



	LECTURE 1	LECTURE 2	LECTURE 3
DAY 1	Day 1 Review Quiz Study Guide Pharmacokinetics FA p232 Study Guide Metabolism & Elimination FA p232 – p234, FA p50 Study Guide Autonomic Pharmacology FA p238 - p239 Study Guide Quick Quiz – Parasympathetic System Study Guide	Autonomic Nervous System FA p235, FA p237, FA p239 Study Guide Neurotransmission FA p236 – p237 Study Guide Quick Review Study Guide Autonomic Agents FA p238 Study Guide Sympathetic Nervous System FA p240 – p241 Quick Quiz – Sympathomimetics Study Guide Autonomic Drugs FA p242, FA p420 Glaucoma FA p241, FA p247, FA p420 – p421, FA p430, FA p499 Study Guide Quick Quiz – Drug Suffixes	Nerves of Upper Extremity FA p372, FA p374, FA p375 Study Guide Nerves of Upper Extremity Review Study Guide Rapid Review FA p335, FA p380, FA p518 – p519 End Session Quiz Study Guide
DAY 2	Bacteriology FA p136, FA p139, FA p147 Bacteriology High Yield Questions Study Guide Bacteriology FA p140 – p142 Study Guide Bacteriology High Yield Questions Study Guide Bacteriology High Yield Questions Study Guide Bacteriology FA p138 – 139, FA p142 – p143 Bacterial Basics Quick Quiz Study Guide Gram-positive Bacteriology FA p140, FA p144 – p146, FA p276 Study Guide Bacteriology FA p138 – p139, FA p146 – p148 Study Guide Bacteriology High Yield Questions Study Guide Bacteriology High Yield Questions Study Guide	Study Guide  Immunology FA p205 - p206 Study Guide Immunology High Yield Questions Study Guide Immunology FA p206 - p207, FA p209, FA p223, FA p223 Inflammation FA p221, p223 Immunology FA p200 - p204, p348 - p349, p209 Immune Response FA p208 - p209, FA p203, FA p216, FA p198, FA p393 Study Guide	Immune Response FA p210 – p212 Study Guide Immune Deficiencies FA p213 – p214 Study Guide Immunodeficiencies High Yield Questions FA p215 Study Guide Immunology Quiz Study Guide Rapid Review FA p372, FA p380, FA p520 Brachial Plexus FA p372 Study Guide
DAY 3	Day 3 Review Study Guide Bacteriology FA p144 Epidemiology FA p50 - p52 Study Guide Epidemiology High Yield Questions Study Guide Epidemiology FA p52 - p55 Study Guide Epidemiology High Yield Questions Study Guide Epidemiology High Yield Questions Study Guide Epidemiology FA p55 - p56	Ethics FA p57 - p59 Ethics High Yield Questions Study Guide Epidemiology & Ethics Quiz FA p51 - p52, FA p56 Study Guide Development FA p56, FA p59 - p60 Development High Yield Questions Study Guide Development FA p60 - p63 Study Guide Rapid Review FA p521	Penicillins FA p185 Study Guide Penicillins High Yield Questions Study Guide Cephalosporins FA p186 Study Guide Gram-negative Bacteria FA p186 – p187 Other Cell Wall Inhibitors Study Guide Antibiotics High Yield Questions Study Guide Antibiotics High Yield Questions Study Guide Gram-negative Bacteria FA p149 – p154 Study Guide Zoonotic Bacteria Study Guide Gram-negative Bacteria FA p154 Gram-negative High Yield Questions Study Guide Quick Quiz – Gram-negative Bacteria Study Guide Antibiotics, Part 2 FA p187 Study Guide Antibiotics High Yield Question Study Guide Antibiotics Part 2 FA p188 Antibiotics, Part 2 FA p188 – p190, FA p245 – p246 Study Guide

	1 -		
	Day 4 Review Quiz	Psychiatry Pathology	Rapid Review
	Study Guide	FA p445, FA p454	FA p522
	Psychology	Mania & Lithium High Yield Questions	Cranial Nerves
	FA p438 – p440	Study Guide	FA p415
	Psychology Quick Quiz	Psychiatry Pathology	Study Guide
	Study Guide	FA p445, FA p62, FA p454 – p455	Bacteria that do not Gram Stain
	Child Psych	Depression High Yield Questions	FA p148 – p149, FA p152 – p156,
	FA p441 – p442	Study Guide	FA p514
	Study Guide	Psychiatry Pathology	Quick Quiz
	Psychiatry	FA p446 – p447, FA p454	Study Guide
	FA p449	Anxiety Disorder High Yield Questions	Mycobacteria Agents
DAY	Psychiatry High Yield Questions	Study Guide	FA p190 – FA p191, FA p245
DAY 4	Study Guide	Psychiatry Pathology	Study Guide
	Psychiatry	FA p447 – p448	Quick Quiz
	FA p443 – p449	Somatoform & Personality Disorder	FA p245
	Study Guide Psychiatry High Yield Questions	High Yield Questions Study Guide	Study Guide
	Study Guide	Psychiatry Pathology	
	Psychiatry	FA p449 – p451	Anne
	FA p425, FA p435 – p436,	Substance Abuse High Yield	// //
	FA p443 – p444, FA p449, FA p453	Questions	/ / /
1	Schizophrenia High Yield Questions	Study Guide	//
	Study Guide		
	Psychiatry		
	FA p449		
	Day 5 Review Quiz	Embryology - Gastrointestinal System	Mycology
	FÁ p355	FA p130 - p131	FA p157 – p159
	Study Guide	Study Guide	Mycology High Yield Questions
	Embryology	Embryology – Urogenital System	Study Guide
	FA p118 – p126	FA 132 – p134, FA p485 – p486,	Antifungal Therapy
	Study Guide	FA p495,	FA p192 – p193
	Embryology Quick Quiz	Study Guide	Antifungal High Yield Questions
D 437 5	Study Guide	Congenital Pathology – High Yield	Study Guide
DAY 5	Congenital Pathology	Questions	Parasitology
	FA p89, FA p267 – p269	Study Guide	FA p160 – p161
	Study Guide	Neurology – Circle of Willis	Protozoa High Yield Questions
	Embryology Quick Quiz #2	FA p405, Study Guide	Study Guide
	Study Guide	Rapid Review	Parasitology
	Basic Embryology FA p126 – p130	FA p523, FA p277	FA p162 – p163
	Embryology Quick Quiz #		Helminths High Yield Questions Study Guide
	Study Guide		Study Guide
	Day 6 Review Quiz	Cardiovascular Physiology	Cardio Pathology
	Study Guide	FA p262	FA p269 – p 270, FA p282
	Cardiovascular Physiology	EKG Interpretation	Cardio Pathology High Yield Questions
	FA p254 – p257, FA p283  Cardiovascular Pharmacology	FA p262 – p264	Study Guide
		Study Guide	Cardio Pathology
	FA 257, FA 260, FA p284 – p286	Cardiac Physiology	FA p270
	Rapid Review	FA p264 - p266, FA p462	Cardio Pathology High Yield Questions
	FA p524, FA p 276,	Cardiac Physiology Quiz	Study Guide
	Cardiac Physiology Quiz	Study Guide	Cardio Pathology
	Study Guide	Cardiac Pathology	FA p270
		FA p269	Cardio Pathology High Yield Questions
		Cardiac High Yield Questions	Study Guide
		Study Guide	Cardio Pathology
		Cardiac Pathology	FA p271, FA p281
DAY 6		FA p280	Cardio Pathology High Yield Questions
		Study Guide	Study Guide
		Hypertension High Yield Questions	Cardio Pathology
		Study Guide	FA p272
		Cardiac Pathology	Study Guide
		FA p269	Cardio Pharmacology
			FA p273, FA p363 – p364  Cardio Pathology
			FA p273 – p274, FA p283
			Study Guide
			Cardio Pathology High Yield Questions
			Study Guide
			Pharmacology: Antidotes
			FA p243, FA p246
			Toxicology Quiz
			Study Guide
	Day 7 Review Quiz	Virology	Microbiology – HIV
	Study Guide	FA p164, FA p167, FA p172, FA p196	FA p173 – p174, FA p182, FA p194
	Heart Murmurs	Study Guide	FA p197
	FA 258 – p259	Microbiology Review by Systems	Study Guide
	Study Guide	Study Guide	HIV High Yield Questions
DAY-	Bacterial Endocarditis	Virology	Study Guide
DAY 7	FA p275	FA p168 – p171	Microbiology – HIV Therapy
	Cardiovascular Pathology	Study Guide	FA p197
	FA p273	Virology – RNA Viruses	Study Guide
	Study Guide	FA p169	Microbiology – Therapies
	Rapid Review FA p523	Virology FA p195	FA p197, FA p208
	Cardio Pathology Quiz	Study Guide	Microbiology – Quick Quiz
	J Gardio Fathology Wulz	I Study Guide	Study Guide

	Study Guide		Microbiology By Systems FA p139, FA p175 – p181 Study Guide Microbiology High Yield Questions Study Guide Microbiology By Systems FA p181 – p186 Microbiology High Yield Questions Study Guide Microbiology End Session Quiz Study Guide
DAY 8	Day 8 Review Quiz Study Guide Oncology FA p225 – p227, FA p491 Oncology – Oncogenes FA p227 – p230 Study Guide Basic Oncology Quiz Study Guide Cancer Drugs FA p364 – p368 Oncology Quiz FA p399 Study Guide	Musculoskeletal & Connective Tissue FA p222, FA p 367, FAp370 Study Guide Musculoskeletal & Connective Tissue High Yield Questions FA p371 Study Guide Musculoskeletal & Connective Tissue FA p372 - FA p373, FA p435 Musculoskeletal & Connective Tissue FI p374 - FA p375, FA p435 Musculoskeletal & Connective Tissue High Yield Questions Study Guide Musculoskeletal & Connective Tissue FA p378 - p379, FA p392 Musculoskeletal - Pathology FA p299, FA p379 - p380 Study Guide Musculoskeletal High Yield Questions Study Guide Musculoskeletal - Pathology FA p381 - p384, FA p387 - p388, FA p392 Study Guide Musculoskeletal High Yield Question Study Guide Musculoskeletal High Yield Question Study Guide Musculoskeletal High Yield Question	Musculoskeletal Pathology FA p384 – p387 Study Guide Musculoskeletal High Yield Questions Study Guide Musculoskeletal Pathology FA p387 Derm Pathology FA p276, FA p387 – p390 Study Guide Derm High Yield Questions Study Guide Rapid Review FA p526 Derm Pathology FA p276, FA p387 – p390 Study Guide Connective/Musculoskeletal Quiz Study Guide
DAY 9	Day 9 Review Quiz Study Guide Endocrine Basics Study Guide Pituitary Gland FA p30, FA p288, FA p290, FA p294 – p295 Study Guide Pituitary – High Yield Questions Study Guide PTH and Calcium FA p293 – p294, FA p299 Study Guide PTH and Calcium High Yield Questions Study Guide PTH and Calcium High Yield Questions Study Guide PTH and Calcium FA p299 Calcium Quiz Study Guide Thyroid Gland FA p295, FA p297 – p298, FA p305 Study Guide Thyroid – High Yield Questions Study Guide	Study Guide  Endocrinology – Adrenals FA p288, FA p291 Steroid Synthesis Study Guide Adrenal Pathology and Therapy FA p292, FA p296 – p297, FA p303 FA 305 Rapid Review FA p527 Endocrinology – Pancreas & DM FA p104, FA p280, FA p289, FA p301 – p302 Study Guide Diabetes Therapy FA p304 Endocrinology – High Yield Questions Study Guide Endocrinology – Pathology FA p300, FA p302 Study Guide Neuro Review – Wallenberg's Syndrome FA p405 Study Guide Endocrinology Quiz	Molecular Biology FA p66 – p68, Study Guide Biochemistry High Yield Questions Study Guide Molecular Biochemistry FA p69, Study Guide Molecular Biochemistry FA p70, Study Guide Molecular Biochemistry FA p7 p70, Study Guide Molecular Biochemistry FA pg 71 – p75, FA p79, Study Guide Biochemistry Quick Quiz Study Guide Pharmacology FA p102, FA p244 – p245, FA p262, FA p494 Pharmacology Quick Quiz Study Guide, FA p244
DAY 10	Day 10 Review Quiz Study Guide Female Reproduction – Part 1 FA p89, FA p246, FA p478, FA p482 – p483 Menstrual Cycle Study Guide Reproductive Physiology FA p482, FA p484 – p485, FA p489, FA p498 Contraception Study Guide Reproductive Pathology FA p488 – p489, FA p492, FA p497 – p499 Uterine Pathology Study Guide, FA p490 – p491, FA p498 Ovarian Tumor Quiz Study Guide	Study Guide  Pregnancy Pathology FA p132, FA p487 – p488 Study Guide  Pregnancy Pathology High Yield Questions Study Guide  Breast Pathology FA p492 – p495, FA p498 p499 Female Reproduction Quiz Study Guide Neuro Cavernous Sinus FA p418, FA p421 – p422, FA p528	Genetics FA p81 Gel Electrophoresis Study Guide Genetics FA p81, FA p83 – p84 Modules of Inheritance FA p85 Pedigrees Study Guide Genetics FA p379, FA p472 Genetics Worksheet Study Guide Genetics FA p87 Cystic Fibrosis Study Guide Biochemistry: Metabolism FA p111 Lysosomal Storage Diseases Study Guide Genetics

			FA p87 – p89, Image FA pI-25 <b>Genetics Quiz</b> Study Guide
DAY 11	Day 11 Review Quiz Study Guide  Male Reproduction FA p133, FA p479 – p482, FA p495, FA p497 – p499  Male Reproduction High Yield Question Study Guide Male Reproductive Pathology FA p494 – p496 Study Guide Male Reproduction High Yield Questions Study Guide Male Reproduction FA p496 Male Reproduction FA p496 Male Reproduction Quiz Study Guide Toxicology FA p244 – p245 Toxicology Quiz FA p245 Study Guide Rapid Review FA p529	Cell Biology FA p76 p77, F p364 Study Guide Cell Biology High Yield Questions Study guide Cell Biology FA p78, Study Guide, FA p 391 Arachidonic Acid Pathway Study Guide Cell Biology FA p79, FA p236, FA p283, FA p294, Study Guide Inflammation FA p79 p80, FA p220 p223, Study Guide Cell Biology Quiz Study Guide	Neurology Anatomy and Physiology FA p396 – p398 Study Guide Hypothalamus High Yield Questions Study Guide Neurology Anatomy and Physiology FA p398 – p399 Thalamus High Yield Questions Study Guide Neurology Anatomy and Physiology Study Guide Neurology Anatomy and Physiology FA p399 Cerebellum High Yield Questions Study Guide Neurology Anatomy and Physiology FA p399 – p404, FA p415, FA p435 – p436 Study Guide Neurology High Yield Questions Study Guide Neurology High Yield Questions Study Guide Neurology Pathology FA p3 428 Brain Tumor High Yield Questions Study Guide
DAY 12	Day 12 Review Quiz Study Guide Test Taking Hints Study Guide Circle of Willis FA p405 Study Guide Brain Occlusion FA p405 Study Guide Neurology Pathology FA p405 – p408 Study Guide Spinal Nerves FA p408 – p409 Study Guide Neurology Pathology FA p409 – p412, FA p425 Study Guide Neurology Lesions Quiz Study Guide Neurology Lesions Quiz Study Guide Neurology Physiology FA p413 – p414	Neurology – Brain Stem FA p415 Study Guide Neurology – Cranial Nerves FA p416-419 Study Guide Cranial Nerve Quiz FA p416 Study Guide Peripheral Nerve Quiz Study Guide Neurology – Eyes and Ears FA p420 – p422 Neurology – Pupillary Light Reflex FA p424 Study Guide Neurology – Pathology FA p423, FA p425 – p426, FA p431 Study Guide Neurology – Anti-Seizure Meds FA p431 – p433 Study Guide Neurology – Pathology FA p427, FA p429, FA p436 Study Guide Neuro Pathology Guide Neuro Pathology Study Guide Neuro Pathology Quiz	Neurology Pharmacology FA p430, FA p433 – p436 Neurology Pharmacology Quiz Study Guide Biochemistry: Metabolism FA p95, FA p289 Study Guide Metabolism High Yield Questions Study Guide Biochemistry: Metabolism FA p99 Metabolism High Yield Questions Study Guide Biochemistry: Metabolism FA p99 Metabolism High Yield Questions Study Guide Biochemistry: Metabolism FA p94, FA p99 – p104 Study Guide Fuel Usage Study Guide Biochemistry: Metabolism FA p113 – p114 End Session Quiz Study Guide
DAY 13	Day 13 Review Quiz Study Guide Respiratory Anatomy FA p131, FA p502 — p504 Respiratory Anatomy Quiz Study Guide Respiratory Physiology FA p504 Respiratory Physiology Questions Study Guide Respiratory Physiology FA p505 — p507 Respiratory Physiology Questions Study Guide Respiratory Physiology FA p507 — p509, FA p516 Study Guide Rapid Review FA p530 — p532	Study Guide  Respiratory Pathology FA p510 Study Guide Respiratory Pathology High Yield Questions Study Guide Respiratory Pathology FA p510, FA p512 Respiratory Pathology High Yield Question Study Guide Respiratory Pathology FA p510, FA p515 Respiratory Pathology FA p510, FA p515 Respiratory Pathology High Yield Questions Study Guide Respiratory Pathology FA p514 Study Guide Respiratory Pathology FA p510 – p512 Study Guide Respiratory Pathology High Yield Questions Study Guide Respiratory Pathology High Yield Questions Study Guide Respiratory Pathology FA p512 – p513 Respiratory Pathology High Yield Questions Study Guide	Biochemistry: Proteins and Fats FA pg 104, FA p106p108 Biochemistry Review Study Guide Biochemistry: Metabolism FA p95 - p96, FA p105, FA p112, FA p114 p115 Study Guide End of Session Quiz: Biochem Study Guide Immunosuppressants FA p215 - p216, Study Guide Immunosuppressants Review Study Guide

