, byssinosis, • end-stage is Hamman Rich lung ("honeycomb" lung)
- **α1-Antitrypsin deficiency**: • lung and liver disease, • lung disease more often seen in young adults– AAT not synthesized in liver, • liver disease more often seen in children– AAT synthesized but cannot be secreted in liver (see PAS positive granules in hepatocytes)
- **Patient with Marfan's syndrome has diastolic murmur**: aortic regurgitation due to stretching of aortic valve ring
- **Addison's disease**: MC due to autoimmune destruction
- **Negative birefringent crystal in synovial fluid**: monosodium urate, yellow when parallel to the slow ray of the analyzer
- **Risk factors for osteoarthritis**: excess weight as in type II DM or obesity from other causes
- **Coarctation of aorta**: • blood pressure greater in upper than lower extremity, • reverse is true in Takayasu's arteritis
- **Precipitating causes of hemolysis in G6PD deficiency**: • fava bean ingestion, • infection, • oxidizing drugs (primaquine, dapsone, TMP/SMX, nitrofurantoin)
- **Association of Hirschsprung's disease with Down syndrome**: review classic features f Down syndrome in Genetics notes
- **Villous adenoma**: • sessile polyp with villous-like (resembles small intestinal villi) structures having fibrous core and lined by dysplastic glandular epithelium, • highest propensity of all polyps for malignant transformation, • MC located in rectum, • increased mucous production leading to hypoproteinemia and hypokalemia
- **Gross picture of osteogenic sarcoma**: • mass in metaphysis with invasion into surrounding muscle, • upper tibia or lower femur, • x-ray– Codman's triangle, sunburst appearance of bone made by osteoid, • Rb suppressor gene relationship
- **Bloody nipple discharge in young woman and no palpable mass**: benign intraductal papilloma in lactiferous duct
- **Young woman with hematuria after upper respiratory** infection and negative ASO titer: • classic history for IgA glomerulonephritis (Berger's), • MC type of glomerulonephritis
- **Kidney stones**: • majority of stones contain calcium– calcium oxalate MC, calcium phosphate, • staghorn calculus– magnesium ammonium phosphate, alkaline pH, Proteus infection
- **Picture of patient with actinic (solar) keratosis of skin**: • pearly-gray/white lesion in sun-exposed area (face, dorsum of hand), • precursor for squamous cell carcinoma of skin
- **Retinoic acid Rx for acute progranulocytic leukemia (M3):** • retinoic acid increases differentiation of leukemic cells, • t; 15:17 translocation, • lots of Auer rods, • DIC invariable
- **Peripheral blood smear of microcytic anemia**: • order serum ferritin, since iron deficiency is MCC, • cells are hypochromic due to decreased synthesis of hemoglobin

- **Barbiturate inducing acute porphyric attack**: • acute intermittent porphyria, • AD disease with absent uroporphyrinogen synthase, • belly full of scars
- **Mother with maculopapular rash during pregnancy and neonate with saber shins**: congenital syphilis
- **Hemorrhagic infarct of brain in patient with atrial fibrillation**: embolic infarct
- **Picture of old brain infarct with cystic cavity remaining**: liquefactive necrosis
- **Patient with twitching of face with tapping of facial nerve**: • tetany due to decrease in ionized calcium, • Chvostek's sign, • Trousseau's sign is when thumb adducts into palm when taking blood pressure
- **Migratory thrombophlebitis**: • paraneoplastic sign for carcinoma of head of pancreas, • sign of hypercoagulability, • also called Trousseau's sign
- **First reversible sign of tissue hypoxia**: cellular swelling due to decrease in ATP and dysfunctional Na^+/K^+ ATPase pump
- **Acute bleeding due to 1 cm punctate lesion in rectum**: • probably solitary rectal ulcer or adenocarcinoma, • not diverticular disease or angiodysplasia
- **Causes of proteinuria**: glomerulonephritis MCC
- **Carcinoid tumor**: • APUD tumor– neural crest origin, neurosecretory granules, S100 antigen positive, • all are malignant, • size determines ability to metastasize (≥2 cm), • appendix MC location, • terminal ileum MC location with capability of metastasis to liver causing carcinoid syndrome (flushing, diarrhea)
- **Iron reabsorption in bowel**: • two types of iron in gut– *non-heme iron (plants, wheat grains), which has iron in ferric condition, *heme iron (meat products), which has iron in ferrous state, • iron is mainly absorbed in duodenum in ferrous state, • ferrous iron is bound to chelators to keep it soluble (gastric acid, ascorbic acid), • presence of carbonates, phytates, oxalates, phosphates combine with iron to form insoluble complexes that cannot be absorbed, • absorbed iron binds to **intracellular iron carrier** (key factor determining reabsorption of iron) that directs iron to following sites– *apoferritin (protein) in mucosal cells to form ferritin (micelles of iron carried as ferric hydroxyphosphate), *transferrin (binding protein of iron) in plasma, *mitochondria (very little), • less iron stores (iron deficiency) causes increased liver synthesis of transferrin which has a low saturation– more iron is directed to transferrin in plasma than to apoferritin to produce ferritin, • increased iron stores (e.g., iron overload disease) results in decreased liver synthesis of transferrin which is highly saturated– more iron is directed to apoferritin leading to an increase in mucosal ferritin, which is lost in the stool when mucosal cells are shed
- **B_{12} deficiency associations**: • macrocytic anemia, • dysfunctional propionate metabolism leading to dorsal column disease, • increased plasma homocysteine
- **Elderly patient does not develop a hemolytic transfusion reaction when given wrong ABO blood group**: elderly patients normally lose isohemagglutinins with age, so none may be present to attack ABO antigens in transfused blood
- **Cystic fibrosis transmembrane regulator (CFTR)**: • 3 nucleotide deletion coding for phenylalanine is MC mutation on chromosome 7, • effect on CFTR– defective processing of CFTR in **Golgi apparatus** so it is not fully folded and is degraded before it reaches cell surface
- **Osteomyelitis**: • hematogenous spread of *Staphylococcus aureus*, • metaphysis of bone, • think *Salmonella species* for sickle cell disease
- **Screen for autoimmune disease in relatives**: • screen for HLA antigens unique to the autoimmune disease, • see Immunopathology notes and Musculoskeletal notes