		Respiratory Pathology	
		FA p514	
	,	Pneumonia Quiz	
		Study Guide	
		Respiratory Pathology	
		FA p514, FA p516	
		Study Guide	
		End Session Quiz: Respiratory	
		Study Guide	
	Day 14 Review Quiz	Gl Pathology	GI Pathology
	Study Guide	FA p322 - p325, FA p327, FA p389	FA p330
	GI Anatomy	Gl Pathology High Yield Questions	Hepatic Pathology
	FA p308, FA p310 – p313,	Study Guide	Study Guide
	FA p320 – p321, FA p333	Gl Pathology	Gl Pathology
	GI Pathology		
		FA p326 – p328, FA p338 – p339,	FA p331
	Study Guide	FA p393	Hepatic Pathology
	GI Anatomy	Gl Pathology High Yield Questions	FA p331 – p332
	FA p 314 – p317, FA p319,	Study Guide	Study Guide
	FA p321, FA p337 – p338	Gl Pathology	Gl Pathology
	Gl Physiology	FA p329 - p330, FA p339	FA p333 - p334
	FA p320		GI Pathology High Yield Questions
	GI Quiz		Study Guide
DAY 14	Study Guide		Gl Pathology
	Olday Guide		
			FA p335 – p336, FA p339
			Gl Pathology Quiz
			Study Guide
			Vitamins
			FA p90
			Water Soluble Vitamins
			Study Guide
			Fat Soluble Vitamins
			Study Guide
			Vitamin Quiz
			FA p94
			Study Guide
	Day 15 Review Quiz	Renal Physiology	Hematology
	Study Guide	FA p465	FA p342 – p347, FA p362 – p363
	Renal Anatomy	Renal Physiology High Yield Questions	Study Guide
	FA p458 – p460, FA p462 – p463	Study Guide	Hematology Questions
	Renal Anatomy & Physiology High	Renal Physiology	Study Guide
	Yield Questions	FA p465 p466	Hematology Pathology
	Study Guide	Renal High Yield Questions	FA p348 – p349
	Renal Physiology	Study Guide	
	FA p460 – p461	Renal Quiz	Hematology High Yield Questions
			Study Guide
	Renal Physiology High Yield Questions	Study Guide	Hematology Pathology
	Study Guide	Renal Pathology	FA p348 – p354
DAY 15	Renal Physiology	FA p466 – p468	Hematology High Yield Questions
	FA p462	Renal Pathology High Yield Questions	Study Guide
	Nephron Physiology	Study Guide	Hematology
	Study Guide	Renal Pathology	FA p353 – p356
	Renal Physiology	FA p469 – p471	Study Guide
	1	Renal Pathology High Yield Questions	Hematology High Yield Questions
	FΔ p464		i meniatology migh field Questions
	FA p464		
	Renal Physiology – High Yield	Study Guide	Study Guide
	Renal Physiology – High Yield Questions	Study Guide Renal Pathology	Study Guide Hematology Pathology
	Renal Physiology – High Yield Questions Study Guide	Study Guide Renal Pathology FA p472	Study Guide
	Renal Physiology – High Yield Questions Study Guide Renal Physiology	Study Guide Renal Pathology FA p472 Renal Pathology Quiz	Study Guide Hematology Pathology
	Renal Physiology – High Yield Questions Study Guide	Study Guide Renal Pathology FA p472	Study Guide Hematology Pathology FA p356 – p360

# <u>Doctors In Training: USMLE Step 1 Review – Day 1 Review Quiz</u>

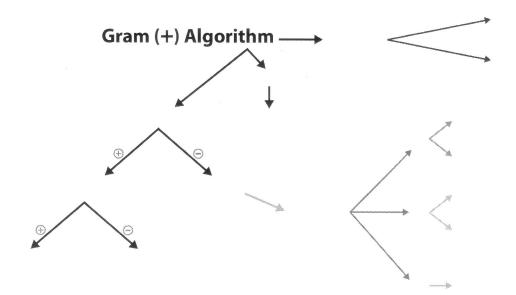
1.	Disease Cushing's syndrome- Conn's syndrome- Addison's disease- Graves' disease
2.	What is the function of MacConkey's agar? (FA p138)
3.	What 5 classes of medications are used to treat glaucoma? (FA p430)
4.	Your patient has facial angiofibroma, ash-leaf spots of skin depigmentation, history of seizures, and mental retardation. What condition does this patient have? What neoplasms is this patient at risk of developing? (FA p227)
5.	What is the cause of achalasia? How is achalasia diagnosed? (FA p322)
6.	Compare the leading causes of death in ages 15-24 to those in ages 25-64? (FA p56)
7.	<ul> <li>In which glomerular disease would you expect to see the following changes? (FA p467 – FA p468)</li> <li>Anti-GBM antibodies (immunofluorescence)</li> <li>Kimmelstiel-Wilson lesions (light microscope)</li> <li>"Spike and dome" appearance (electron microscope)</li> <li>"Tram track" of subendothelial humps (electron microscope)</li> <li>Subepithelial humps (electron microscope)</li> </ul>
8.	What are the clinical uses for metronidazole? (FA p190)
9.	What are the 2 most common complications after an MI? (FA p272) What is Dressler's syndrome? (FA p272)
10.	What is the cause of Chronic granulomatous disease? What are the consequences of Chronic granulomatous disease? (FA p214)
11.	What is the WAGR complex? (FA p469)

1.	Place the following agents in the appropriate categories: (FA p238 – FA p242) norepinephrine, metoprolol, timolol, scopolamine, phenoxybenzamine, bethanechol, isoproterenol, donepezil, prazosin, atropine, propranolol, labetalol, hexamethonium, atenolol, terbutaline, dopamine, pilocarpine, carbachol, edrophonium, phenylephrine, glycopyrrolate, phentolamine, neostigmine, benztropine, terazosin, pralidoxime, echothiophate, ipratropium, epinephrine, esmolol, oxybutynin		
	Direct cholinergic agonists:	Indirect cholinergic agonists (anti-acetylcholinesterases):	
	Cholinergic antagonists:	Nicotinic antagonist:	
		Cholinesterase regenerator:	
	Sympathomimetics $\alpha_1 \alpha_2 \beta_1 \beta_2$ agonist- $\alpha_1 \alpha_2 \beta_1$ agonist- $D_1 = D_2 > \beta_1 > \alpha_1$ agonist- $\beta_1 = \beta_2$ agonist- $\beta_1 > \beta_2$ agonist-	<u>α-blockers:</u>	
	$\alpha_1 > \alpha_2$ agonist-	<u>β-blockers:</u> Nonselective ( $β_2 = β_1$ ):	
		$\beta_1$ selective:	
2.	What are the 4 important pharmacokinetic equations? (Fa	A p232)	
3.	What agents stimulate the release of NE from the presyn NE by inhibiting its reuptake into the presynaptic cell from		
4.	What are the 5 classes of drugs used to treat glaucoma?	(FA p430)	
5.	<ul> <li>What pathology fits the following high-yield phrase? (FA)</li> <li>Gout + mental retardation + lip-biting</li> <li>Hypertension + hypokalemia + metabolic alkalosis</li> <li>Fever + night sweats + weight loss</li> <li>Adrenal hemorrhage due to meningococcemia</li> <li>Blue sclera</li> <li>C's of Huntington's disease</li> </ul>	p518, FA p519)	
6.	<ul> <li>What nerve is damaged when a patient presents with the</li> <li>Scapular winging</li> <li>Loss of forearm pronation</li> <li>Cannot abduct or adduct fingers</li> <li>Weak lateral rotation of arm</li> <li>Unable to abduct arm beyond 10 degrees</li> </ul>	following symptom (upper extremity)? (FA p374)	
	Co	pyright © 2011, All Rights Reserved, Doctors In Training.com, LLC	

<u>Doctors In Training.com: USMLE Step 1 Review – Day 2 Review Quiz</u>

### Doctors In Training.com: USMLE Step 1 Review - Day 3 Review Quiz

- 1. What pathology fits the following high-yield statement? (FA p518 FA p520)
  - Opacities seen on x-ray on both sides of the carina
  - · Dermatitis, diarrhea, dementia, possibly death
  - Greenish rings around the periphery of the iris
  - Hyperphagia, hypersexuality, hyperorality, hyperdocality
  - Nystagmus, intention tremor, scanning speech
  - Lower extremity purpura, arthalgias, renal disease
- 2. What immunopathology matches the following statements?
  - Antimitochondrial antibodies
  - · Antiplatelet antibodies
  - · Newborn with chronic diarrhea, failure to thrive and chronic Candida
  - Child with eczema, course facial features, and cold abscesses
  - · Child with partial albinism, peripheral neuropathy, and recurrent infections
- 3. Which alpha adrenergic antagonists are used in the treatment of pheochromocytoma? (FA p241)
- 4. What is the clinical use for the following antimuscarinic drug(s)? (FA p239)
  - Ipratroprium
  - Atropine, homatropine, tropicamide
  - Benztropine
  - Scopolamine
- 5. In which order of elimination (zero or first) would you see a <u>linear</u> decrease in the plasma concentration of a substance when plotted against time? (FA p233)
- 6. Which 2 bacteria are well known for being obligate intracellular bacteria? Why can't these bacteria replicate extracellularly? (FA p139)
- 7. Which bacteria are known for forming spores? (FA p147)



Doctors In Training.com: USMLE Step 1 Review - Day 4 Review Quiz

1.	What are 5 examples of encapsulated bacteria? What test can be used to detect encapsulated bacteria? (FA p139)
2.	What is the drug of choice for anaphylactic shock? Cardiogenic shock? Septic shock? (FA p240)
3.	Distinguish the following types of organ transplant rejection.  Mechanism  Hyperacute rejection  Acute rejection  Chronic rejection
4.	Which antibiotics are used for narrow-spectrum anaerobic coverage? (FA p188, FA p190)
5.	What portion of the brachial plexus is injured in Erb-Duchenne Palsy? What are the symptoms? (FA p375)
6.	Epinephrine and NE exert their effects by binding to adrenergic receptors. Which adrenergic receptor dominates in the following tissue? What effects are mediated by these receptors in these tissues? (FA p235)  Vascular smooth muscle Renal vasculature Heart Pulmonary bronchioles Presynaptic neurons Pupillary sphincter Kidney JG cells G-cells of pancreas  α-cells of pancreas Liver
7.	<ul> <li>What high-yield path fits the following statement? (FA p520 – FA p521)</li> <li>Elastic skin, joint hypermobility</li> <li>Enlarged, hard, left supraclavicular lymph node</li> <li>Large "bull's eye" rash</li> <li>Strawberry tongue</li> <li>Resting tremor, rigidity</li> <li>Rash on palms and soles</li> </ul>
8.	Which cytokines are secreted by the two different types of helper T cells? (FA p208)
9.	What are the 3 different G proteins and what are their downstream effects? Which receptors use these G proteins? (FA p236)
10.	What drug category has the following ending? (FA p247)  -ane -azine -conazole -tidine -tropin -chol -chol -bendazole  Copyright © 2011, All Rights Reserved, Doctors In Training.com, LLC

## Doctors In Training.com: USMLE Step 1 Review - Day 5 Review Quiz

 Categorize the following antidepressants as either a SSRI, TCA, MAOI, NDRI, or SNRI. (FA p455 – FA p456)

nortriptyline, selegiline, bupropion, mirtazapine, fluvoxamine, doxepin, phenelzine, fluoxetine, clomipramine, imipramine, amitriptyline, milnacipran, desipramine, sertraline, venlafaxine, paroxetine, tranylcypromine, duloxetine, citalopram, desvenlafaxine, trazodone

SSRI -

NDRI -

SNRI -

TCA -

MAOI -

Tetracyclic -

- 2. How does the drug dose response curve change with the addition of a competitive antagonist compared to a noncompetitive antagonist? (FA p234)
- 3. What pathology is associated with the following high-yield phrase? (FA p518 FA p522)
  - "Worst headache of my life"
  - Waxy casts in urine
  - Neuropathy + AV nodal block
  - Port-wine stain in the ophthalmic division of the trigeminal nerve
  - · Urethritis, conjunctivitis, arthritis
  - Lack of GpIIb/IIIa → defect in platelets → prolonged bleeding
  - Painless jaundice
- 4. What nerve is most at risk of injury with the following types of fractures/injury? (FA p374)
  - Shaft of the humerus
  - · Surgical neck of the humerus
  - · Supracondyle of the humerus
  - Medial epicondyle
  - Anterior shoulder dislocation
  - Injury to the carpal tunnel
- 5. What are the phagocyte immunodeficiencies? What are the X-linked immunodeficiencies? (FA p214)
- 6. What personality disorder fits the following statement? (FA p447-448)
  - Excessive need to be taken care of, submissive and clinging behavior
  - Low self-confidence, fears of separation and losing support
  - · Grandiosity, feels he is entitled to things, lack of empathy
  - Suicide attempts (→ 15% mortality), unstable mood and behavior
  - Sense of emptiness and loneliness, impulsiveness
  - Odd appearance, thoughts, and behavior; no psychosis; social awkwardness
  - Controlling, perfectionistic, orderly, stubborn, indecisive
  - Criminality, unable to conform to social norms, disregard for others' rights
- 7. A small study of USMLE test takers for a particular school revealed scores of 225, 225, 225, 229, 230, 240, and 250 with the average score being 232. What is the mean, median, and mode for these values? Would this create a positively skewed curve or a negatively skewed curve? (FA p53)
- 8. To what immune cell does the following cell surface protein belong? (FA p209)
  - CD4

CD19

CD14

• CD3

CD16

- CD8
- 9. What are some of the main distinguishing features in autistic disorder, Rett's disorder, and Asperger's syndrome? (FA p442)

# <u>Doctors In Training.com: USMLE Step 1 Review – Day 6 Review Quiz</u>

1. What heart defect is a/w the following disorder? (FA p269)

• Chromosome 22q11 deletions

	<ul> <li>Down syndrome</li> <li>Congenital rubella</li> <li>Turner's syndrome</li> <li>Marfan's syndrome</li> </ul>
2.	<ul> <li>What cranial nerves innervate the tongue in the following ways? (FA p129)</li> <li>Taste in the anterior 2/3</li> <li>Taste in posterior 1/3 (main innervater)</li> <li>Motor</li> <li>Sensation in the anterior 2/3</li> <li>Sensation in the posterior 1/3</li> </ul>
3.	<ul> <li>What pathology fits the following phrase? (FA p518 – FA p526)</li> <li>Antiplatelet antibodies</li> <li>Bamboo spine on X-ray</li> <li>Anti-histone antibodies</li> <li>Webbed neck, short stature</li> <li>Painful, raised lesions on palms + fever</li> <li>Dry eyes, dry mouth, arthritis</li> </ul>
4.	Assuming a normal Gaussian distribution for the results of a particular test, an average value of 35, and SD of 4, what percentage of people will be in the interval between 31 and 43? (FA p53)
5.	What conditions are a/w an elevated ESR (erythrocyte sedimentation rate) (FA p223)?
3.	What are the toxic side effects of tricyclic antidepressant use? (FA p455)
7.	What anti-seizure drugs are also used to treat bipolar disorder? (FA p431)
3.	For which organisms can the following antibiotic classes be used? (FA p186, FA p188)  tetracyclines  macrolides  2 <sup>nd</sup> gen. cephalosporins
9.	What are the symptoms of organophosphate poisoning? What are the symptoms of atropine overdose? (FA p238 $-$ FA p239)
10.	What brain structure is responsible for extraocular movements during REM sleep? (FA p62)
	Copyright © 2011, All Rights Reserved, Doctors In Training.com, LLC

### Doctors In Training.com: USMLE Step 1 Review - Day 7 Review Quiz

- 1. What are the side effects of amiodarone? (FA p285)
- 2. What protozoal/helminth matches the following statement? (FA p160 FA p163)
  - · Contracted by eating undercooked fish and causes an inflammation of the biliary tract
  - Most common protozoal infection in US
  - · Cause of Chagas' disease
  - · Most common helminthic infection in the US
  - Snail host, "swimmers itch"
  - Diarrhea in campers and hikers
  - Transmitted in raw meat or infected cat feces
- 3. What pathology fits the following high-yield phrase?
  - · Thyroid cells with optically clear nuclei
  - Anemia with hypersegmented neutrophils
  - Branching rods on oral infection
  - Eczema + recurrent infections + thrombocytopenia
  - Hemosiderinuria + thrombosis
  - Dermatitis, dementia, diarrhea, (death)
- 4. What medication is used to treat the following parasitic infection? (FA p160 FA p163)
  - Trichomonas or Gardnerella
  - Plasmodium vivax or ovale
  - Hookworm, pinworm, roundworm
  - Pediculosis capitis or pubis
- 5. What are the positive symptoms of schizophrenia? What are the negative symptoms of schizophrenia? (FA p444)
- 6. What immunodeficiency matches the following statement? (FA p213-214)
  - Neutrophils fail to respond to chemotactic stimuli
  - Adenosine deaminase deficiency
  - Failure of endodermal development
  - Defective tyrosine kinase gene
  - Associated with high levels of IgE
- 7. What organism is associated with the following statement? (FA p154)
  - Cat scratch
  - Dog/cat bite
  - Cat feces
  - Puppy feces
  - Animal urine
- 8. Name 7 teratogens (FA p120)
- 9. Which lipid-lowering agent matches the following description? (FA p282)
  - SE: facial flushing
  - SE: elevated LFTs, myositis
  - SE: GI discomfort, bad taste
  - · Best effect on HDL
  - Best effect on triglycerides/VLDL
  - · Best effect on LDL/cholesterol
  - Binds C. diff. toxin

# <u>Doctors In Training.com: USMLE Step 1 Review – Day 8 Review Quiz</u>

1.	What type of vaccine uses a live virus that has lost its virulence? What are some examples of live virus vaccines? (FA p164)
2.	Which HIV medications cause pancreatitis? Which cause rash? Which cause peripheral neuropathy and lactic acidosis? (FA p197)
3.	<ul> <li>Which type of vasculitis fits the following description? (FA p278 – FA p279)</li> <li>Necrotizing granulomas of lung and necrotizing glomerulonephritis</li> <li>Necrotizing immune complex inflammation of visceral/renal vessels</li> <li>Young Asian women</li> <li>Young asthmatics</li> <li>Infants and young children; involved coronary arteries</li> <li>Most common vasculitis</li> <li>A/w hepatitis B infection</li> </ul>
4.	<ul> <li>What pathology matches the following statements?</li> <li>Antiepithelial cell antibodies</li> <li>Anti-basement membrane</li> <li>Cough, conjunctivitis, coryza, fever</li> <li>Councilman bodies</li> <li>Green/yellow pigment just within the corneoscleral margin</li> <li>Anticentromere antibodies</li> <li>Dementia + eosinophilic inclusions in neurons</li> <li>Anti-ds-DNA antibodies (ANA antibodies)</li> </ul>
5.	What type of antipsychotic is often the first line of treatment for psychosis? Which antipsychotic should be reserved for severe, refractory cases because of agranulocytosis? (FA p453)
6.	What part of the viral life cycle is blocked by amantadine? By acyclovir? (FA p195-196)
7.	Name 8 different indirect cholinergic agonists and state the use for each. (FA p238)
8.	In which causes of vaginal discharge/vaginitis will the pH be high? In which will the pH be low? (FA p181, handout)
9.	What are the different causes of post-op fever? (FA p178, handout)
10.	Which antibiotics are safe during pregnancy? (FA p196, FA p120, handout)  Copyright © 2011, All Rights Reserved, Doctors In Training.com, LLC

Doctors In Training.com: USMLE Step 1 Review - Day 9 Review Quiz 1. What portion of the thalamus relays the following information? (FA p399) Somatosensory from body (via medial lemniscus and spinothalamic) Cerebellum (dentate nucleus) and basal ganglia → motor cortex Trigeminothalamic and taste pathways to somatosensory cortex Mamillothalamic tract → cingulate gyrus (part of Papez circuit) Integration of visual, auditory, and somesthetic input Memory loss results if destroyed (Auditory info) brachium of inferior colliculus → primary auditory cortex Which tumor marker would you use to follow the following cancer? (FA p228) Hepatocellular carcinoma (Hep B and C patients) Ovarian cancer Pancreatic cancer Melanoma Colon cancer Astrocytoma 3. A 70-year-old patient of yours comes down with pneumonia. What organisms would you suspect? (FA p176) 4. What is the mechanism of action of the drug disulfiram? Why would this drug make you feel terrible when taken when taken with alcohol? What other drugs have a disulfiram-like reaction? (FA p94) 5. What is the mechanism of action of the following drug categories? (FA p197) Protease inhibitors Nucleoside reverse transcriptase inhibitors Non-nucleoside reverse transcriptase inhibitors Fusion inhibitors 6. What are the common circumstances when passive immunity is required? (FA p209) 7. What nerve is damaged when a patient presents with the following symptom(s) (upper extremity)? (FA p374) Loss of forearm pronation Loss of arm and forearm flexion Trouble initiating arm abduction Unable to raise arm above horizontal What problem / abnormality is a/w the following buzzwords? Boot-shaped heart Continuous machine-like murmur Tendon xanthomas Subluxation of lenses Café-au-lait spots Tuft of hair on lower back 9. What adult cell types arise from neural crest cells? (FA p119)

10. Metastasis to the brain, liver, and bone commonly come from which locations? (FA p230)

Liver

Brain

- 11. How does conversion disorder differ from somatization disorder? (FA p447)
- 12. What reactions are catalyzed by cytochrome P450? (FA p191 FA 193, FA p 245)
- 13. To what class of medication does the following drug belong?
  - Primaquine
  - Saquinavir
  - Betaxolol
  - Prazosin
  - Thiopental
  - Tranylcypromine
  - Sertraline

- Temazepam
- Desipramine
- Captopril
- Busulfan
- Mortifloxacin
- Zanamivir
- Miconazole
- 14. Which antibiotic fits the following description? (FA p185 FA p191)
  - · SE: teeth discoloration
  - SE: tendonitis
  - SE: red man syndrome
  - SE: gray baby syndrome
  - SE: cartilage damage in children
  - SE: nephrotoxicity (esp. with cephalosporins), ototoxicity (esp. with loop diuretics)
  - SE: pseudomembranous colitis
  - · Drug of choice for gonorrhea
  - · Drug class for Lyme disease or Rocky Mountain spotted fever
  - · Used to treat Giardia lamblia
  - Can be used to treat MRSA as well as C. diff colitis
  - Treatment for G(-) rods in pts with renal insufficiency
  - BIG GUN (effective v. G(+)cocci, G(-)rods, and anaerobes)
  - Prophylaxis in AIDS pts against P. jiroveci pneumonia
  - Used as solo prophylaxis against TB

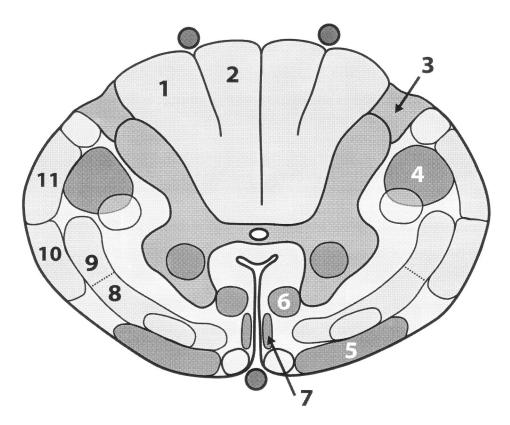
## 15. Complete the following chart of developmental milestones (FA p60)

3m	gross motor rolls over	verbal •	fine motor hands together	self-care
6m	•	•	•	•
12m	•	1-3 words	•	drinks from cup
15m	walk backward, run	•	•	•
18m	•	•	4 cube tower	•
2y	jump up	half understandable	•	washes/dries hands
3у	•	•	•	•
4y	•		•	
5y			copies square	

# <u>Doctors In Training.com: USMLE Step 1 Review – Day 10 Review Quiz</u>

1.	Where can you find nicotinic acetylcholine receptors in the body? (FA p235)
2.	What are the functions of interleukins 1-5? (FA p208)
3.	What changes in sleep patterns and sexual anatomy are seen in the elderly? (FA p61)
4.	What is the main difference between delirium and dementia? Which is more commonly reversible? (FA p443)
5.	What are the layers of the epidermis? (FA p370)
6.	Where would you expect to find B cells and T cells in the spleen? In the lymph nodes? (FA p200)
7.	What structures arise from the paramesonephric ducts? (FA p133)
8.	<ul> <li>Which defense mechanism fits the following description? (FA p440)</li> <li>Involuntary withholding of a feeling from conscience awareness</li> <li>A veteran that can describe horrific war details without any emotion</li> <li>A child abuser was himself abused as a child</li> <li>Underlies all other defense mechanisms</li> <li>May lead to multiple personalities</li> <li>Adult whining, bedwetting, crying</li> </ul>
9.	What is the basic equation for cardiac output? What is the Fick principle? (FA p254)
10.	Describe the flow of ions during a pacemaker action potential. (FA p261)

- 11. What are 4 types of epithelial cell junctions? What are 4 proteins involved in non-epithelial adhesion mechanisms? (FA p370)
- 12. Label the following spinal cord cross section.



- 13. What pathology fits the following statement?
  - Psammoma bodies (FA p230)
  - Posterior cervical adenopathy
  - Lytic bone lesions on x-ray
  - Thyroid-like appearance of the kidney
  - Low serum ceruloplasmin
- 14. To what drug category does the following drug belong?
  - Azathioprine
  - Probenecid
  - Primaquine
  - Cefprozil
  - Lamivudine
  - Tobramycin
  - Losartan
  - Indinavir

- 6-mercaptopurine
- Rofecoxib
- Carmustine
- Doxycycline
- Timolol
- Methotrexate
- Cimetidine
- Mefloquine
- 15. What is the mechanism of action of N-acetylcysteine when given as an antidote for acetaminophen overdose? (FA p392)

11.	What are the different mechanisms by which heart contractility can be increased? (FA p255)
12.	What pathology fits the following description?  Smudge cell  Port-wine stain in ophthalmic division of trigeminal nerve  S3 heart sound  Cardiac tumor in child with tuberous sclerosis  Adrenal hemorrhage a/w meningococcemia  Ferruginous bodies  Subepithelial humps on EM  Myocyte disarray  Currant jelly stool  Sacroilitis  Adverse reaction from mixing succinylcholine with inhaled anesthetics
13.	Which antihypertensive drug fits the following side effect? (FA p280)  First dose orthostatic hypotension  Hypertrichosis  Cyanide toxicity  Dry mouth, sedation, severe rebound HTN  Bradycardia, impotence, asthma exacerbation  Reflex tachycardia  Metabolic alkalosis  Elevated anti-histone antibodies  Hypercalcemia
14.	Which cancer(s) is a/w the following tumor marker? (FA p228)  PSA AFP ShCG CA-125 Elevated alk. phos.
15.	Study X shows that vitamin C can prevent Coronavirus infections, but 10 other studies show no benefit. What type of error is found in study X? (FA p54)
16.	What structures are at risk for injury with an anterior shoulder dislocation? (FA p371, study guide)
17.	What is the rate-limiting step in purine synthesis? In pyrimidine synthesis? (FA p68)
18.	<ul> <li>Which anticancer drug fits the following description? (FA p365 – FA p367)</li> <li>Prevents breast cancer</li> <li>Treatment for testicular cancer</li> <li>Treatment for childhood tumors (Ewing's sarcoma, Wilms' tumor, rhabdomyosarcoma)</li> <li>Inhibits ribonucleotide reductase</li> <li>SE of hemorrhagic cystitis</li> <li>Antibody against Philadelphia chromosome</li> </ul>
19.	What drugs should not be given to sulfa allergic patients? (FA p246)

Copyright © 2011, All Rights Reserved, Doctors In Training.com, LLC

### Doctors In Training.com: USMLE Step 1 Review – Day 11 Review Quiz

- 1. How is hnRNA processed before it leaves the nucleus? (FA p72)
- 2. What structures run through the cavernous sinus? (FA p418)
- 3. How do cardiac output, blood pressure, GFR, and thyroid hormone change during pregnancy? (FA p484)
- 4. Which neoplasm is most commonly responsible for the hormone paraneoplastic syndrome? (FA p229)
  - ACTH → Cushing's syndrome
  - PTH-related peptide → hypercalcemia
  - Erythropoietin → polycythemia
  - ADH → SIADH
- 5. What are the stages of behavioral change? (FA 450)
- 6. Describe what changes you would see in serum calcium, serum phosphate, alkaline phosphatase, and PTH with the following diseases: (FA p380)

Disease	Serum Ca	Serum Phos	Alk Phos	PTH
Primary Hyperparathyroidism	35			
Paget's Disease of Bone				
Vitamin D Toxicity				
Renal Insufficiency				

- 7. Which skin disorder matches the following statement? (FA p388 FA p389)
  - Pruritic, purple, polygonal papules
  - Pruritic vesicles a/w celiac disease
  - · Thickened scar esp. around face/chest
  - Parakeratotic scaling
  - Keratin-filled cysts
  - Skin rash and proximal muscle weakness
  - Honey crusting lesions common about the nose and lips
  - Hyperkeratosis and koilocytosis
- 8. What portion of the spinal cord is affected by tabes dorsalis? What portion is affected by polio? (FA p411)
- 9. What is the treatment of choice for the following protozoa? (FA p161)
  - Trichomonas vaginalis
  - Trypanosoma cruzi
  - Plasmodium vivax
  - Leishmania donovani
  - Entamoeba histolytica
  - Toxoplasma gondii
- 10. What enzyme is responsible for tRNA charging? What enzyme catalyzes peptide bond formation? (FA p74)
- 11. What are the characteristic features of HELLP syndrome? (FA p487)