- **Source of *Legionella* infections**: • air conditioning cooling towers/condensers, • showers, • vegetable misters in grocery stores
- **Septic arthritis in sexually active woman**: *Neisseria gonorrhoeae*
- **Know S/S of fetal alcohol syndrome**: • mental retardation, • microcephaly, • maxillary hypoplasia, • atrial septal defect, • hypoglycemia at birth, • often give signs and ask what question to ask the mother– alcohol intake
- **Picture of farmer's arm with large, crateriform lesion**: probable squamous cell carcinoma
- **Preeclampsia pathophysiology**: • decrease in PGE_2 and NO, which are vasodilators, • increase in ATII, TXA_2, which are vasoconstrictors
- **Patient taking penicillin for streptococcal infection develops hemolytic anemia**: due to autoimmune hemolytic anemia (type II) against BPO attached to RBC membrane
- **Know gout**: review Musculoskeletal notes
- **Know prostate hyperplasia**: • testosterone + DHT effect on transitional zone of prostate around urethra, • problems with voiding more likely hyperplasia than cancer, • cystitis common due to urinary retention, • septic shock due to *E. coli* from urinary retention, • hyperplasia does not become cancer
- **Epidural hematoma**: fracture of temporoparietal bone and rupture of middle meningeal artery
- **Hematology pictures**: • hypersegmented neutrophil (B12/folate deficiency), • Auer rod (acute myelogenous leukemias), • sickle cells, • spherocytes, • microcytic anemia, • schistocytes, • multiple myeloma marrow with plasma cells
- **Anemia in renal failure**: take erythropoietin
- **Malabsorption with blunt villi**: celiac disease
- **J-K disease from brain instrument treated with formaldehyde**: prions
- **Bronze diabetes**: look for iron in liver– hemochromatosis
- **40 yr. old man with dementia and senile plaques in brain**: Down syndrome patient with Alzheimer's
- **Easy bruising in hospitalized patient on antibiotics**: vitamin K1 deficiency from destruction of colon bacteria
- **Chronic granulomatous disease of childhood**: • SXR, • absent NADPH oxidase, cannot produce superoxide FRs or peroxide, • absent respiratory burst
- **Pancreatic** tumor associated with peptic ulcers: ZE syndrome with secretion of gastrin
- **Multinucleated giant cell associated with viral infection**: measles– Warthin-Finkeldey giant cell
- **Achalasia**: failure of relaxation of lower esophageal sphincter at junction of distal esophagus with proximal stomach
- **Cerebral edema in Pb poisoning**: • increase in δ-aminolevulinic acid in brain is toxic and produces demyelination and increased vessel permeability, • can be prevented by taking heme, which inhibits ALA synthase
- **Alcoholic with bad breath and cavitary lung lesion**: • lung abscess from aspiration of oropharyngeal material, • mixed aerobes and anaerobes
- **Teenager faints when playing sports**: hypertrophic cardiomyopathy
- **Main site for acetaminophen toxicity in liver**: around terminal hepatic venule (centrilobular)– least amount of oxygen in this site
- **Sarcoidosis**: non-caseating granulomas
- **Polyhydramnios**: • TE fistula, • duodenal atresia (Down syndrome)
- **Oligohydramnios**: renal disorder in fetus– polycystic kidneys, renal dysplasia
- **Block left renal vein**: produces a left-sided varicocele

- **Injury to head with polyuria**: central diabetes insipidus from transection of pituitary stalk
- **Supine and where does foreign body go**: superior segment of RLL
- **Picture of lymph node**: • B cells in follicles, • T cells in parafollicular area, • histiocytes in sinuses
- **Patient with an increase in amylase and lipase**: • patient most likely an alcoholic with acute pancreatitis, • cannot be mumps because of lipase
- **Casts in renal disease**: • chronic renal failure– broad cast, waxy cast, • nephritic syndrome– RBC cast, • nephrotic syndrome– fatty cast with Maltese crosses, • acute tubular necrosis– renal tubular cast, • acute pyelonephritis– white blood cell cast
- **Renal EM pictures**: • tram track of type I membranoproliferative, • subendothelial deposits– SLE, type I membranoproliferative, • fusion of podocytes in minimal change disease, • subepithelial deposits– membranous GN and post-streptococcal GN
- **Rheumatic fever**: increased ASO titer
- **Picture of staghorn calculus**: • magnesium ammonium phosphate, • urease uropathogen like *Proteus*, • alkaline urine pH
- **Overdose of barbiturates**: acute respiratory acidosis
- **Eye effects in Cushings syndrome**: cataracts from increased glucocorticoids
- **Renal mass in a child**: Wilm's tumor
- **Prostate cancer**: • osteoblastic– increased alkaline phosphatase, • vertebral column favorite location
- **What makes a laboratory test more specific**: raising the upper limit of normal increases specificity (less FPs) and positive predictive value
- **Findings at autopsy of RDS**: hyaline membranes with massive atelectasis
- **Baby bleeds after circumcision on 10th day**: mother is breast feeding baby– no vitamin K in breast milk
- **Statistics**: calculate sensitivity/specificity/positive and negative predictive value, risk ratio, odds ratio, cohort studies, cross-over studies

Anatomy High Yield

- **Find hypoglossal nerve in brain stem:** exits in medulla at preolivary sulcus
- **Know brachial plexus injuries**
- **Peroneal nerve injury**: • equinovarus position of foot, • loss of foot eversion, • loss of dorsiflexion of foot, • loss of toe extension, • numbness of anterolateral leg and dorsum of foot
- **Know cerebellum and cerebellar function**: Purkinje (rabies inclusions), mossy fibers in lower cerebellum
- **Spinal lemniscus tract and medial lemniscus**: both go to thalamus
- **Know types of junctions in lateral region of cells**: zona occludens (tight junctions), zona adherens, desmosome, gap junction (nexus, passage of materials)
- **Leaky junctions**: present in proximal tubules of the kidneys
- **Actin**: present in muscle in iris but are not responsible for motility in sperm
- **Patient stabbed in the neck has signs of right hemisection**: • bilateral loss of pain and temperature sensation within dermatome of involved segments (crossed spinothalamic in ventral commissure), • ipsilateral flaccid paralysis in affected myotomes (ventral horn), • contralateral loss of pain and temperature sensation one segment below lesion (lateral spinothalamic tract), • ipsilateral spastic paralysis with pyramidal signs (loss of lateral

superior mesenteric vein (largest vessel), • inferior mesenteric vein ends by joining the splenic vein

- **Drawing of a winged scapula**: • injury to long thoracic nerve, • common injury in axillary node dissection in a modified radical mastectomy
- **Ulnar nerve functions**: • medial epicondyle injuries, • normally adducts fingers due to innervation of palmar and dorsal interosseus muscles, • adducts thumb (adductor pollicis muscle)
- **Lightening pains when coughing**: due to herniated disc compressing sensory root
- **EM of plasma cell**: secretes antibodies
- **Characteristics of postganglionic peripheral nervous system fibers**: • short, • near end organ
- **Duodenal ulcer perforation and bleed**: gastroduodenal artery
- **Know eye muscle functions and their paralysis**
- **Brachial plexus question**: waiter's tip deformity– Erb-Duchenne C5 and C6 in upper trunk
- **Know different tests for tears of ligaments/menisci in the knee**
- **Bicornuate uterus**: failure of fusion of paramesonephric duct
- **CN V**: goes through superior orbital fissure
- **Picture of brain and ask where melatonin produced**: pineal gland
- **Abdominal incision to avoid interrupting blood supply**: midline
- **Cleft palate**: maxillary prominence fails to fuse with medial nasal prominence
- **Hematopoiesis at 28th week**: bone marrow main site
- **Schwann cell/oligodendrocyte**: Schwann cell makes myelin for PNS oligodendrocyte for CNS
- **Schwann cells**: develop from neural crest cells
- **Picture of fetal pituitary**: neurohypophysis is posterior lobe where ADH is stored
- **Know location of CN V and course of CN III**
- **Loss of pain and temperature on side of face**: CN V lesion