<u>Do</u> 1.	ctors In Training.com: USMLE Step 1 Review – Day 12 Review Quiz What are the most common causes of meningitis in the following age ranges? (FA p177)
	<u>newborn → 6m</u> <u>children (6m-6y)</u> <u>6y → 60y</u> <u>60+ y</u>
2.	What portion of the brain is supplied by the anterior cerebral artery? Middle cerebral artery? (FA p404)
3.	What group of genes is responsible for skeletal development? (FA p118)
4.	What is the classic clinical presentation of a thyroglossal duct cyst? (FA p130)
5.	Which hepatic phase of metabolism is lost first by geriatric patients? Which phase is mediated by cytochrome p450? (FA p233)
6.	What are the 4 obligate aerobic bacteria? (FA 138)
7.	<ul> <li>Which type of vasculitis fits the following description? (FA p277 – FA p279)</li> <li>Necrotizing granulomas of lung and necrotizing glomerulonephritis</li> <li>Necrotizing immune complex inflammation of visceral/renal vessels</li> <li>Young Asian women</li> <li>Young asthmatics</li> <li>Infants and young children; involved coronary arteries</li> <li>Most common vasculitis</li> <li>A/w hepatitis B infection</li> </ul>
8.	What can prevent the neurotoxicity of isoniazid? (FA p191)
9.	What is the treatment for TCA cardiotoxicity? What is the treatment for theophylline cardiotoxicity? (FA p243)
10.	What is the difference between malingering and factitious disorder? (FA p447)

#### **Test Day Tips**

### What should I do five days prior to the test?

- I would split FA into 4-5 equal sections. Since FA contains 516 pages of material, each section will have 103-129 pages. Over 4-5 days review FA entirely by going through 103-129 pages per day. If you go through 10 pages an hour, it should take you 9-12 hrs per day to do this. As you come across a detail that you did not recognize before or have not seen before, write it down. At the end of each day and at the beginning of the next day, review those details you have written. The small details in FA are often overlooked and may be on your test. If you decide to continue with Q-bank or World during these 5 days, I wouldn't do more than 25-50 questions a day. Concentrate on your knowledge base.
- At the end of Day 5, I would do the following:
  - Review all of the unfamiliar details written from the previous 5 days
  - Review all of the HYQ in the DIT handouts, the "definitely know" topics highlighted during the course, and the 3-5 star topics highlighted during the course.
  - Decide what information is going to be put on your marker board right before the test and memorize that information.
  - Consider taking a 150 NMBE test online (free or \$45). Since these tests are slightly easier than the real thing it will boost your confidence a little. Since there are no answers given, you won't waste time going through the answers. You can expect 3-4 of those questions to be on your actual test. It will allow you to regain familiarity with the actual testing format and make sure you've gone through the tutorial so you can skip it on your test day and add that time to your break time.
  - Skim through FA again at your leisure to review random topics, but pay particular attention to the "definitely know" and 3-5 star topics
  - Stop studying at least 2 hours before bedtime to make sure you get a good night's sleep.
- By going through this 5-day program, you will be able to say and know that you've reviewed everything in the 5 days before the test.

### What should I put on my markerboard prior to the start of the test?

- Don't write on your markerboard for more than 5 minutes before you start your test.
- Put whatever you want, but you may want to consider the following:
  - \* Developmental milestones
  - \* The 4 pharmacokinetic equations
  - \* Sens, spec, PPV, NPV, OR, RR equations and square
  - \* Error square
  - \* Lung volume diagram

## Test Day Tips

- Bring a cooler with ice, water, Gatorade, or juice. Pack a lunch. Bring some fruits and snacks. (You
  may not be able to predict what you're going to want to eat so it's better to bring too much than too
  little.) Eat light, not heavy.
- Consider getting out in the sun and/or stretching during your breaks.
- Bring a light sweater or sweatshirt in case it's cold.
- Don't forget your ID and USMLE pass.
- Take your breaks when you need them/however you want them (for example: 2 sections → break → 2 sections). Some breaks may need to be longer than others. Don't be afraid to take a small 5 minute bathroom break.
- Expect 5-10 questions in each section that you have never seen before. If you expect this, then it won't freak you out when it happens (and it will happen).
- Bring your own watch to keep track of your break time!
- Consider answering 10 practice questions prior to going into the test center for "warm-up" (but don't look at the answers in case you are incorrect).

# <u>Doctors In Training.com: USMLE Step 1 Review – Day 13 Review Quiz</u>

- 1. What pathology matches the following statement?
  - Lens-shaped lesion on head CT
  - Common underlying cause of Intussusception
  - No milk production in the postpartum period
  - Pigmented hamartomas in the iris
  - Howell-Jolly bodies
  - Cancer a/w asbestos
  - Owl's eye inclusions-

Owl's eye nucleus-

Owl's eye protozoan-

- 50-year-old male with new, unexplained skin yellowing and no other symptoms
- 2. What is seen histologically 4-24 hours after an MI? 2-4 days after an MI? (FA p271)
- 3. To what drug category does the following drug belong?
  - Cholestyramine
  - Venlafaxine
  - Fluphenazine
  - Phentolamine
  - Captopril
  - Trazadone
  - Carteolol

- Clarithromycin
- Famotidine
- Fluvoxamine
- 6-mercaptopurine
- Selegiline
- Terbinafine
- Clozapine
- 4. For what type of information is the following thalamic nucleus a relay station?
  - Ventral posterior lateral
- Ventral posterior medial

Lateral geniculate

- Ventral anterior
- 5. What is the antidote for the following toxin? (FA p243)
  - Copper, gold, arsenic
  - · Arsenic, mercury, gold
  - t-PA, streptokinase
  - Digitalis
- 6. What are the 4 main pharmacokinetic equations? (FA p232)
- 7. Where does fetal erythropoiesis take place? In which adult bones does erythropoiesis take place? (FA p124)
- 8. What artery is damaged (via hemorrhagic stroke or ischemic stroke) with the following presentation? (FA p405)
  - Aneurysm causes the eye to look down and out
  - Aneurysm may cause bilateral loss of lateral visual fields
  - Broca's or Wernicke's aphasia
  - Unilateral lower extremity sensory and/or motor loss
  - Unilateral facial and arm sensory and/or motor loss
- 9. Which hormones use steroid receptors? Which hormones use tyrosine kinase receptors? (FA p294)

## Doctors In Training.com: USMLE Step 1 Review - Day 14 Review Quiz

- 1. Which primary bone tumor fits the following description? (FA p381)
  - Most common malignant primary bone tumor of children
  - Most common benign bone tumor
  - 11;22 translocation
  - Soap-bubble appearance on X-ray
  - Onion-skin appearance of bone
  - Codman's triangle on X-ray
- 2. What are the most common causes of hypocalcemia?
- 3. What is the triad of symptoms of Wernicke's encephalopathy? What is the triad of symptoms of Korsakoff syndrome? (FA p451)
- 4. What drugs have the following side effects? (FA p244 FA p245)
  - Agranulocytosis
  - Osteoporosis
  - Pulmonary fibrosis
  - Gynecomastia
  - Photosensitivity
  - Drug-induced lupus
- 5. What are the 4 cardinal features of Parkinson's disease? (FA p401) How is Lewy body dementia unique?
- 6. Describe how the murmur of mitral regurgitation is different from the murmur of aortic regurgitation? (FA p259)
- 7. What BP values mark the diagnosis of hypertension? What values mark prehypertension? (FA p269)
- 8. What organisms are known for causing endocarditis? (FA p275)
- 9. What are the common locations for tophi in gout patients? (FA p384)
- 10. Which autoimmune disorder matches the following description? (FA p212)
  - Anti-TSH receptor antibodies
  - Antimitochondrial antibodies
  - Anticentromere antibodies
  - Antihistone antibodies
  - Anti-smooth muscle antibodies
- 11. To which lymph nodes does cancer in the following areas most commonly metastasize? (FA p200)
  - Stomach
  - Duodenum, jejunum
  - Sigmoid colon
  - Rectum
  - Testes
  - Scrotum

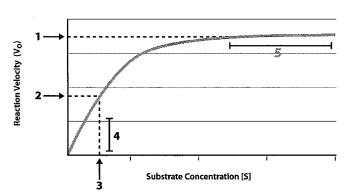
#### Doctors In Training.com: USMLE Step 1 Review - Day 15 Review Quiz

- 1. Which immunosuppressant fits the following description? (FA p215 FA p216)
  - Derivative of 6-mercaptopurine
  - · Causes phocomelia
  - · Nephrotoxic in 75% of pts
  - SE: acne, osteoporosis, HTN, hyperglycemia, immunosuppression → infection
  - Inhibits secretion of IL-2 and other cytokines
  - Alkylating agent that requires bioactivation in liver
  - Inhibits dihydrofolate reductase
- 2. What arachidonic acid product has actions that oppose that of prostacyclin? (FA p391)
- 3. What substances are well known for causing hemolytic anemia in patients with G6PD deficiency? (FA p102)
- 4. What enzyme is deficient in the following diseases? (FA p103 FA p104)
  - Fructose intolerance
  - Essential fructosuria
  - Classic galactosemia
- 5. What might you see in a first trimester ultrasound of a fetus with Down syndrome? (FA p88)
- 6. Which protozoal organism matches the following statement? (FA p160 FA p161)
  - Diarrhea in campers and hikers
  - Itchy vaginitis
  - · Sandfly is the vector
  - Ixodes tick is the vector
  - Anopheles mosquito is the vector
  - Sodium stibogluconate is the treatment
  - Suramin or melarsoprol is the treatment
  - Maltese cross seen in RBCs
  - Treat with metronidazole
  - Severe diarrhea in AIDS patients
- 7. What is the result of a glycolytic enzyme deficiency? (FA p98) What is the result of a deficiency in pyruvate dehydrogenase? (FA p99)
- 8. What co-factors are required for the function of pyruvate dehydrogenase? What other enzyme requires the same co-factors? (FA p99)
- 9. How does the presentation of a right parietal lobe lesion differ from the presentation of a left parietal lobe lesion? (FA p403)
- 10. What is the clinical appearance of internuclear ophthalmoplegia? With what disorder is it commonly associated? (FA p424)

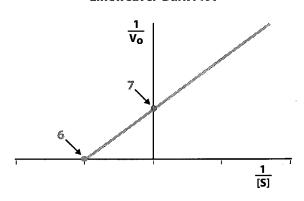
## Pharmacodynamics (FA p232 - FA p234)

Label the following graphs of enzyme kinetics:

# **Graph of Michaelis-Menten Kinetics**

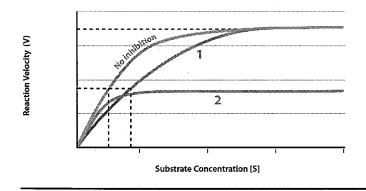


#### Lineweaver-Burk Plot

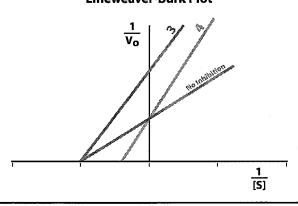


Label the following plots as either competitive or noncompetitive inhibition:

**Graph of Michaelis-Menten Kinetics** 



Lineweaver-Burk Plot



What 4 pharmacokinetics equations are most important to know for Step 1?

## Pharmacokinetics (FA p232 - FA p234)

- 1. A 60 kg man with status asthmaticus is being given an IV infusion of drug X at 60 mg/hr. The clearance of drug X is 2L/h, and the volume of distribution is approximately 0.5 L/kg. 48 hours after administration has begun, the asthma attack is under control. At this time, the concentration of drug X in his plasma is 20 mg/L.
  - A. What is the half-life of drug X in this pt?
  - B. What loading dose could have been used to reach the target concentration of 20 mg/L?
  - C. If the pt begins to show signs of toxicity, and the target dose is decreased to 10 mg/L, what would you do to get to this level?
  - D. Assuming 100% bioavailability, what oral dose of drug X would be necessary to maintain the new target level?
  - E. If the pt has a kidney problem, and the clearance is reduced to 1 L/h, but Vd is unchanged, what effect will this have on loading dose and maintenance dose?

#### Urine pH and Drug Elimination (FA p233)

- pKa (acid dissociation constant) is the pH at which the amount of the non-protonated form (A<sup>-</sup> or B) = the amount of protonated form (HA or BH<sup>+</sup>)
- If pH is low (acidic environment) and less than pKa, there will be more of the protonated form (HA or BH<sup>+</sup>)
   → basic drugs (BH<sup>+</sup>) get trapped
- If pH is high (basic environment) and higher than pKa, there will be more of the nonprotonated form (A⁻ or B) → acidic drugs (A⁻) get trapped
- Treat acidic drug OD (i.e., salicylates) with NaHCO<sub>3</sub> → traps the acidic drug in the basic urine
- Treat basic drug OD (i.e., amphetamines) with NH<sub>4</sub>Cl → traps basic drug in the acidic urine

)

))))

)

)))))

)

)

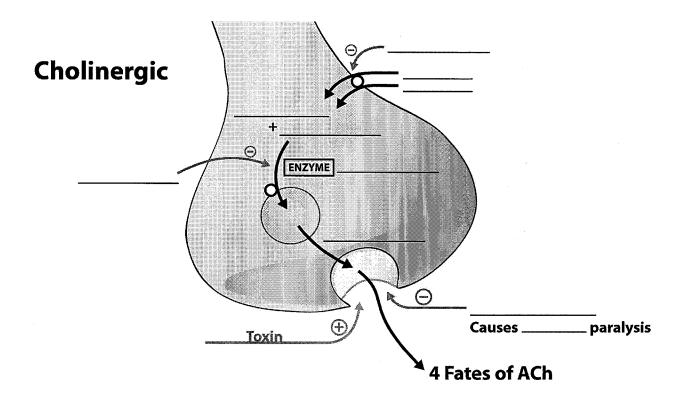
)

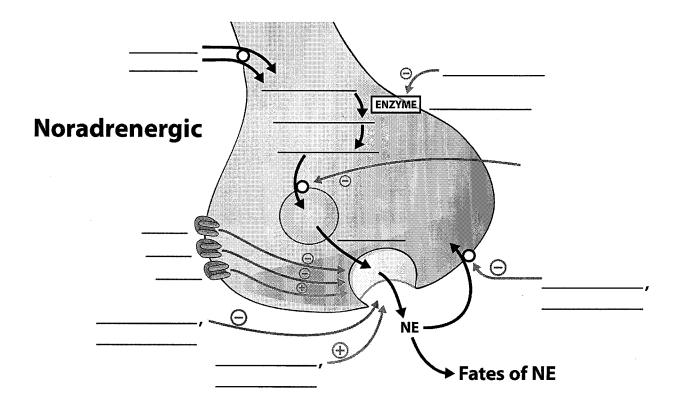
)

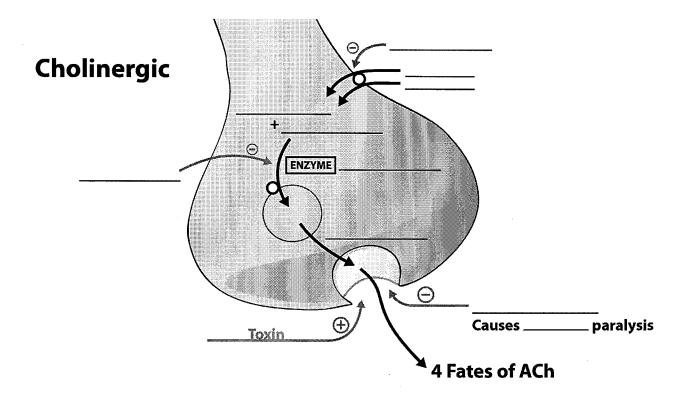
•		Sympathetic Sympathetic	ffect the following body structures? <u>Parasympathetic</u>
	Heart Eye		
	Salivary glands		
	Bronchiolar smooth muscle Bladder		
	Male GU GI tract		
	Gritadi		
	What are the symptoms of excess	parasympathetic activity? (FA	v n238)
	,	·	( <b>P20</b> 0)
	What drugs can cause excess para	asympathetic activity? (FA p23	38)
•	Alzheimer's anticholinesterases  • Donepezil		
	Galantamine		
	Rivastigmine		
	Myasthenia Gravis (FA p386)		
•	<ul> <li>Antibodies to the acetylcholine</li> </ul>	receptor	
	<ul><li>Most common board question p</li><li>Tensilon test</li></ul>	presentation:	that worsens throughout the day
	• Thymus pathology: - 50%	a/w thymic	
	- 20%	a/w thymic	
	<ul><li>15%</li><li>Myasthenic crisis – rapidly prog</li></ul>	gressing weakness esp. in	muscles
	• Rx:,		
			•
	What drug regenerates acetylcholir	nesterases after organophospi	hate noisoning? (EA n238)
,	What drug regenerates acetylcholi	iesterases after organophospi	nate poisoning? (FA p236)