Pharmacology High Yield

- **Drug of choice for open angle glaucoma**: timolol, β1 and β2 blocker
- **Allopurinol:** inhibits xanthine oxidase
- **Isoniazid**: causes pyridoxine deficiency leading to peripheral neuropathy and sideroblastic anemia, MOA: INH is nicotinic acid derivative that inhibits synthesis of mycolic acid in mycobacteria cell wall
- **Succinylcholine**: • depolarizing agent used as muscle relaxant during surgery, • binds to nicotinic receptors in skeletal muscle causing persistent depolarization at motor end-plate, • hydrolyzes plasma cholinesterase, • initial fasciculations followed by muscle paralysis, • duration of action only 5–10 min, • effects not reversed by cholinesterase inhibitors– no pharmacologic antidote to overdose, • some patients have atypical cholinesterase and cannot metabolize the drug
- **Preganglionic neurotransmitter acetylcholine**: • activates muscarinic and nicotinic receptors, • muscarinic effects– pupillary miosis (contracts iris sphincter, used after cataract surgery), accomodation of lens for near vision (contracts ciliary muscles), bronchoconstrictor, slow heart rate (SA node effect), increase PR interval (AV node effect), stimulate GI secretions, increases GI motility (enteric nervous system stimulation), micturition (stimulate detrusor muscle, which relaxes internal sphincter of bladder)

- **Nitric oxide**: • potent vasodilator synthesized in endothelial cells, • activates cyclic GMP, which inactivates myosin light chain kinase in smooth muscle cells leading to vasodilatation, • Ach can lead to its synthesis when injected into vessels
- **Woman in third trimester has premature contractions**: use terbutaline, a selective β2-adrenergic receptor agonist that inhibits uterine contractions
- **Know effect of aspirin on kidney**: • decrease PGE_2 synthesis (vasodilator) leading to unopposed AT II effect, • renal papillary necrosis
- **Know methotrexate very well**: • see Neoplasia notes, • blocks dihydrofolate reductase (macrocytic anemia due to folate deficiency), • S phase inhibitor, • leucovorin rescue, • interstitial fibrosis in lungs
- **Know MOA and side effects of chemotherapy agents**: see Neoplasia notes and pharm notes
- **Peripheral neuropathy and cancer drug**: vincristine
- **Know nerve-ending locations in a schematic affected by botulinum poison, reserpine, guanethidine**
- **Know MOA of sucralfate**: • viscous polymer of sucrose octasulfate + aluminum hydroxide that adheres to ulcer crater, • stimulates PGE_2 in mucous cells (responsible for mucous barrier)
- **Effect of mixing statin drugs with niacin**: rhabdomyolysis-- each drug by itself can produce rhabdomyolysis
- **MOA of amphotericin B**: • binds ergosterol in fungal cell membrane, which increases its permeability, • nystatin has same mechanism
- **MOA of clotrimazole**: • inhibits ergosterol synthesis, • other azole compounds have similar action
- **MOA of flucytosine**: inhibits nucleic acid synthesis
- **MOA of griseofulvin**: inhibits microtubule function and mitosis
- **Know definitions for potency and efficacy of drug**
- **Propylthiouracil**: • drug of choice for decreasing synthesis of thyroid hormone in Graves disease, • agranulocytosis, • only drug that can be used in pregnancy
- **Fastest way to increase heartbeat in shock**: • order of drugs with decreasing effectiveness is isoproterenol, dobutamine, and dopamine, • dopamine in low doses is best for renal vasodilatation
- **Dapsone**: • sulfone that inhibits synthesis of folic acid by *M. leprae*, • may precipitate hemolytic anemia in G6PD deficiency, • nephrotic syndrome, • peripheral neuropathy
- **Prolongation of QRS on ECG**: quinidine
- **Anticonvulsant/antiepileptic drug with effect on epiphyseal plate**: phenytoin via its revving up of the cytochrome system in the liver and causing vitamin D deficiency (increased metabolism of 25 hydroxylated vitamin D)
- **MOA of ondansetron**: • selective serotonin 5-HT3 receptor antagonist, • useful in blocking chemoreceptor trigger zone (CTZ) in the area postrema, hence preventing vomiting
- **Opioid overdose**: • see Environmental path notes on drugs of abuse, • respiratory depression-- respiratory acidosis, • miotic pupils
- **First Rx of alcoholic in ER:** give IV thiamine to prevent acute Wernicke's encephalopathy
- **Graphs showing effect of adding drugs to other drugs**
- **Heparin**: MCC of thrombocytopenia in hospital
- **Acute Rx for coumarin overdose**: fresh frozen plasma best choice
- **Nitrofurantoin**: • concentrated in urine, • urinary tract antiseptic

- **Cyclophosphamide**: • hemorrhagic cystitis, • transitional cell carcinoma, • activated (not metabolized) in the liver
- **Doxorubicin and prednisone**: metabolized in liver
- **Gout after cancer therapy**: prevent by giving allopurinol to prevent gout and urate nephropathy
- **Given log dose curve for 2 drugs and must compare efficacy and potency**
- **Muscle fasciculations after neuromuscular block**: initial effect of succinylcholine
- **MOA of levodopa**: blocks peripheral dopa decarboxylase
- **Bronchial asthma**: • terbutaline can be used as bronchodilator, • albuterol more often used
- **Rx of paroxysmal supraventricular tachycardia**: adenosine, including its association with WPW syndrome
- **MOA of clonidine**: activates α_2-adrenergic and imidazole receptors in the central nervous system which reduces sympathetic outflow from the vasomotor center in the medulla
- **Captopril**: • bradykinin side-effects include cough and angioedema, • cough not seen with losartan
- **Hydralazine**: • better tolerated in fast acetylators, • cause of drug-induced SLE, • can be used in hypertension in pregnancy
- **Patient with hypertension, hypernatremia and hypokalemia**: • losartan, an ATII receptor antagonist, is the best drug, • corrects HTN and electrolyte problem (blocks release of aldosterone, hence sodium is lost in the urine and potassium retained)
- **Rx of pulmonary edema**: loop diuretic is very useful
- **Rx of opioid overdose**: naloxone, which is a competitive opioid receptor antagonist
- **Urinary retention in prostate hyperplasia**: • use selective α_1- blockers, relax smooth muscle in bladder neck and prostate, • examples– prazosin, terazosin
- **MOA of saw palmetto**: • anti-androgen effect– blocks androgen uptake and availability without altering serum levels, • causes shrinking of transitional zone of prostate around the urethra
- **Narcolepsy**: Rx with amphetamines
- **Premature labor and must deliver baby**: give glucocorticoids to increase surfactant synthesis
- **Know how to calculate maintenance dose of a drug**
- **Interpret dose/response curves and whether antagonist is competitive and non-competitive:** most are
- **Know types of studies necessary to study effects of a new drug**
- **Drug used to eliminate calcium in patient with hypercalcemia**: loop diuretic
- **Drug used to remove calcium from urine in a calcium stone former**: hydrochlorothiazide
- **Patient with respiratory alkalosis and then metabolic acidosis**: salicylate intoxication
- **S-phase drug used in treatment of acute lymphoblastic leukemia**: methotrexate
- **Analog of hypoxanthine requiring HGPRTase for bioactivation**: • 6-mercaptopurine, • allopurinol could cause toxicity, since the drug is a purine
- **Drug that competes with dUMP for thymidylate synthase**: 5-fluorocuracil
- **Drug used in Rx of Wilm's tumor**: actinomycin D (dactinomycin)
- **Antimetabolite that together with an antibiotic is used in Rx of acute myelogenous leukemia**: cytarabine + daunomycin (anthracycline antibiotic)
- **Nephron site responsible for ACE inhibitors causing increase in serum creatinine**: block in AT II (works as vasoconstrictor of efferent arteriole in glomerulus) by ACE inhibitor removes important control for maintaining intrarenal blood flow causing potential for renal failure (particularly with bilateral renal artery stenosis)

- **Nephron site of action of thiazides**: Na^+/Cl^- pump in cortical thick ascending limb
- **Vitamin given in Rx of TB**: pyridoxine (B6)– used up when using isoniazid, risk of peripheral neuropathy and sideroblastic anemia
- **Drugs that are generally safe in pregnancy**: • safe– methyldopa, hydralazine, low doses of propylthiouracil, cephalosporins, penicillin, • not safe– methotrexate, ACE inhibitor, retinoic acid, sulfur containing drugs
- **Why is gentamicin ineffective in *Legionella* infections**: • aminoglycosides affect the 30S ribosomal subunit, • resistance to any drugs that are protein synthesis inhibitors may be due to– *inactivation of the drug by bacterial enzymes, *decreased uptake of drugs via porins in bacterial membranes, * **decreased binding of drug to 30S ribosomal subunit (my guess for answer)**
- **Know classic ECG changes for cardiovascular drugs**: • prolonged QRS with quinidine, amiodarone, • prolonged QT interval with sotalol, amiodarone, • prolonged PR interval with digitalis, • β-blockers, • calcium channel blockers, • giant U wave with quinidine, • ST depression with digitalis (hockey stick configuration), quinidine, • short QT interval with digitalis, • flat T wave with quinidine, • bradycardia with quinidine
- **Know mechanisms for resistance to various classes of antibiotics**: note the ones above for 30S protein synthesis inhibitors (tetracyclines, aminoglycosides, spectinomycin)
- **Know drugs of choice for infections**: heavy emphasis on fungal diseases, Legionella, Pneumococcus, etc.
- **Patient with Salmonella and G6PD deficiency**: avoid TMP/SMX (sulfur drug)
- **MOA of disulfiram reaction with metronidazole**: inhibits aldehyde dehydrogenase
- **MOA of norfloxacin**: inhibits DNA gyrase
- **Avoid tetracycline in pregnancy**
- **MOA of erythromycin**: • inhibits 50S ribosomal subunit in bacterial protein synthesis, • also other macrolides, • chloramphenicol, • clindamycin
- **Chloramphenicol**: aplastic anemia in adults (idiosyncratic, not dose dependent)
- **Know blockers for different acetylcholine receptors**
- **Child eats honey and gets weak**: • botulism, • intestinal colonization of organism with toxin production
- **Antihypertensives increasing blood lipids**: • β-blockers, • thiazides
- **MOA of trimethoprim**: blocks dihydrofolate reductase
- **Muscle relaxant for electroconvulsive Rx**: succinylcholine
- **Rx of prostate cancer**: • leuprolide– GnRH agonist blocks FSH and LH and lowers testosterone and DHT, • flutamide– competes with testosterone for androgen receptor, • finasteride– blocks 5α-reductase, decreases DHT, increases testosterone (good for preventing impotency and hair growth), mainly used in prostate hyperplasia, • ketoconazole– reduce testosterone synthesis, more often used in hyperplasia
- **Young woman with vaginal cytology containing malignant cells**: DES exposure with clear cell adenocarcinoma
- **CMV infection**: ganciclovir first, then foscarnet if it does not work
- **Most common side-effect of immunosuppressant drugs**: • infection, • squamous cancer of skin MC cancer
- **Rx of absence seizures**: • ethosuximide
- **Showed EEG in patient with absence seizures**: • shows 3/sec spike and wave discharge, • increased with hyperventilation
- **Drug abuser with flu-like syndrome, fever, mydriasis**: methadone + naloxone
- **Patient with polyuria, polydipsia**: taking lithium– produces nephrogenic diabetes insipidus