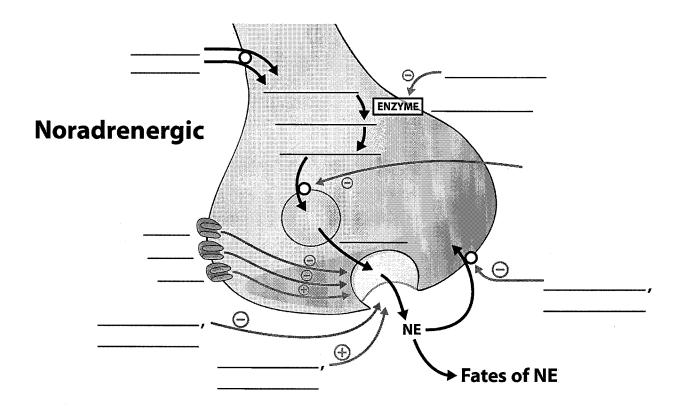
<u>Pa</u>	Parasympathetic Inhibition		
1.	What are the symptoms of inhibiting parasympathetic activity? (FA p239)		
2.	What drugs inhibit parasympathetic activity? What are their uses? (FA p239)		
3.	<ul> <li>What anticholinergics are used in the treatment of urge type urinary incontinence?</li> <li>Oxybutynin</li> <li>Tolterodine</li> <li>Darifenacin and solifenacin</li> <li>Trospium</li> </ul>		
4.	In what pt populations is atropine contraindicated? (FA p239)		
5.	<ul> <li>What other medications have anticholinergic side effects?</li> <li>First Generation H1 blockers: diphenhydramine (Benadryl), doxylamine (Unisom), chlorpheniramine</li> <li>Traditional neuroleptics (FA p453)</li> <li>Tricyclic antidepressants (FA p455)</li> <li>Amantadine (FA p195)</li> </ul>		

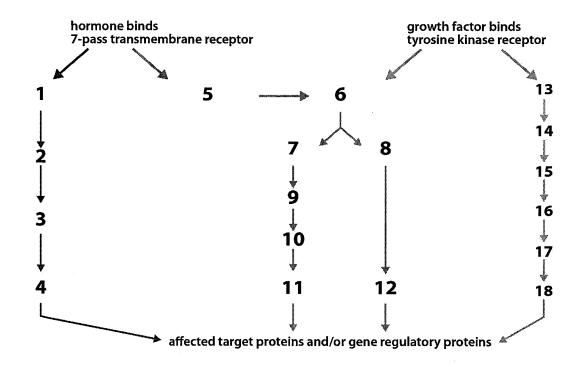
	ick Quiz : Parasympathetics What are the symptoms of excess parasympathetic activity? (FA p238)
2.	What are the symptoms of inhibiting parasympathetic activity? (FA p239)
3.	Identify the following drugs as a direct cholinergic agonist, anti-acetylcholinesterase, anti-muscarinic, or cholinesterase regenerator:
	<ul> <li>Physostigmine</li> <li>Pilocarpine</li> <li>Echothiophate</li> <li>Oxybutynin</li> <li>Atropine</li> <li>Donepezil</li> <li>Pralidoxime</li> <li>Bethanechol</li> <li>Neostigmine</li> <li>Darifenacin</li> <li>Ipratropium</li> <li>Tropicamide</li> <li>Benztropine</li> <li>Scopolamine</li> <li>Edrophonium</li> <li>Tolterodine</li> <li>Trospium</li> <li>Rivastigmine</li> <li>Homatropine</li> <li>Pyridostigmine</li> <li>Carbachol</li> </ul>
4.	HYQ: A gardener presents with shortness of breath, salivation, miosis, and diarrhea → What caused this? What is the mechanism of action? →
5.	HYQ: Atropine is not effective in reversal of organophosphate poisoning → What drug would best help this pt? →
6.	HYQ: Which of the following drugs would help improve FEV1 in a pt with COPD →
7.	HYQ: 30-year-old schizophrenic male now has urinary retention due to his neuroleptic $\rightarrow$ What do you treat it with? $\rightarrow$
8.	HYQ: (see slide) $\rightarrow$ In the dark, both pupils are dilated. In the light, the control pupil is miotic while the pupil given drug X remains mydriatic. $\rightarrow$ What is drug X? $\rightarrow$

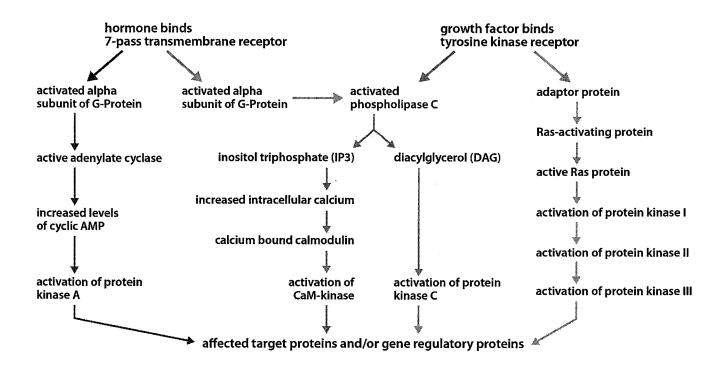












1.	metabolism? What reactions take place in Phase I metabolism? What reactions take place in Phase II metabolism? (FA p233)
	Phase I
2.	What questions are asked during the 4 clinical phases of drug development? (FA p50) Phase II- Phase III- Phase IV-
3.	Name 5 drugs that inhibit acetylcholinesterase. What is the clinical application for each? (FA p238)
4.	What are the various clinical applications of atropine? (FA p239)
5.	What G protein class does the following receptor stimulate? (FA p236)  • α <sub>1</sub>
	<ul> <li>α<sub>2</sub></li> <li>β<sub>1</sub></li> </ul>
	• β <sub>2</sub>
	<ul> <li>M<sub>1</sub></li> <li>M<sub>2</sub></li> </ul>
	<ul> <li>M<sub>3</sub></li> <li>D<sub>2</sub></li> </ul>
6.	How many half-lives does it take for a drug infused at a constant rate to reach 94% of steady state? What variables determine the half-life of a drug? (FA p232)
7.	How does hexamethonium affect the following parameters? (FA p239)  • Blood pressure
	Heart rate     Cardiac output
	<ul> <li>Urine output</li> <li>GI motility</li> <li>Pupil of the eye</li> </ul>
	r upii oi uie eye

#### **Quick Quiz: Sympathomimetics**

Which receptors are stimulated by the following sympathomimetics? (FA p240 - FA p241)

- Clonidine
- Dopamine
- Phenylephrine
- Albuterol
- Norepinephrine
- Isoproterenol
- Epinephrine
- Dobutamine
- Terbutaline

Which sympathomimetic matches the following statement? (FA p240)

- Given as a nebulizer for asthma
- Drug of choice for anaphylaxis
- Most common first line agent for pts in cardiogenic shock
- Most common first line agent for pts in septic shock
- Given subQ for asthma
- Used by ENT to vasoconstrict nasal vessels
- Used to treat ADHD

HYQ: What drug(s) would be most appropriate in a pt in shock because they maintains renal blood flow? →

#### Glaucoma Worksheet (FA p421)

Glaucoma - increased intraocular pressure

Outline the flow of aqueous humor.

Formed in a capillary bed in the ciliary body  $\rightarrow$  secreted into the posterior chamber  $\rightarrow$  flows between the angle formed by the lens and the iris diaphragm  $\rightarrow$  into anterior chamber  $\rightarrow$  reabsorbed by the canal of Schlemm

What is the pathogenesis of glaucoma?

Blocked canal of Schlemm → aqueous humor not reabsorbed → increased pressure → atrophy of optic nerve

### Open Angle Glaucoma

- Common, insidious form; almost always bilateral
- Risk factors: older than 40, black, diabetes
- Early stage- asymptomatic
- Late stage- areas of reduced/absent vision, contraction of visual field (peripheral → central)

#### Acute Angle-Closure Glaucoma

- Emergency
- Abrupt onset of pain, nausea, colored halos, rainbows around light
- Red, teary eye with hazy cornea and fixed, mid-dilated pupil (not reactive to light) that is firm to palpation

#### Diagnosis

- Cupping of the optic disk (cup:disc ratio greater than 1:2)
- Tonometry

HYQ: 60-year-old male has a hard time driving at night because of worsening vision and the appearance of halos around oncoming headlights →

#### **Quick Quiz: Drug Suffixes**

What drug category has the following ending? (FA p247)

-ane	-azepam	
-azine	-azole	
-barbital	-caine	
-cillin	-cycline	
-ipramine	-navir	
-olol	-operidol	
-oxin	-phylline	
-pril	-terol	
-tidine	-triptyline	
-tropin	-zosin	
-dronate	-sartan	
-chol	-stigmine	
-mustine	-curium/curonium	_
-statin	-glitazone	
-bendazole	-dipine	

### Nerves of the Upper Limb (FA p372)

What does the **RADIAL** nerve innervate, and what is seen if this nerve is damaged?

Triceps Cannot extend forearm, loss of triceps reflex

Skin of posterior arm

Loss of sensation of posterior arm

Deep branch

Supinator & Brachioradialis Loss of brachioradialis reflex

Extensor muscles of forearm WRIST DROP (cannot extend wrist)

Abductor pollicus longus

Skin of posterior forearm Loss of sensation of posterior forearm

Superficial branch

Skin of lateral, posterior hand Loss of sensation of lateral, posterior hand

Hint: radial nerve innervates the BEST: Brachioradialis, Extensors of wrist and fingers, Supinator, and Triceps

• <u>Saturday Night Palsy</u>: radial nerve compression against the spiral groove of the humerus → weak wrist and finger extension, weak brachioradialis reflex, but normal triceps

What does the **ULNAR** nerve innervate, and what is seen if this nerve is damaged?

Flexor carpi ulnaris

medial 1/2 of flexor digitorum profundus CLAW HAND\*

Deep branch

Hypothenar muscles

Adductor pollicis Cannot adduct thumb

Ulnar two lumbricals

All interosseous muscles Cannot abduct or adduct fingers

Superficial branch

Skin over medial hand Loss of sensation of medial hand

• <u>\*Claw Hand</u>: cannot flex DIP joint of 4<sup>th</sup> and 5<sup>th</sup> digits, atrophy of interosseus muscles and inability to extend the interphalangeal joints when trying to straighten fingers.

What does the **MEDIAN** nerve innervate, and what is seen if this nerve is damaged?

Pronator teres Cannot pronate
Flexor carpi radialis Weak wrist flexion

Palmaris longus

Flexor digitorum superficialis

Flexor pollicus longus Cannot flex thumb Pronator quadratus Cannot pronate

lateral 1/2 of flexor digitorum profundus BISHOP'S HAND / HAND OF BENEDICTION\*

Radial two lumbricals

Skin over lateral palm

Loss of sensation of lateral palm

Skin of distal first 3 ½ digits

Loss of sensation of distal first 3 ½ digits

Recurrent branch

Thenar muscles APE HAND\*\* (cannot oppose thumb)

- <u>\*Hand of Benediction</u>: loss of PIP flexion in digits 1-3 and loss of DIP flexion in digits 2-3 → when pt attempts to make a fist, digits 2 and 3 remain partially extended (ECA p478)
- \*\* Ape Hand: thumb movements are limited to flexion/extension in the plane of the palm
- <u>Carpal Tunnel Syndrome</u>: median nerve entrapment at the carpal tunnel (enclosed by the inelastic flexor retinaculum ventrally, and the carpal bones dorsally)
- HYQ: An elderly woman with chronic osteoarthritis and diffuse pain now presents with numbness and tingling over the lateral digits of her right hand that sometimes radiates up to the elbow. Exam reveals wasting of the thenar eminence → what is the diagnosis? →

What does the MUSCULOCUTANEOUS nerve innervate, and what is seen if this nerve is damaged?

Biceps Weak arm and forearm flexion, and forearm supination

Coracobrachialis Weak arm flexion
Brachialis Weak forearm flexion

Skin of lateral forearm Loss of sensation of the lateral forearm

)

)

)

)

)

)

)

)

)

)

)

)

)

)

)

)

)

)