- **Rx of ADHD**: methyl phenidate
- **Question on Rx of depression**: tricyclic antidepressants– clomipramine blocks neuronal reuptake of NOR (+2) and serotonin (+3)
- **Phenytoin interaction with theophylline**: phenytoin revs up cytochrome system and increases metabolism of theophylline
- **Effect of chronic use of a hypnotic drug to induce sleep**: psychologic dependence
- **Patient with Wegener's granulomatosis has hemorrhagic cystitis**: cyclophosphamide effect
- **K1 is the active form of vitamin K**
- **Patient with hypertension has SLE-like syndrome**: hydralazine
- **Vasoconstrictors that increases IP3**: drugs activating α1-adrenergic receptors
- **Know drugs that have their effects on pacemaker action potentials**
- **Know mechanisms of action at receptors (adrenergic, cholinergic, hypothalamic releasing factors, histamine, VIP)**: e.g., cAMP, IP3/diacyclglycerol, etc.
- **Know CNS drugs of choice for specific CNS conditions**: e.g., types of seizures, etc.
- **Know drugs of abuse**: review Environmental pathology notes and pharm notes on this subject
- **Iron poisoning in child**: biggest concern is hemorrhagic gastritis and liver necrosis
- **Know all the receptors, mechanisms of transduction, neuronal tracts, functions**: α1, α2, β1, β2, D types for dopamine, GABA, Histamine, 5-HT types for serotonin, Muscarinic, Nicotinic, NO, opioid receptors (δ, κ, μ)
- **Picture of woman's ring finger with blue discoloration on undersurface and Hx of drug abuse and frequent sexual activity**: probable IV heroin abuser using finger as site of injection that is selling sex for drugs
- **Gold salts**: • used in Rx of rheumatoid arthritis, • oral drug called auranofin, • parenteral form called gold sodium thiomalate, • takes 3–6 mths before effects are noticed, • complications– potentially fatal dermatitis/stomatitis common, bone marrow depression, flushing, hypotension, tachycardia, renal disease
- **Hydroxychloroquine**: • used in Rx of rheumatoid arthritis, • complications– retinal degeneration, dermatitis, bone marrow depression
- **Penicillamine**: • used in Rx of rheumatoid arthritis, •complications– aplastic anemia, renal damage (membranous glomerulonephritis)
- **Acetaminophen**: • weak cyclooxygenase inhibitor in peripheral tissues– lack of antiinflammatory effect, • effector inhibitor of prostaglandins in CNS– antipyretic, analgesic
- **Penicillin MOA**: • β-lactam antibiotic– cell wall synthesis inhibitor, • binds to receptors in bacterial cytoplasmic membrane, • inhibits transpeptidase enzymes that cross-link peptidoglycan chains in bacterial cell wall, • activates autolytic enzymes in bacterial cell wall
- **Chloramphenicol MOA**: • inhibits bacterial protein synthesis, • binds to 50S ribosomal subunits, hence indirectly inhibiting transpeptidation by peptidyltransferase
- **Mesna**: • mercaptoethanesulfonate, • reduces incidence of hemorrhagic cystitis associated with cyclophosphamide by reducing formation of acrolein
- **Ribavirin MOA**: • inhibits guanosine triphosphate formation, which prevents capping of viral mRNA, • blocks RNA-dependent RNA polymerases, • used in Rx of RSV infections
- **Ondansetron MOA**: 5-HT_3 receptor blocker– central antemetic
- **Tamoxifen**: • estrogen receptor partial agonist– blocks binding of estrogen to receptors of estrogen sensitive breast cancer cells, • used primarily in breast cancers that are ERA

positive, • also used in progesterone resistant endometrial cancer, • protects against osteoporosis and increases HDL, • complications– hot flashes similar to menopause, vaginal bleeding, endometrial hyperplasia/cancer

- **Know pharmacokinetics**: • half-life, • volume of distribution, • maintenance dose
- **Aminoglycosides**: • affect 30S ribosomal subunit in bacterial protein synthesis, • nephrotoxic and ototoxic, • MCC of drug-induced nephrotoxin acute tubular necrosis, • ototoxicity related to accumulation in labyrinth and hair cells of cochlea, vestibular signs/symptoms– nystagmus, dizziness, vertigo, N/V, • cochlear signs/symptoms– tinnitus, sensorineural hearing loss
- ***H. pylori***: • Rx– bismuth + tetracycline (or amoxicillin) + metronidazole + proton pump blocker or amoxicillin + clarithromycin + proton pump blocker, • prevention– proton pump blocker + bismuth
- **Antifungal drug destroying fungal cell membranes**: • **polyenes** like amphotericin B– *polyenes bind to ergosterol in cell membrane and cause formation of artificial pores in the membrane, *toxicity of amphotericin– distal RTA with magnesium and potassium wasting, • azoles block synthesis of ergosterol in cell membrane, • flucytosine blocks nucleic acid synthesis, • griseofulvin disrupts microtubules
- **Alkylating agents MOA**: • alkylate DNA, RNA, other proteins, • leads to breakage of DNA strands and cross-linking which inhibits strand replication
- **HMG-CoA reductase inhibitors**: • statin drugs block CH synthesis, • hepatocytes compensate by up-regulation of LDL receptor synthesis leading to increased clearance of IDL and LDL remnants derived from VLDL
- **Sildenafil**: • drug for Rx of erectile dysfunction, • inhibits breakdown of cGMP by type 5 phosphodiesterase– increases levels of cGMP, which causes vasodilatation in corpus cavernosum and penis
- **Nitroglycerin MOA**: • release nitric oxide (vasodilator) in endothelial cells, • primarily a venodilator– causes venous pooling and reduces preload, • has some arterial vasodilatation when administered IV– reduces afterload, • uses– angina, acute myocardial infarction
- **Nitroprusside MOA**: • used in hypertensive emergencies and in dissecting aortic aneurysms, • metabolized to cyanide in RBCs– cyanide converted to thiocyanate, must measure levels of thiocyanate during Rx to avoid toxicity
- **Phentolamine**: • nonselective α-adrenergic receptor antagonist– competitive receptor antagonist, • produces vasodilatation– reduces TPR and blood pressure, • reverses effects of epinephrine, • clinical uses– *hypertensive episodes due to pheochromocytoma, *reversal of effects of accidental injection of epinephrine in subcutaneous tissue
- **Naproxen**: • newer, long-acting NSAID that blocks cyclooxygenase, • very significant potential for renal damage in those with preexisting renal disease
- **Doxorubicin**: • antibiotic, • MOA– *intercalate base pairs, *interact with topoisomerase II, *generate free radicals, block synthesis of DNA/RNA and cause DNA strand scission, • side effects– *dose-dependent congestive cardiomyopathy via free radical damage, *marrow suppression, • dexrazoxane, a FR scavenger, may protect against cardiotoxicity
- **MAO inhibitor used in treating a patient with resting tremor**: • selegiline, • blocks

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[illegible] type B which normally metabolizes dopamine, so brain levels increase, • hepatic metabolism produces amphetamine

- **Dantrolene MOA**: blocks calcium release from sarcoplasmic reticulum of skeletal muscle, • DOA in Rx of malignant hyperthermia, • used in Rx of muscle spasms in cerebral palsy

- **Digitalis**: blocks Na^+/K^+ ATPase pump in cardiac muscle– 3 Na^+ into muscle and 2 K^+ out of muscle
- **Antihypertensive with Coombs positive hemolytic anemia**: • methyldopa, • alters Rh antigens on surface of RBC, so IgG autoantibodies react against it, • type II hypersensitivity
- **Know different insulin preparations and times of onset of activity**
- **Fluoroquinolone MOA**: • blocks bacterial DNA synthesis by inhibiting topoisomerase II (DNA gyrase) and topoisomerase IV, • DNA gyrase important in relaxation of supercoiled DNA involved in normal transcription and duplication, • type IV topoisomerase important in separation of replicated chromosomal DNA during cell division
- **Benzodiazepines**: retrograde amnesia
- **Propylthiouracil MOA**: • reduces iodination of tyrosine, • reduces coupling of MIT and DIT to form T_3 and T_4, • inhibits peripheral conversion of T_4 to T_3 by inhibiting the outer ring 5'-deiodinase, • side-effects– rash, agranulocytosis
- **Drug lowering HDL**: • probucol, • may cause torsade de pointes– variation of QRS configuration, type of polymorphic ventricular tachycardia, • may prolong QT interval
- **Drugs causing torsade de pointes**: drugs that slow ventricular repolarization and prolong QT interval– quinidine, sotalol, phenothiazines, cisapride
- **MOA inhibitor associations**: • inhibit MAO type A (metabolizes NOR, serotonin, tyramine) and B (metabolizes dopamine), • hypertensive reactions if taking foods with tyramine– *byproduct of tyrosine metabolism, *bananas, *fermented products like cheese, beer, wine, sympathomimetic reaction in that it causes the release of stored catecholamines leading to hypertension, • administered with fluoxetine (SSRI) produces serotonin syndrome– hyperthermia, myoclonus (failure to relax muscle)
- **Stage fright/test anxiety**: give propranolol
- **H_1 antagonists for Rx of hay-fever**
- **β-2 agonists**: activate adenylate cyclase to increase cAMP
- **Bronchial asthma**: • zileuton– inhibits 5-lipoxygenase, • zafirlukast and montelukast block leukotriene receptors
- **Know MOA of methadone**: • Rx of opioid abuse, • saturates CNS opiate receptors
- **Receptor involved in tardive dyskinesia**: D_2
- **Phencyclidine toxicity**: • angel dust, reacts with opioid-like sigma receptors and subtypes of glutamate receptors, • dissociative anesthesia– e.g., loss of sensation in lower limbs, • agitation/violent behavior– cannot hold patient down
- **Acyclovir MOA**: • guanosine analog that is activated to form acyclovir triphosphate a competitive substrate for DNA polymerase– subsequent chain termination following incorporation into viral DNA, • clinical uses– varicella/zoster virus, mucocutaneous/genital herpes
- **Girl on rifampin becomes pregnant while on birth control pills**: rifampin revs up the liver cytochrome system, like alcohol, barbiturates, phenytoin
- **Antagonist of α1-blocker**: α1-agonist like pseudoephedrine
- **Complications of thiazides**: • hyponatremia, • hypokalemia, • metabolic alkalosis, • hyperuricemia, • hyperglycemia, • hypercalcemia
- **ACE inhibitor effect on plasma renin activity**: increases due to decrease in AT II and aldosterone
- **Drugs affecting tubulin in mitotic phase**: • vinca alkaloids, • paclitaxel

Biochemistry High Yield

- **Know GTP/GMP system**
- **Know effect of toxins on transcription and translation**
- **Know Tay-Sachs**: see Path notes in genetics, hexosaminidase A deficiency, 4 nucleotide insertion leading to frameshift mutation, GM2 ganglioside accumulation, cherry red macula
- **Know hyperlipoproteinemias**: see Cardiovascular notes in Path, type I and V have chylomicrons associated with them, type II is increase in LDL, type III is remnant disease (dysbetalipoproteinemia), increase in VLDL in type IV and type V
- **PCR mechanism**: uses DNA polymerase to break down DNA into fragments
- **Know oxidative pathway and cytochromes**
- **Know locations of biochemical processes in cell**: • cytosol– glycolysis, HMP shunt, FA synthesis, glycogen synthesis, • mitochondrial matrix– β-oxidation of FAs, TCA cycle, • inner mitochondrial membrane– oxidative phosphorylation, • both cytosol and mitochondria– gluconeogenesis, urea cycle, heme synthesis
- **Lysosomes**: • located in cytosol, • know I disease and all lysosomal storage diseases (see Genetics notes)
- **Debranching enzymes in glycogenolysis**: • glucosyl (4:4) transferase– removes 3 outer glucoses from the residues and transfers them to the linear branch for further breakdown, • amylo-α-1,6 glucosidase– cleaves off remaining glucose leaving free glucose
- **Neurotransmitter from an essential amino acid**: serotonin coming from tryptophan
- **Brain energy during starvation**: • ketone bodies, • uses glucose during fed and fasting state
- **Gluconeogenic enzymes**: • pyruvate carboxylase, • phosphoenolpyruvate carboxykinase, • fructose 1,6-bisphosphatase (rate limiting), • glucose 6-phosphatase (deficient in von Gierke's glycogenosis)
- **Pompe's disease**: missing lysosomal enzyme α-glucosidase
- **RBC ribosomes**: • lost after RBC leaves bone marrow, • persistence in peripheral blood produces basophilic stippling, • coarse basophilic stippling sign of Pb poisoning (ribonuclease denatured by Pb)
- **Know wobble hypothesis involving codon recognition by tRNA**
- **β-Thalassemia mechanisms**: • most often a splicing defect, •severe β-thal is due to a stop codon preventing β-chain transcription
- **Patient with aldolase B deficiency**: • hereditary fructose intolerance, • avoid fructose in diet, • avoid honey
- **McArdle's glycogenosis**: • absent muscle phosphorylase, • no lactic acid accumulation after exercise
- **Man with 2900 calorie diet with 30% of it representing fat, how many grams is fat**: • fat has 9 cal/g, • 2900 x 0.30 = 870 calories is fat, • 870 ÷ 9 = ~97 grams
- **Vmax and Km:** • glucokinase– high Km (low affinity for glucose) and high Vm (only reacts with glucose), • hexokinase– low Km (high affinity for glucose, good for fasting state) and low Vm (reacts with all hexose sugars)

☞ **Fasting state versus starvation:**

	Fasting state at 24 hs	Starvation (prolonged fasting)
Glycogenolysis	Increased	Decreased– no stores left after 10–18 hs
Gluconeogenesis	Increased	Slightly decreased– decrease in protein catabo-lism and increased use of ketones for fuel
β-oxidation of FAs	Increased	Markedly increased– primary fuel source for muscle
Catabolism of muscle to release AAs as substrate for gluconeo-genesis	Increased	Decreased– conserve muscle for important body functions
Production of urea from AA metabolism	Increased	Decreased– less muscle breakdown of protein with less AAs to metabolize
Ketone body synthesis	Increased	Markedly increased– by-product of increased β-oxidation of FAs
Muscle use of fatty acids for fuel	Increased	Markedly increased– primary fuel
Muscle use of ketones for fuel	Increased	Decreased– allows the brain to use ketones for fuel
Brain use of glucose for fuel	Increased	Decreased relative to the early fasting state– allows RBCs to primarily use glucose for fuel
Brain use of ketones for fuel	Decreased	Increased– primary fuel with glucose used to a lesser extent than in the early fasting state
RBC use of glucose for fuel	Remains the same	Remains the same