<ul> <li>Ape hand</li> <li>Wrist drop</li> <li>Scapular winging</li> <li>Unable to wipe bottom</li> <li>Loss of forearm pronation</li> <li>Cannot abduct or adduct fingers</li> <li>Loss of arm abduction</li> <li>Weak lateral rotation of arm</li> <li>Loss of arm and forearm flexion</li> <li>Loss of forearm extension</li> <li>Trouble initiating arm abduction</li> <li>Unable to abduct arm beyond 10 degrees</li> <li>Unable to raise arm above horizontal</li> </ul> 2. What nerves run with the following arteries? <ul> <li>Dorsal scapular artery</li> <li>Lateral thoracic artery</li> <li>Suprascapular artery</li> <li>Suprascapular artery</li> <li>Posterior circumflex artery</li> <li>Suprascapular artery</li> <li>Deep brachial artery</li> <li>Unar artery</li> <li>Brachial artery</li> <li>Anterior interosseous artery</li> <li>Posterior interosseous artery</li> </ul> 3. What nerve is most at risk of injury with the following types of fractures/injury? <ul> <li>Shaft of the humerus</li> <li>Surpical neck of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> </ul> <li>4. HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured?</li> <li>→</li> <li>→</li> <li>Which nerve and what injury? →</li>		What nerve is damaged when a patient presents with the following symptom (upper extremity)? (FA p374)  • Claw hand
<ul> <li>Scapular winging</li> <li>Unable to wipe bottom</li> <li>Loss of forearm pronation</li> <li>Cannot abduct or adduct fingers</li> <li>Loss of arm abduction</li> <li>Weak lateral rotation of arm</li> <li>Loss of forearm extension</li> <li>Trouble initiating arm abduction</li> <li>Unable to abduct arm beyond 10 degrees</li> <li>Unable to raise arm above horizontal</li> <li>What nerves run with the following arteries?</li> <li>Dorsal scapular artery</li> <li>Lateral thoracic artery</li> <li>Posterior circumitex artery</li> <li>Suprascapular artery</li> <li>Thoracodorsal artery</li> <li>Dies phrachial artery</li> <li>Unar artery</li> <li>Brachial artery</li> <li>Brachial artery</li> <li>Posterior interosseous artery</li> <li>Posterior interosseous artery</li> <li>Shaft of the humerus</li> <li>Supracondyle of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> <li>HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured?</li> <li>HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm → Which nerve and what injury? →</li> <li>HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break</li> </ul>		, ip a riskita
<ul> <li>Unable to wipe bottom</li> <li>Loss of forearm pronation</li> <li>Cannot abduct or adduct fingers</li> <li>Loss of arm abduction</li> <li>Weak lateral rotation of arm</li> <li>Loss of arm and forearm flexion</li> <li>Loss of forearm extension</li> <li>Trouble initiating arm abduction</li> <li>Unable to abduct arm beyond 10 degrees</li> <li>Unable to raise arm above horizontal</li> <li>What nerves run with the following arteries?</li> <li>Dorsal scapular artery</li> <li>Lateral thoracic artery</li> <li>Posterior circumflex artery</li> <li>Suprascapular artery</li> <li>Thoracodorsal artery</li> <li>Unar artery</li> <li>Brachial artery</li> <li>Ulnar artery</li> <li>Brachial artery</li> <li>Anterior interosseous artery</li> <li>Posterior interosseous artery</li> <li>Suprical neck of the humerus</li> <li>Surgical neck of the humerus</li> <li>Surgical neck of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> <li>HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured?</li> <li>HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm</li> <li>Which nerve and what injury? →</li> <li>HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break</li> </ul>		
<ul> <li>Loss of forearm pronation</li> <li>Cannot abduct or adduct fingers</li> <li>Loss of arm abduction</li> <li>Weak lateral rotation of arm</li> <li>Loss of arm and forearm flexion</li> <li>Loss of forearm extension</li> <li>Trouble initiating arm abduction</li> <li>Unable to abduct arm beyond 10 degrees</li> <li>Unable to raise arm above horizontal</li> <li>What nerves run with the following arteries?</li> <li>Dorsal scapular artery</li> <li>Lateral thoracic artery</li> <li>Posterior circumflex artery</li> <li>Suprascapular artery</li> <li>Thoracodorsal artery</li> <li>Deep brachial artery</li> <li>Unar artery</li> <li>Brachial artery</li> <li>Anterior interosseous artery</li> <li>Posterior interosseous artery</li> <li>Posterior interosseous artery</li> <li>Shaft of the humerus</li> <li>Surpracondyle of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> <li>HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? →</li> <li>HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm → Which nerve and what injury? →</li> <li>HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break</li> </ul>		Ocapular winging
<ul> <li>Cannot abduct or adduct fingers</li> <li>Loss of arm abduction</li> <li>Weak lateral rotation of arm</li> <li>Loss of arm and forearm flexion</li> <li>Loss of forearm extension</li> <li>Trouble initiating arm abduction</li> <li>Unable to abduct arm beyond 10 degrees</li> <li>Unable to raise arm above horizontal</li> <li>What nerves run with the following arteries?</li> <li>Dorsal scapular artery</li> <li>Lateral thoracic artery</li> <li>Posterior circumflex artery</li> <li>Suprascapular artery</li> <li>Thoracodorsal artery</li> <li>Deep brachial artery</li> <li>Deep brachial artery</li> <li>Posterior interosseous artery</li> <li>Posterior interosseous artery</li> <li>Posterior interosseous artery</li> <li>Shaft of the humerus</li> <li>Sugracondyle of the humerus</li> <li>Sugracondyle of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> <li>HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured?</li> <li>→</li> <li>HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm → Which nerve and what injury? →</li> <li>HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break</li> </ul>		
<ul> <li>Loss of arm abduction</li> <li>Weak lateral rotation of arm</li> <li>Loss of arm and forearm flexion</li> <li>Loss of forearm extension</li> <li>Trouble initiating arm abduction</li> <li>Unable to abduct arm beyond 10 degrees</li> <li>Unable to raise arm above horizontal</li> </ul> 2. What nerves run with the following arteries? <ul> <li>Dorsal scapular artery</li> <li>Lateral thoracic artery</li> <li>Posterior circumflex artery</li> <li>Suprascapular artery</li> <li>Thoracodorsal artery</li> <li>Deep brachial artery</li> <li>Ulnar artery</li> <li>Brachial artery</li> <li>Anterior interosseous artery</li> <li>Posterior interosseous artery</li> <li>Posterior interosseous artery</li> <li>Shaft of the humerus</li> <li>Surgical neck of the humerus</li> <li>Surgical neck of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> </ul> 4. HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? <ul> <li>→</li> <li>HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm</li> <li>→ Which nerve and what injury? →</li> </ul> <li>6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break</li>		
<ul> <li>Weak lateral rotation of arm</li> <li>Loss of arm and forearm flexion</li> <li>Loss of forearm extension</li> <li>Trouble initiating arm abduction</li> <li>Unable to abduct arm beyond 10 degrees</li> <li>Unable to raise arm above horizontal</li> </ul> 2. What nerves run with the following arteries? <ul> <li>Dorsal scapular artery</li> <li>Lateral thoracic artery</li> <li>Posterior circumflex artery</li> <li>Posterior circumflex artery</li> <li>Suprascapular artery</li> <li>Thoracodorsal artery</li> <li>Deep brachial artery</li> <li>Ulnar artery</li> <li>Brachial artery</li> <li>Anterior interosseous artery</li> <li>Posterior interosseous artery</li> <li>Shaft of the humerus</li> <li>Sugrical neck of the humerus</li> <li>Sugrical neck of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> </ul> 4. HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? → 5. HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm. → Which nerve and what injury? → 6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break		
<ul> <li>Loss of arm and forearm flexion</li> <li>Loss of forearm extension</li> <li>Trouble initiating arm abduction</li> <li>Unable to abduct arm beyond 10 degrees</li> <li>Unable to raise arm above horizontal</li> </ul> 2. What nerves run with the following arteries? <ul> <li>Dorsal scapular artery</li> <li>Lateral thoracic artery</li> <li>Posterior circumflex artery</li> <li>Posterior circumflex artery</li> <li>Posterior dircumflex artery</li> <li>Thoracodorsal artery</li> <li>Deep brachial artery</li> <li>Unar artery</li> <li>Brachial artery</li> <li>Anterior interosseous artery</li> <li>Posterior interosseous artery</li> <li>Posterior interosseous artery</li> </ul> 3. What nerve is most at risk of injury with the following types of fractures/injury? <ul> <li>Shaft of the humerus</li> <li>Surgical neck of the humerus</li> <li>Surgical neck of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> </ul> <li>4. HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured?</li> <li>→ Which nerve and what injury? →</li>		
<ul> <li>Loss of forearm extension</li> <li>Trouble initiating arm abduction</li> <li>Unable to abduct arm beyond 10 degrees</li> <li>Unable to raise arm above horizontal</li> </ul> 2. What nerves run with the following arteries? <ul> <li>Dorsal scapular artery</li> <li>Lateral thoracic artery</li> <li>Posterior circumflex artery</li> <li>Suprascapular artery</li> <li>Thoracodorsal artery</li> <li>Deep brachial artery</li> <li>Ulnar artery</li> <li>Brachial artery</li> <li>Anterior interosseous artery</li> <li>Posterior interosseous artery</li> </ul> 3. What nerve is most at risk of injury with the following types of fractures/injury? <ul> <li>Suprical neck of the humerus</li> <li>Surgical neck of the humerus</li> <li>Surgical neck of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> </ul> 4. HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? <ul> <li>→</li> <li>HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm. → Which nerve and what injury? →</li> </ul> 6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break		
<ul> <li>Unable to abduct arm beyond 10 degrees</li> <li>Unable to raise arm above horizontal</li> </ul> 2. What nerves run with the following arteries? <ul> <li>Dorsal scapular artery</li> <li>Lateral thoracic artery</li> <li>Posterior circumflex artery</li> <li>Suprascapular artery</li> <li>Thoracodorsal artery</li> <li>Deep brachial artery</li> <li>Ulnar artery</li> <li>Brachial artery</li> <li>Anterior interosseous artery</li> <li>Posterior interosseous artery</li> </ul> 3. What nerve is most at risk of injury with the following types of fractures/injury? <ul> <li>Shaft of the humerus</li> <li>Suprical neck of the humerus</li> <li>Suprical neck of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> </ul> 4. HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? → 5. HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm → Which nerve and what injury? → <li>6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break</li>		
<ul> <li>Unable to abduct arm beyond 10 degrees</li> <li>Unable to raise arm above horizontal</li> </ul> 2. What nerves run with the following arteries? <ul> <li>Dorsal scapular artery</li> <li>Lateral thoracic artery</li> <li>Posterior circumflex artery</li> <li>Suprascapular artery</li> <li>Thoracodorsal artery</li> <li>Deep brachial artery</li> <li>Ulnar artery</li> <li>Brachial artery</li> <li>Anterior interosseous artery</li> </ul> 3. What nerve is most at risk of injury with the following types of fractures/injury? <ul> <li>Shaft of the humerus</li> <li>Supracondyle of the humerus</li> <li>Suprical neck of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> </ul> 4. HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? <ul> <li>→</li> <li>HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm</li> <li>→ Which nerve and what injury? →</li> </ul> 6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break		Throughts better the same of the term
<ul> <li>Unable to raise arm above horizontal</li> <li>What nerves run with the following arteries?</li> <li>Dorsal scapular artery</li> <li>Lateral thoracic artery</li> <li>Posterior circumflex artery</li> <li>Suprascapular artery</li> <li>Thoracodorsal artery</li> <li>Deep brachial artery</li> <li>Ulnar artery</li> <li>Brachial artery</li> <li>Anterior interosseous artery</li> <li>Posterior interosseous artery</li> <li>Shaft of the humerus</li> <li>Surgical neck of the humerus</li> <li>Supracondyle of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> <li>HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? →</li> <li>HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm. → Which nerve and what injury? →</li> <li>HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break</li> </ul>		
<ul> <li>Dorsal scapular artery</li> <li>Lateral thoracic artery</li> <li>Posterior circumflex artery</li> <li>Suprascapular artery</li> <li>Thoracodorsal artery</li> <li>Deep brachial artery</li> <li>Ulnar artery</li> <li>Brachial artery</li> <li>Anterior interosseous artery</li> <li>Posterior interosseous artery</li> <li>Shaft of the humerus</li> <li>Surgical neck of the humerus</li> <li>Surgical neck of the humerus</li> <li>Supracondyle of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> <li>HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured?</li> <li>→ Which nerve and what injury? →</li> <li>6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break</li> </ul>		
<ul> <li>Dorsal scapular artery</li> <li>Lateral thoracic artery</li> <li>Posterior circumflex artery</li> <li>Suprascapular artery</li> <li>Thoracodorsal artery</li> <li>Deep brachial artery</li> <li>Ulnar artery</li> <li>Brachial artery</li> <li>Anterior interosseous artery</li> <li>Posterior interosseous artery</li> <li>Posterior interosseous artery</li> <li>Shaft of the humerus</li> <li>Surgical neck of the humerus</li> <li>Surgical neck of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> <li>HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured?</li> <li>→ Which nerve and what injury? →</li> <li>6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break</li> </ul>	2	What parves run with the following arteries?
<ul> <li>Lateral thoracic artery</li> <li>Posterior circumflex artery</li> <li>Suprascapular artery</li> <li>Thoracodorsal artery</li> <li>Deep brachial artery</li> <li>Ulnar artery</li> <li>Brachial artery</li> <li>Anterior interosseous artery</li> <li>Posterior interosseous artery</li> <li>Shaft of the humerus</li> <li>Surgical neck of the humerus</li> <li>Surgical neck of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> </ul> 4. HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? → Which nerve and what injury? → 6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break	۷.	
<ul> <li>Suprascapular artery</li> <li>Thoracodorsal artery</li> <li>Deep brachial artery</li> <li>Ulnar artery</li> <li>Brachial artery</li> <li>Anterior interosseous artery</li> <li>Posterior interosseous artery</li> </ul> 3. What nerve is most at risk of injury with the following types of fractures/injury? <ul> <li>Shaft of the humerus</li> <li>Surgical neck of the humerus</li> <li>Supracondyle of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> </ul> 4. HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? → 5. HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm. → Which nerve and what injury? → 6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break		Lateral thoracic artery
<ul> <li>Thoracodorsal artery</li> <li>Deep brachial artery</li> <li>Ulnar artery</li> <li>Brachial artery</li> <li>Anterior interosseous artery</li> <li>Posterior interosseous artery</li> <li>Shaft of the humerus</li> <li>Surgical neck of the humerus</li> <li>Supracondyle of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> </ul> 4. HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? → 5. HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm. → Which nerve and what injury? → 6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break		
<ul> <li>Deep brachial artery</li> <li>Ulnar artery</li> <li>Brachial artery</li> <li>Anterior interosseous artery</li> <li>Posterior interosseous artery</li> </ul> 3. What nerve is most at risk of injury with the following types of fractures/injury? <ul> <li>Shaft of the humerus</li> <li>Surgical neck of the humerus</li> <li>Supracondyle of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> </ul> 4. HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? → 5. HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm. → Which nerve and what injury? → 6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break		
<ul> <li>Ulnar artery</li> <li>Brachial artery</li> <li>Anterior interosseous artery</li> <li>Posterior interosseous artery</li> </ul> 3. What nerve is most at risk of injury with the following types of fractures/injury? <ul> <li>Shaft of the humerus</li> <li>Surgical neck of the humerus</li> <li>Supracondyle of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> </ul> 4. HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? → 5. HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm. → Which nerve and what injury? → 6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break		
<ul> <li>Brachial artery</li> <li>Anterior interosseous artery</li> <li>Posterior interosseous artery</li> </ul> 3. What nerve is most at risk of injury with the following types of fractures/injury? <ul> <li>Shaft of the humerus</li> <li>Surgical neck of the humerus</li> <li>Supracondyle of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> </ul> 4. HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? → 5. HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm. → Which nerve and what injury? → 6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break		
<ul> <li>Anterior interosseous artery</li> <li>Posterior interosseous artery</li> <li>Shaft of the humerus</li> <li>Surgical neck of the humerus</li> <li>Supracondyle of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> </ul> 4. HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? → 5. HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm. → Which nerve and what injury? → 6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break		
<ol> <li>What nerve is most at risk of injury with the following types of fractures/injury?         <ul> <li>Shaft of the humerus</li> <li>Surgical neck of the humerus</li> <li>Supracondyle of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> </ul> </li> <li>HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? →</li> <li>HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm. → Which nerve and what injury? →</li> <li>HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break</li> </ol>		
<ul> <li>Shaft of the humerus</li> <li>Surgical neck of the humerus</li> <li>Supracondyle of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> </ul> 4. HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? → 5. HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm. → Which nerve and what injury? → 6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break		Posterior interosseous artery
<ul> <li>Surgical neck of the humerus</li> <li>Supracondyle of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> </ul> 4. HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? → 5. HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm. → Which nerve and what injury? → 6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break	3.	What nerve is most at risk of injury with the following types of fractures/injury?
<ul> <li>Supracondyle of the humerus</li> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> </ul> 4. HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? → 5. HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm. → Which nerve and what injury? → 6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break		Shaft of the humerus
<ul> <li>Medial epicondyle</li> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> </ul> 4. HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? 5. HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm. → Which nerve and what injury? → 6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break		
<ul> <li>Anterior shoulder dislocation</li> <li>Injury to the carpal tunnel</li> <li>4. HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? →</li> <li>5. HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm. → Which nerve and what injury? →</li> <li>6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break</li> </ul>		
<ul> <li>Injury to the carpal tunnel</li> <li>4. HYQ: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured? →</li> <li>5. HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm. → Which nerve and what injury? →</li> <li>6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break</li> </ul>		
<ul> <li>→</li> <li>5. HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm. → Which nerve and what injury? →</li> <li>6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break</li> </ul>		
<ul> <li>→</li> <li>5. HYQ: An adolescent falls while skateboarding and injures his elbow. He can't feel the medial part of his palm. → Which nerve and what injury? →</li> <li>6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break</li> </ul>	4	HYO: A gymnast sustains an anterior shoulder dislocation. → What nerve is most likely to have been injured?
<ul> <li>→ Which nerve and what injury? →</li> <li>6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break</li> </ul>	••	
<ul> <li>→ Which nerve and what injury? →</li> <li>6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break</li> </ul>	_	
6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break of the humerus. → Which nerve and which artery have the highest risk of being damaged? →	Э.	
<ol> <li>HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break of the humerus. → Which nerve and which artery have the highest risk of being damaged? →</li> </ol>		
6. HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break of the humerus. → Which nerve and which artery have the highest risk of being damaged? →		
	6.	HYQ: A high-school athlete falls on his arm during practice. In the ER, a radiograph shows a midshaft break of the humerus. → Which nerve and which artery have the highest risk of being damaged? →

# **End Session Quiz**

1.	What are the 5 classes of drugs used to treat glaucoma? (FA p430)
2.	How does blood pressure response to phenylephrine administration change if an $\alpha$ -blocker is administered beforehand? Why is this different than the change seen when epinephrine is used rather than phenylephrine? (FA p241)
3.	What are the common side effects of $\beta\text{-blockers?}$ Which pt populations should use caution when taking $\beta\text{-blockers?}$ (FA p242)
4.	What are the various clinical uses for the following sympathomimetics? (FA p240)  Dopamine  Clonidine  Amphetamine  Terbutaline  Epinephrine
5.	What drug category does the following medication fall under? (FA p247)  Lorsartan  Vecuronium  Ticarcillin  Desipramine  Enalapril  Lorazepam  Rosiglitazone
3.	<ul> <li>What pathology is a/w the following key words? (FA p518 – FA p519)</li> <li>Bilateral hilar lymphadenopathy</li> <li>Cherry-red spot on macula</li> <li>Slapped cheeks rash on child</li> <li>Organism a/w dog or cat bite</li> <li>Facial muscle spasm upon tapping the cheek</li> <li>Cough, conjunctivitis, coryza</li> <li>Nephritis, hearing loss, cataracts</li> </ul>
7.	What nerve is damaged when a patient presents with the following symptom (upper extremity)? (FA p374)  Claw hand  Wrist drop  Scapular winging  Unable to wipe bottom  Loss of forearm pronation  Weak lateral rotation of arm  Loss of arm and forearm flexion  Loss of forearm extension  Unable to raise arm above horizontal