Microbiology High Yield

- ☞ **Know effect of diphtheria toxin**: diptheria toxin inhibits protein synthesis by ADP ribosylation of elongation factor 2, antitoxin Rx of choice, prevent with diphtheria toxoid immunization
- ☞ **Know effect of *Pseudomonas aeruginosa* toxin**: exotoxin A inhibits protein synthesis using same mechanism as diphtheria toxin (see above)
- ☞ ***Neisseria gonorrhoeae***: • see Gynecology notes and clinical discussion, • gram negative diplococcus, • endotoxin is lipo**oligo**saccharide (not lipo**poly**saccharide like *N. meningitidis*), • oxidase positive (contain cytochrome c), • chocolate agar (modified Thayer-Marten), • pili (attach to mucosal surfaces, resists phagocytosis by neutrophils, antigenic change responsible for repeated infections), • IgA protease (hydrolyzes secretory IgA to make it easier to stick to vagina and urethra), • capsule (protects against phagocytosis), • protein I (interferes with neutrophil degranulation and intracellular killing of bacteria), • sugar fermentation– glucose (*N. meningitidis* is maltose and glucose), • plasmid mediated penicillinase producing strains, • discharge in first week after sexual contact, • Rx– ceftriaxone or spectinomycin if allergic to penicillin
- ☞ ***Francisella tularensis***: • gram negative rod, • can survive in macrophages for prolonged periods, • antiphagocytic capsule, • vector (**ticks** using a wild rabbit reservoir), • transmission (cleaning animal hides [e.g., rabbits], arthropod bite, aerosol), •

ulceroglandular disease MC clinical presentation, • requires cysteine for growth, • Rx: streptomycin

- ***Campylobacter jejuni***: • comma/S-shaped gram negative rods, • ingestion of contaminated **poultry** (fowl are reservoir), milk, or water, decreased gastric acidity increases chance of infection, • grows at 42°C, • MCC bacterial gastroenteritis in United States, • some strains have enterotoxin similar to cholera (secretory type of diarrhea in this case), • bloody stools resembling ulcerative colitis, • association with Guillain-Barré syndrome (antibody against organisms cross-react with neurons), • Rx: erythromycin, • *C. fetus* causes septicemia
- **MCC of otitis media/sinusitis in children**: *Streptococcus pneumoniae*
- **MCC of otitis externa**: • *Pseudomonas aeruginosa*, • also cause of malignant otitis external in diabetics
- ***Hemophilus influenzae***: • gram negative coccobacillus, • requires factor X (hemin, blood) and V (NAD) for growth
- **Macrophages**: • multilobulated nucleus and have granules, • previous monocytes, • microglial cell macrophage of CNS and reservoir of HIV in CNS
- **Know NK cells**: see Inflammation notes
- **Know functions of interleukin-2**: see Inflammation notes
- **Clue cell**: *Gardnerella vaginalis* infection
- **Sporotrichosis**: • prick of thorn from rose, • prick from lobster spine (packed in sphagnum moss, which has organism)
- **Patient sticks himself with a knife and develops trismus**: tetanus
- **Rx of *Pneumocystis carinii* pneumonia in HIV**: trimethoprim-sulfamethoxazole
- **Picture of budding yeast with narrow based bud**: • *Cryptococcus neoformans*, • Rx with amphotericin
- **Rx of choice for *Chlamydia trachomatis***: doxycycline
- **Chocolate agar**: contains blood which supports growth of bacteria
- **Child with meningitis and picture of gram negative diplococcus**: • *Neisseria meningitidis*, • capsule prevents phagocytosis, • endotoxin (lipopolysaccharide) produces shock, • IgA protease degrades secretory IgA to allow adherence of organism to mucosa in posterior nasopharynx, • prevention– use vaccine, give rifampin to close contacts, • Rx patient with penicillin G
- **Normal microflora of nasopharynx**: • anaerobic bacteria (Peptostreptococcus, Fusobacterium, Bacteroides), • viridans group streptococci, • coagulase negative staphylococcus, • avirulent *Hemophilus* and *Neisseria meningitidis* species
- **Normal microflora of skin**: MC is coagulase negative staphylococcus, less commonly– *Staphylococcus aureus*, *Corynebacteria*, *Propionibacter* (important in acne), *Clostridium perfringens* (20% of healthy people), *Candida*, *Malassezia*
- **Picture of *Aspergillus***: look for narrow angled septate hyphae and fruiting body
- **Coccidioidomycosis**: • think Southwest, • arthrospores in dust
- **Recurrent vesicles around mouth and vermilion border of lips**: *Herpes simplex* I
- **Elderly man with painful vesicles in any dermatome**: *Herpes zoster* (shingles)
- **Review concept of complementation in defective (mutant) virus**: replication of another virus provides missing function required by the mutant virus
- **Initial defense against Salmonella in blood**: endotoxins released by bacteria activate the alternative complement system
- **Self-induced abortion**: cervical swab and put into anaerobic medium for *Clostridium*
- **Know bacterial reproduction types**

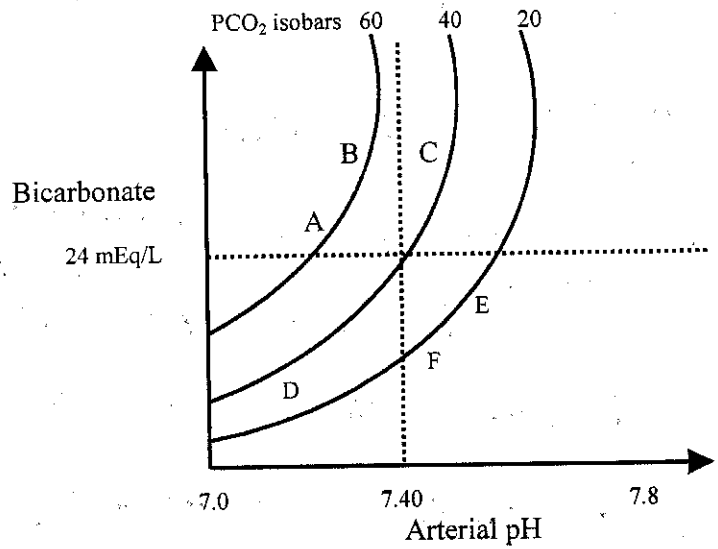
- **Know SCID, DiGeorge, Bruton's, IgA deficiency, Wiskott-Aldrich**: • SCID with adenosine deaminase deficiency– *SXR, *adenine buildup toxic to B and T cells, *accumulation of dATP, which inhibits ribonucleotide reductase with subsequent decrease in deoxynucleoside triphosphate precursors for DNA, *BM transplant helpful
- **Spirochetes in synovial fluid**: Lyme's disease due to *Borrelia burgdorferi*
- **Infertile woman with scarred fallopian tubes**: *Chlamydia trachomatis* MCC
- **J-K disease from brain instrument treated with formaldehyde**: prions
- **Coxsackie**: MCC of myocarditis (dilated cardiomyopathy with lymphocytes in biopsy) and pericarditis
- **Listeria**: • gram positive rod, • tumbling motility, • pregnant woman should not eat soft cheese
- **Wound infection**: gram positive cocci = *S. aureus*
- **Middle aged woman with meningitis**: *Streptococcus pneumoniae*– gram positive diplococcus
- **Patient with pneumonia has elevated ASO titer**: group A streptococcus
- **Gram positive rod resistant to heat**: *Bacillus anthrax*