## Recommended Home Review: Day 1

- 1. Review today's information. Be sure to include the following:
  - Memorize the 4 pharmacokinetic equations
  - Memorize the drugs of the autonomic nervous system (below)
  - Memorize the G-protein second messengers
  - Memorize the nerves of the upper limb
  - Memorize the Rapid Review reviewed today
- 2. Have a study partner quiz you randomly from the pages reviewed today
- 3. Take a 25-50 question review guiz (Q-bank or other resource)
- 4. Review the answers to the guiz above
- 5. Spend 30min 1hr previewing tomorrow's information

### Place the following agents in the appropriate categories:

norepinephrine, metoprolol, timolol, darifenacin, scopolamine, phenoxybenzamine, bethanechol, isoproterenol, donepezil, prazosin, trospium, atropine, propranolol, labetalol, hexamethonium, atenolol, tacrine, terbutaline, dopamine, pilocarpine, carbachol, edrophonium, solifenacin, phenylephrine, phentolamine, oxybutynin, neostigmine, benztropine, terazosin, pralidoxime, echothiophate, ipratropium, epinephrine, esmolol, methoscopolamine, glycopyrrolate, tolterodine

**Direct cholinergic agonists** 

Indirect cholinergic agonists
(antiacetylcholinesterases)

Cholinergic Antagonists

Nicotinic antagonist-Cholinesterase regenerator-

**Sympathomimetics** 

 $\alpha_1 \alpha_2 \beta_1 \beta_2$  agonist-

α<sub>1</sub> α<sub>2</sub> β<sub>1</sub> agonist-

 $D_1 = D_2 > \beta_1 > \alpha_1$  agonist-

 $\beta_1 = \beta_2$  agonist-

 $\beta_2 > \beta_1$  agonist-

α₁ > α₂ agonist-

<u>α-blockers</u>

<u>β-blockers</u>

nonselective ( $\beta_2 = \beta_1$ ):

β<sub>1</sub> selective:

· · · · · · · · · · · · · · · · · · ·
<i>,</i>
·
)
) ·
, ,
) 
· · · · · · · · · · · · · · · · · · ·
)
)
)
)
·
,

### General Bacteriology

- 1. What bacterial structure has the following function? (FA p136)
  - Mediates adherence of bacteria to the surface of a cell
  - Protects against phagocytosis
  - Provides rigid support to bacterial cell and protects against osmotic pressure differences
  - Space between the inner and outer cellular membranes in Gram (-) bacteria
  - Motility
  - Bacterial form which provides resistance to dehydration, heat, and chemicals
  - Forms attachment between two bacteria during transfer of DNA material (AKA conjugation)
  - Genetic material within bacteria that contains genes for antibiotic resistance
- What exotoxin matches the following characteristics? (FA p141)
  - Inhibits ACh release → flaccid paralysis
  - Lecithinase that causes gas gangrene
  - Inhibits the inhibitor of adenylate cyclase → whooping cough
  - Stimulates adenylate cyclase → Cl<sup>-</sup> and water into gut → diarrhea
  - **Destroys leukocytes**
  - Composed of edema factor, lethal factor, and protective antigen
  - Enterotoxin causing rice-water diarrhea
  - Causes scarlet fever
  - Causes toxic shock syndrome
  - Inactivates EF-2 → pseudomembranous pharyngitis
  - Blocks the release of the inhibitory neurotransmitter glycine
- 3. What 5 bacteria secrete enterotoxins (exotoxin that causes water and electrolyte imbalances of intestinal epithelium resulting in diarrhea)? (FA p141)
- 4. What known toxins are secreted by Staphylococcus aureus? What is the action of each?
  - α-toxin

→ hemolysis

β-toxin

→ sphingomyelinase

- Proteins A, B, and C of y-toxin  $\rightarrow$  A+B = hemolysin, B+C = leukocidin
- Hemolysin

→ hemolysis

Leukocidin

- → destroys leukocytes
- Enterotoxins A-E
- → food poisoning → vomiting and diarrhea

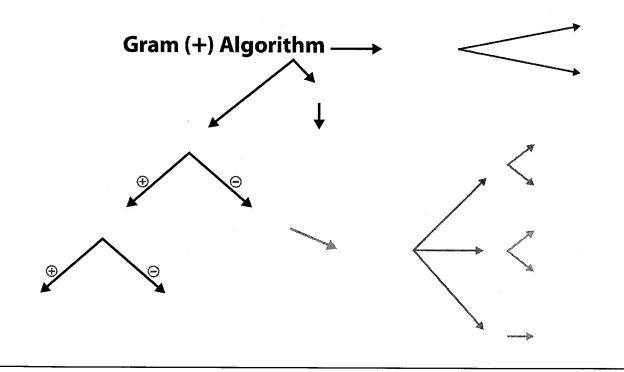
TSST-1

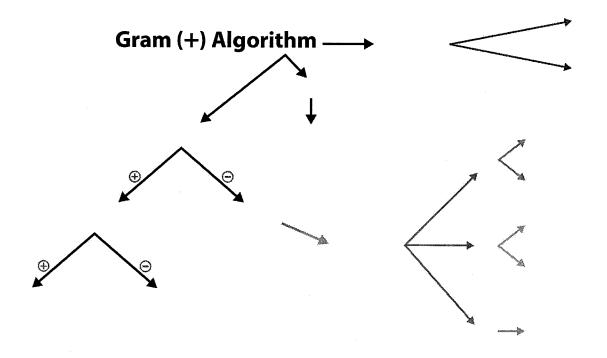
- → release of cytokines → toxic shock syndrome
- Epidermolytic / exfoliative
- → epithelial cell lysis → scalded skin syndrome
- 5. What known toxins are secreted by Streptococcus pyogenes (group A strep.)? What is the action of each?
  - Streptolysin O
- → hemolysis (Oxygen labile)
- Streptolysin S
- → hemolysis
- (oxygen Stabile)
- Erythrogenic / pyrogenic toxins → skin rash (erythro-) and fever (pyro-) of scarlet fever

### **Quick Quiz – Bacteria Basics**

- 1. What bacterial structure has the following function? (FA p136)
  - Mediates adherence of bacteria to the surface of a cell
  - Protects against phagocytosis
  - Space between the inner and outer cellular membranes in Gram (-) bacteria
  - Forms attachment between two bacteria during transfer of DNA material (AKA conjugation)
  - Genetic material within bacteria that contains genes for antibiotic resistance
- 2. What exotoxin matches the following characteristics? (FA p141)
  - Inhibits ACh release → flaccid paralysis
  - Stimulates adenylate cyclase → Cl and water into gut → diarrhea
  - · Causes scarlet fever
  - Inactivates EF-2 → pseudomembranous pharyngitis
  - Blocks the release of the inhibitory neurotransmitter glycine
- 3. What are the acute phase cytokines? (FA p136)
- 4. Which organisms do not take gram stain? (FA p138)
- 5. What stain is required to see the following organism? (FA p138)
  - Cryptococcus neoformans
  - Pneumocystis jiroveci (PCP)
  - Amyloid
  - Chlamydia
- 6. Describe the characteristics of MacConkey's agar. (FA p138)
- 7. By what method are plasmids exchanged between bacteria? (FA p143)
- 8. Which bacteria are encapsulated? (FA p139)
- 9. Which bacteria are spore formers? (FA p147)

)



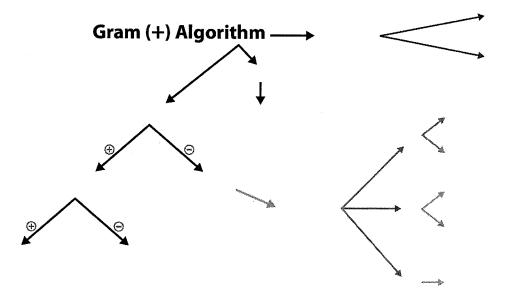


# **Gram-positive Supplement**

1.	Inflammatory diseases Skin and wound infections Organ abscesses Respiratory infection / pneumonia Bacteremia / sepsis UTI (urinary tract infection)  Inflammatory diseases Toxin-mediated diseases Toxic shock syndrome (TSST-1) Scalded skin syndrome (epidermolytic/exfoliative toxin) Gastroenteritis / food-poisoning (enterotoxins)  Gastroenteritis / food-poisoning (enterotoxins)
2.	What skin infections can be caused by both <i>Strep. pyogenes</i> and <i>Staph. aureus</i> ? (FA p145 – FA p146)  • Folliculitis - infected hair follicles  • Cellulitis - deep skin infection  • Impetigo - superficial vesicle → rupture → thick, yellow weeping crusted lesion (AKA honeycomb lesion) (common on children's faces, especially around the mouth)
3.	What problems can be caused by Streptococcus pyogenes (group A streptococci)? (FA p146)  Proliferative / pyogenic Pharyngitis Scarlet fever Endocarditis Toxin-mediated Scarlet fever Toxic-shock syndrome Toxic-shock syndrome Autoimmune-antibody mediated but initiated by S. pyogenes Acute glomerulonephritis Rheumatic fever Rheumatic fever
4.	Why is group-B strep ( <i>Strep. agalactiae</i> ) so common in neonates? What types of infections does this organism cause in neonates? (FA p145)
5.	What are the different Viridans Strep.? (FA p145) S. salivarius S. sanguis S. mitis S. intermedius S. mutans → most prominent organism in dental plaque → may enter circulation during dental procedures and cause subacute endocarditis in those with turbulent flow heart problems (pre-existing endothelial damage). If pt has a heart problem, then prophylaxis with penicillin prior to procedure.
6.	What patients are susceptible to Listeria monocytogenes?
7.	HYQ: What organisms are most commonly implicated in subacute endocarditis?
8.	HYQ: A woman that is breast-feeding develops redness and swelling of her right breast over a period of 24 hours. Examination reveals a warm, fluctuant mass. → What is the diagnosis? →
9.	HYQ: What is the most common aerobic skin flora?

## Quick Quiz - Gram-positive Bacteria

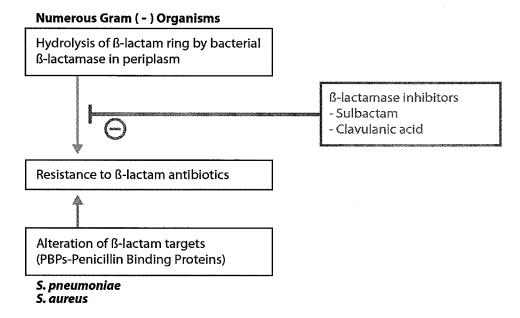
- 1. Which Gram (+) organism matches the following statement? (FA p141, FA p144 FA p148)
  - Causes scalded skin syndrome
  - White membrane on pharynx
  - Pharyngitis → glomerulonephritis
  - Most common cause of meningitis
  - Most common cause of osteomyelitis
  - · Serious newborn infections
  - Infant with poor muscle tone
  - Diarrhea after using antibiotics
  - Respiratory distress in a postal worker
  - Otitis media in children
  - Cellulitis
- 2. Label the following Gram (+) Algorithm:



- 3. HYQ: A 6-month-old child is given honey for symptomatic treatment of a cold and becomes flaccid. → What Gram (+) rod is implicated? → Clostridium botulinum → What is the mechanism of action? →
- 4. HYQ: One hour after eating potato salad at a picnic, an entire family began to vomit. After 10 hours, they were better. → What is the organism? →
- 5. What infections are caused by Strep. pyogenes (group-A strep)? (FA p146)

## Antibiotics - Cell Wall Inhibitors - Penicillins (FA p185)

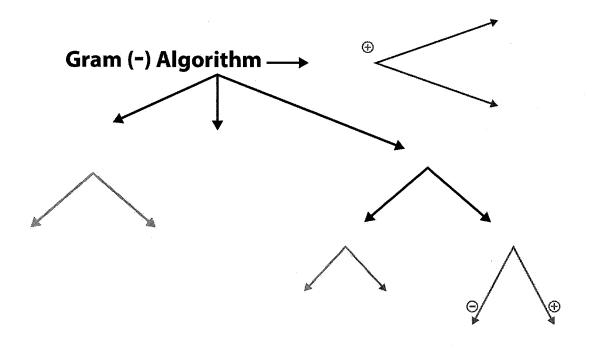
1. Name 2 penicillinase inhibitors that enhance the spectrum of penicillin drugs.

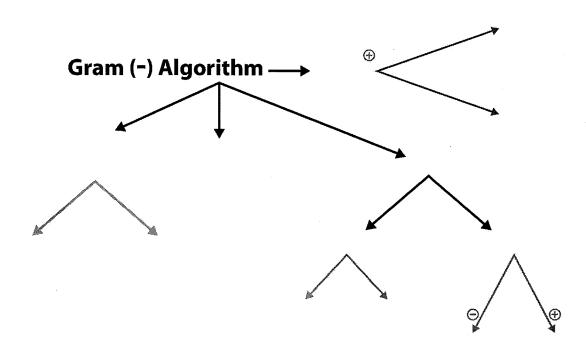


- 2. What is the mechanism of action of penicillin drugs?
- 3. What are the clinical uses for ampicillin and amoxicillin? Which has a greater oral bioavailability?
- 4. What penicillinase inhibitor (AKA beta-lactamase inhibitor) is combined with the following agents to create a drug with an extended spectrum of coverage>?
  - amoxicillin + \_\_\_\_ → Augmentin
  - ampicillin + \_\_\_\_\_ → Unasyn
  - ticarcillin + \_\_\_\_\_ → Timentin
  - piperacillin + \_\_\_\_ → Zosyn
- 5. Which penicillin drug would you use given the following infection?
  - Syphilis
  - UTI
  - Pseudomonas
  - Neonatal infection

) )

<u>An</u>	Antibiotics - Other Cell Wall Inhibitors (FA p184 - FA p187)				
1.	What cephalosporin has the 1 <sup>ST</sup> Gen Cephalexin (Keflex) Cefazolin (Ancef)	e longest half-life?  2 <sup>ND</sup> Gen  Cefprozil (Cefzil)  Cefuroxime (Ceftin)  Ceclor (Ceclor)	3 <sup>RD</sup> Gen Cefdinir (Omnicef) Cefotaxime (Claforan) Cefpodoxime (Vantin) Ceftazidime (Captaz, Tazicef) Ceftriaxone (Rocephin)	4 <sup>TH</sup> <u>Gen</u> Cefipime	
2.	What is a disulfiram-like rea	action? What drugs cau	se a disulfiram-like reaction? (F	A p94, FA p245)	
3.	What are the clinical uses f	or the 1 <sup>st</sup> generation cep	phalosporins?		
4.	What are the clinical uses f	or the 2 <sup>nd</sup> generation ce	phalosporins?		
5.	What are the clinical uses f	or the 3 <sup>rd</sup> generation cep	ohalosporins?		
6.	What are the clinical uses f	or the 4 <sup>th</sup> generation cer	ohalosporins?		
7.	What is the mechanism of a	action and clinical use fo	or aztreonam?		
8.	How is aztreonam similar to	o aminoglycosides? Ho	w is it different?		
9.	What drug is <u>always</u> admin	istered with imipenem?	How does this agent assist imig	penem?	
10.	Against what organisms are	e imipenem and merope	nem effective?		
11.	What is the clinical use and	l toxic side effects of var	ncomycin?		
	<ul> <li>Prophylaxis against bar</li> <li>Increases the nephroto</li> <li>Aminoglycoside pretenting</li> <li>Inpatient treatment for long</li> <li>Sufficient for the treatment of the single dose treatment of the Hospitalized pt with new</li> <li>Treatment for C. diff control</li> <li>Broad spectrum coverations</li> </ul>	yndrome of otitis media if resistan cterial endocarditis exicity of aminoglycoside der MRSA nent of syphilis for gonorrhea w Gram (+) cocci in clus	t to amoxicillin s ters in blood		