Physiology High Yield

- **Know ADH functions well**: vasoconstrictor, increased factor VIII molecule synthesis, reabsorb free water
- **Know central and nephrogenic DI well**
- **Respiration changes with increasing altitude**: respiratory alkalosis, hypoxemia due to decreased atmospheric pressure not a decrease in % oxygen in air
- **Know effect of VIP and enkephalins on GI tract**: • VIP– relaxes smooth muscle, increases intestinal secretion, increases pancreatic secretion, • enkephalins (opiates)– contract smooth muscle, decrease intestinal secretion
- **Know PCO_2 dissociation curve**
- **Inhibin**: • synthesized in Sertoli cells in seminiferous tubules, • negative feedback with FSH
- **Calculations**: • alveolar ventilation– $PAO_2 = PiO_2 - PACO_2/R$, where PiO_2 equals % oxygen x 713) and R is the respiratory quotient that normally equals 0.8, subtract PaO_2 from PAO_2 and you have the A-a gradient, • Fick's equation for cardiac output– cardiac output mL/min = oxygen consumption ÷ oxygen in pulmonary vein - oxygen in pulmonary artery
- **Hormone increasing gastric secretion**: • gastrin, • hormones inhibiting acid secretion– secretin and gastric inhibitory peptide
- **Graph of autoregulation**
- **Must know how to calculate and interpret free water clearance**: see example in Fluids and Hemodynamics and in physiology high yields
- **Fetal circulation**: right to left shunt through the foramen ovale from blood returning via the inferior vena cava is normal in the fetus
- **Effect of increased total peripheral resistance on vascular function curve**: • same as the venous return curve, which depicts the relationship between venous return and right atrial pressure, • increasing TPR (vasoconstriction) decreases venous return to heart, decrease right atrial pressure, and decrease cardiac output– this causes a **counterclockwise rotation of the vascular function curve**, • decreasing TPR (vasodilation) causes a clockwise rotation of the curve– venous return increases, right atrial pressure increases, and cardiac output increases

- **hCG**: has luteinizing hormone activity, keeps corpus luteum of pregnancy synthesizing progesterone until 8–10 wks and then placenta takes over that function
- **Stimulation of histamine H_2 receptors:** increases secretion of acid by parietal cells
- **GI peptide injected into cerebrospinal fluid that increases appetite for carbohydrate**: somatostatin– this normally is made in hypothalamus where it functions to inhibit growth hormone, hence inhibiting GH causes hypoglycemia and the body would crave more carbohydrate to increase glucose levels
- **Atrial natriuretic peptide**: mediated by guanylate cyclase
- **Central diabetes insipidus**: injecting vasopressin causes an increase in urine concentration (POsm) and decrease in urine volume
- **Location of angiotensin converting enzyme**: • pulmonary capillaries, • increased in sarcoidosis, • non-competitive inhibition by ACE inhibitors
- **Vitamin D type in kidneys**: • 1,25 $(OH)_2D_3$, • kidney has 1α-hydroxylase in proximal tubules (PTH stimulates synthesis), • renal disease MCC of hypovitaminosis D
- Effect of thyroid hormone excess on bone: osteoporosis– increases bone turnover resulting in loss of bone mass
- **Primary site for temperature regulation**: • anterior hypothalamus, • fever is due to release of pyrogens stimulating IL-1 release from macrophages– *IL-1 increases synthesis of PGE_2 in the anterior hypothalamus, *PGE_2 raises the hypothalamic set-point (normal core temperature viewed as too low), hence anterior hypothalamic reactions of heat generation prevail, • heat generating mechanisms if core temperature is below set-point include– *increasing the release of thyroid hormones (increases metabolic rate), *vasoconstriction of skin vessels (sympathetic stimulation of α-receptors in smooth muscle), *sympathetic stimulation of β-receptors in brown fat (increases metabolic rate and heat production), *shivering (most effective system, center located in posterior hypothalamus, leads to activation of α and γ motoneurons innervating skeletal muscle), • heat dissipating mechanisms (coordinated in posterior hypothalamus) if core temperature is above set-point include– *reducing sympathetic tone (vasodilatation) of skin vessels leading to shunting of blood through venous plexus in the skin, *increased sympathetic activity of cholinergic fibers innervating sweat glands leading to sweating
- **Cause of decrease in jugular venous pulse on inspiration**: • decrease in lung compliance (e.g., sarcoidosis), • decreased volume of air in the alveoli leads to less compression of vessels in the interstitial tissue, hence they fill up better and drain blood off easier
- **Iron reabsorption in bowel**: • two types of iron in gut– *non-heme iron (plants, wheat grains), which has iron in ferric condition, *heme iron (meat products), which has iron in ferrous state, • iron is mainly absorbed in duodenum in ferrous state, • ferrous iron is bound to chelators to keep it soluble (gastric acid, ascorbic acid), • presence of carbonates, phytates, oxalates, phosphates combine with iron to form insoluble complexes that cannot be absorbed, • absorbed iron binds to **intracellular iron carrier** (key factor determining reabsorption of iron) that directs iron to following sites– *apoferritin (protein) in mucosal cells to form ferritin (micelles of iron carried as ferric hydroxyphosphate), *transferrin (binding protein of iron) in plasma, *mitochondria (very little), • less iron stores (iron deficiency) causes increased liver synthesis of transferrin which has a low saturation– more iron is directed to transferrin in plasma than to apoferritin to produce ferritin, • increased iron stores (e.g., iron overload disease) results in decreased liver synthesis of transferrin which is highly saturated– more iron is directed to apoferritin leading to an increase in mucosal ferritin, which is lost in the stool when mucosal cells are shed

- **Know ventricular volume curve and where different heart sounds are located**: e.g., S2 (closure of AV and PV)
- **Showed renal reabsorption curve**: usually asking for glucose
- **Destroy hypothalamus, what hormone increases**: prolactin– no dopamine to inhibit
- **Effect of carotid massage**: slows heart rate
- **Graph of pH, PCO_2, bicarbonate**: PCO_2 40 mm Hg is normal, bicarbonate 24 mEq/L is normal



• patient A– acute respiratory acidosis with very little bicarbonate compensation, • patient B– chronic respiratory acidosis where there is more compensation by increasing bicarbonate (metabolic alkalosis) and pH comes closer to normal range, • patient C– metabolic alkalosis where there is compensation by increasing PCO_2 (respiratory acidosis) • patient D– metabolic acidosis where there is compensation by decreasing PCO_2 (respiratory alkalosis), • patient E– acute respiratory alkalosis where there is very little drop in bicarbonate for compensation (metabolic acidosis), • patient F– chronic respiratory alkalosis where there is good compensation by dropping bicarbonate (metabolic acidosis) and pH is closer to normal