### **Gram-negative Supplement**

- 1. Neisseria gonorrhea
  - Urethritis, cervicitis, PID, epididymitis (same as Chlamydia trachomatis)
  - Most common cause of septic arthritis in young, sexually active individuals
  - Opthalmia neonatorum (vertical transmission during delivery)
    - sticky eye discharge, may cause blindness
       Rx: erythromycin eye drops
- 2. Pseudomonas aeroginosa
  - Pneumonia (CF, immunocomp)
- Osteomylitis (DM, IVDA)
- · Hot tub folliculitis

- Burn wound infections
- Sepsis (→ very high mortality)
- Endocarditis (IVDA)

- Corneal infections (contact lens)
- External otitis (elderly DM)
- UTI (indwelling Foley)
- 3. Enterobacteriaceae (E. coli, Salmonella, Shigella, Klebsiella, Enterobacter, Serratia, Proteus)
  - All species have somatic (O) antigen

• Flagellar (H) antigen- motile species

Capsular (K) antigen- related to the virulence of the bug

- All ferment glucose and are oxidase negative
- 4. E. coli → diarrhea, UTI, neonatal meningitis/pneumonia/sepsis
  - Entero-toxigenic (ETEC) → most common form of travelers diarrhea (Montezuma's revenge)
    - → Rx: TMP-SMX, fluoroguinolones
    - → similar to cholera (water, shellfish), rice water diarrhea
    - → no intestinal wall invasion → no fever
  - Entero-hemorrhagic (EHEC)\*→ (example) E. coli 0157:H7 → HUS from hamburger meat
     (HUS: hemolysis (anemia), renal failure (uremia), thrombocytopenia)
  - Entero-pathogenic → similar to Shigella
  - Entero-invasive (EIEC)\* → intestinal wall invasion → fever and bloody diarrhea
  - (\* EHEC and ElEC have sHIga like toxin (verotoxin) inhibits 60s ribosome)
- 5. What is the most common cause of gram negative sepsis?
- 6. Proteus spp. (mirabilis, vulgarus)
  - Very motile → no distinct colonies can be grown (common cause of UTI)
  - Carries urease: urea → NH3 + CO2 → ammonium-magnesium-phosphate stones → staghorn calculi
- 7. Salmonella (FA p152)
  - common cause of osteomyelitis in sickle cell patients
  - S. enterica and S. enteritidis: the most common cause of food associated diarrhea in developed countries (poultry, eggs, reptiles)
  - Antibiotics should be avoided because they may prolong the carrier state in Salmonella GI tract infections.
  - S. typhi: causes typhoid fever (see First Aid)
- 8. Shigella
  - · Bacterial dysentery can be caused by Shigella flexneri, Shigella sonnei, or Shigella dysenteriae
  - Shigella flexneri: a/w causing Reiter's syndrome
- 9. Animal Associated Bacteria (Zoonotic Bacteria FA p154)

Cat scratch

- Bartonella henselae

Puppy feces Animal urine - Yersinia enterocolitica

Dog/Cat bite Cat feces - Pasturella multocida- Toxoplasmosis

Rat bites

LeptospiraSpirillum minus

- 10. HYQ: Gram (-), oxidase positive diplococci →
- 11. HYQ: A 22-year-old medical student has a burning feeling in his gut after meals. An EGD is performed and biopsy of the gastric mucosa shows Gram (-) rods. → What is the organism? →
- 12. HYQ: A 50-year-old male smoker presents with a new cough and flu-like symptoms. Gram stain of the sputum shows no organisms but silver stain shows rods. → What is the diagnosis? →

### Quick Quiz - Gram-negative Bacteria

- 1. What Gram (-) bacteria match the following descriptions?
  - · Osteomyelitis in a patient with diabetes mellitus
  - Sepsis, DIC, adrenal hemorrhage
  - 5-yr-old with pharyngitis, drooling, and X-ray reveals thumb sign
  - Osteomyelitis in a patient with sickle cell
  - Alcoholic with aspiration pneumonia
  - Child with a new puppy develops severe abdominal pain
- 2. What enzymes do obligate anaerobes lack? (FA p139)
- 3. What Gram (-) organism matches the following statement?
  - Burn wound infection
  - Motile organism that causes UTI
  - Most common form of travelers' diarrhea
  - Life-threatening meningitis + purpura
  - Common cause of both UTI and pneumonia
  - Corneal infections in contact lens wearers
  - Septic arthritis in young, sexually active patients
- 4. HYQ: A 40-year-old female presents with acute onset of unilateral knee pain and bilateral Bell's palsy. → What organism is most likely responsible for these symptoms and how is it transmitted? →
- 5. HYQ: A 21-year-old male presents with 5 days of fever, chills, and an enlarged, painful knee. → What organism is most likely responsible for his symptoms? What is the treatment? →
- 6. HYQ: After taking a course of amoxicillin, an adult patient develops toxic megacolon and diarrhea. → What is the mechanism of diarrhea? →

) )

)

)

<u>An</u>	tibiotics – Protein Synthesis Inhibitors (FA p187 – FA p190)
1.	What drug classes inhibit protein synthesis?
2.	<ul> <li>Linezolid</li> <li>Mechanism of Action: binds 23s RNA and interacts with the bacterial initiation complex</li> <li>Uses: MRSA, VRE</li> </ul>
3.	Name 5 aminoglycosides.
4.	What are the clinical uses for aminoglycosides? With what type of antibiotics are aminoglycosides synergistic? Why are they ineffective against anaerobes?
5.	What are the side effects of the aminoglycosides?
6.	Which drugs have ototoxicity and nephrotoxicity as side effects?
7.	What are the clinical uses for tetracyclines?
8.	What should you never take with tetracyclines? What are the side-effects of tetracyclines?
9.	What are the clinical uses for macrolides?
10.	What is the most common cause of non-adherence with macrolide use?
11.	What is the clinical use and side-effects of chloramphenicol?
12.	What causes gray baby syndrome? Gray man syndrome? Red man syndrome?
	<ul> <li>Streptogramins</li> <li>Quinupristin/Dalfopristin (Synercid)</li> <li>Synthesized by the bacteria Streptomyces virginiae</li> <li>Streptogramin A: binds peptidyl transferase of the 50S ribosomal subunit (similar to chloramphenicol</li> <li>Streptogramin B: prevents protein chain extension</li> <li>Uses: MRSA, VRE, staph and strep skin infections</li> <li>SE: hepatoxicity, pseudomembranous colitis</li> </ul>
13.	What are the clinical uses and side-effects of clindamycin?
14.	What is the mechanism of action of sulfonamides? What is the mechanism of action of trimethoprim?
15.	What are the clinical uses for TMP-SMX?
16.	What other drugs should be avoided in patients with an allergy to sulfa? (FA p189, FA p246)

1	7	Nitrofurantoin

- Mechanism: Bacteriocidal. Reduced by bacterial proteins to a reactive intermediate that inactivates bacterial ribosomes
- Indication: UTI cystitis (not pyelonephritis) by E. coli or Staph. saprophyticus (not Proteus)
- SE: rarely nausea, HA, flatulence (safe in pregnancy)
- 18. What organisms most commonly cause UTIs?
- 19. What drugs have photosensitivity reactions?
- 20. What drugs can cause Stevens-Johnson syndrome? (FA p245)
- 21. What is the mechanism of action of quinolones? What are the clinical uses for fluoroquinolones?
- 22. What are the side-effects of fluoroquinolones?
- 23. What are the clinical uses for metronidazole?
- 24. What drugs are used in anaerobic infections?
- 25. What drugs are used in *H. pylori* triple therapy?
- 26. What is a disulfiram-like reaction? What drugs cause a disulfiram-like reaction?
- 27. What antibiotics are restricted to topical use because of nephrotoxicity?
- 28. What are the clinical uses and side-effects of polymyxin?
- 29. What drugs are effective against Pseudomonas?

)

)

)

<u>Qı</u>	uick Quiz – Organisms That Do Not Gram Stain
1.	Which <i>Rickettsial</i> sp. has properties unique from the other <i>Rickettsial</i> organisms? What are those unique properties? (FA p154-155)
2.	What infections are caused by Chlamydiae? What is the treatment for most Chlamydia infections? (FA p156
3.	What is the classic presenting symptom in a pt with Lyme disease? (FA p153)
4.	What is the distinction between a Ghon complex and a Ghon focus? Are these seen in primary or secondar tuberculosis? (FA p148)
5.	Which Mycobacteria spp. fits the following description? (FA p149)  Causes leprosy  Causes pulmonary TB-like symptoms in COPD pts  Causes cervical lymphadenitis in children  Causes a disseminated disease in AIDS pts  Hand infection in aquarium
6.	What is the <i>Rickettsial</i> triad of symptoms? (FA p155)
7.	HYQ: A 25-year-old with Mycoplasma atypical pneumonia exhibits anemia due to cryoagglutinins. → What type of immunoglobulins are responsible for the anemia? (FA p156) →
8.	HYQ: A homeless, alcoholic patient vomited while intoxicated and subsequently developed foul-smelling sputum. → What organism is most likely causing his infection? →
9.	<ul> <li>Which antibiotic should be used to treat the following infections?</li> <li>Mycoplasma pneumoniae</li> <li>Rocky Mountain Spotted Fever</li> <li>Early Lyme disease</li> <li>Late Lyme disease</li> <li>Syphilis</li> <li>Leprosy</li> <li>Bacterial vaginosis</li> </ul>

Antibiotic -	Mycobacteria	Agents (	(FA n190	- FA n191)
, tileininein	iii y oobaatti ia	rigonio (		- 1 /

- 1. What drug cocktail is used in the treatment of tuberculosis? 2. What is the only agent used as solo prophylaxis in TB? 3. What antibiotic is used for prevention of MAI in AIDS patients? When should this prophylaxis begin? 4. What is an important side effect of ethambutol? 5. What is the mechanism of action of isoniazid? What are the side-effects of isoniazid? 6. What drugs are known for causing drug-induced lupus? (FA p245) 7. For which infections is rifampin used? 8. What are the R's of rifampin? 9. What drugs are famous for inducing cytochrome P450? (FA p245) 10. What drugs are famous for inhibiting cytochrome P450? (FA p245)
- 11. What agent is used for prophylaxis for the following infections?
  - Gonorrhea
  - Syphilis
  - Recurrent UTIs
  - P. jiroveci pneumonia
  - Exposure to meningococcal or H. flu type-B meningitis
  - Endocarditis prevention in patient with turbulent flow heart disease

)

)

)

)

)

)

Qı	uick Quiz – Antibiotics
1.	What cell wall inhibitor matches the following statement? (FA p185 – FA p187)  next step in treatment of otitis media if resistant to amoxicillin  prophylaxis against bacterial endocarditis  increases the nephrotoxicity of aminoglycosides  sufficient for the treatment of syphilis  single dose treatment for gonorrhea
2.	What are the clinical uses for 1 <sup>st</sup> , 2 <sup>nd</sup> , 3 <sup>rd</sup> , and 4 <sup>th</sup> generation cephalosporins? (FA p186)
3.	What are the clinical uses for macrolides? (FA p188)
4.	What are the side effects of the aminoglycosides? (FA p187)
5.	What drugs have photosensitivity reactions?
6.	Classify the following antibiotic as an aminoglycoside, macrolide, or tetracycline. (FA p187 – FA p188)  Minocycline Gentamycin Frythromycin Tobramycin Azithromycin Doxycycline Amikacin Neomycin Clarithromycin Clindamycin
7.	What is a disulfiram-like reaction? What drugs cause a disulfiram-like reaction?
8.	What agent is used for prophylaxis for the following infections?  Gonorrhea  Syphilis  Recurrent UTIs

- P. jiroveci pneumonia
  Exposure to meningococcal or H. flu type B meningitis
  Endocarditis prevention in patient with turbulent flow heart disease
- 9. What drugs are known for inhibiting cytochrome P450? (FA p245)

## **Mycology** (FA p157 – FA p159)

- 1. Which fungus matches the following statement?
  - Found in SW US including west Texas and California
  - Found in Mississippi and Ohio River basins
  - · Causes "San Joaquin Valley fever"
  - Found in rural Latin America
  - A/w plant thorns and cutaneous injury
  - Found in states east of the Mississippi River
  - Found in bird and bat droppings
  - Mold form contains barrel-shaped arthroconidia
  - Associated with dust storms
  - Broad based budding of yeast
  - Multiple budding of yeast form
  - Causes diaper rash
  - Opportunistic mold with septate hyphae that branch at a 45 degree angle
  - Opportunistic mold with irregular nonspetate hyphae that branch at wide angles (>90 degrees)
  - Causes thrush in immunocompromised pts and vulvovaginitis in women
  - Known for causing pneumonia in AIDS pts → start Bactrim prophylaxis when CD4 <200</li>
  - Yeast known for causing meningitis in AIDS pts
- 2. What are 4 molds that are considered dermatophytes (fungal species commonly found invading superficial layers of skin)?
- 3. What infections are commonly caused by dermatophytes?
- 4. HYQ: A patient returns from a trip to New Mexico and now has pneumonitis. → What is the fungal cause of this pt's lung disease? →
- 5. HYQ: A 30 year-old female has "cauliflower" skin lesions. Tissue biopsy shows broad-based budding yeasts. → What is the likely organism? →
- 6. HYQ: An HIV (+) patient with CSF showing 75/mm³ lymphocytes suddenly dies. Yeast is identified in the CSF. → What is the most likely diagnosis? →
- HYQ: A patient presents with rose gardener's scenario (thorn prick with ulcers along lymphatic drainage). →
   What is the infectious bug? →
- 8. What infections are associated with birds?

)

)

)

)

)

)))

)

)

)

)

)

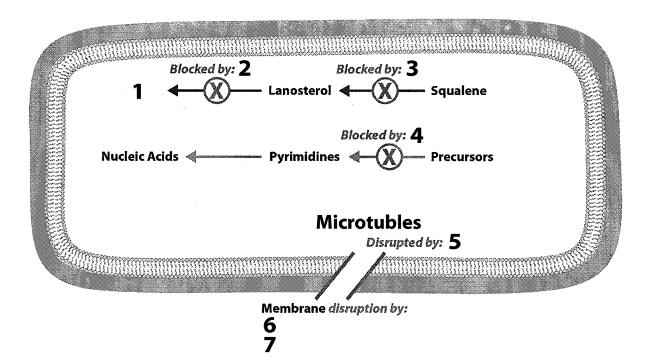
)

)

)

## Antifungals (FA p192 – FA p193)

- 1. Which antifungal fits the following statement:
  - · Interferes with microtubule function
  - "Swish and swallow" for oral candidiasis (thrush)
  - · Cell wall synthesis inhibiter used in invasive aspergillosis
  - Binds ergosterol → membrane pores
  - · Inhibits ergosterol synthesis
  - · Most common treatment for onychomycosis
  - SE: arrhythmias and nephrotoxicity
  - Deposits in keratin-containing tissues
  - Inhibits hormone synthesis and cytochrome P450
  - SE: liver dysfunction
  - SE: teratogenic, carcinogenic
  - Used for cryptococcal meningitis in AIDS
  - Converted to fluorouracil, inhibits DNA synthesis
  - Drug of choice for sporotrichosis
- 2. Which antifungal can be used intrathecally for fungal meningitis?
- 3. What is the clinical use and side effects of griseofulvin?
- 4. Label the following antifungal diagram:



### Parasites: Protozoa (FA p160 – FA p163)

- 1. What protozoan matches the following statement?
  - cause of malaria
  - Most common protozoal infection in US
  - Cause of Chagas disease
  - · Amoebic dysentery
  - African sleeping sickness
  - · Diarrhea in campers and hikers
  - Transmitted in raw meat or infected cat feces
  - Transmitted by sandflies
  - Causes vaginitis
- 2. HYQ: A pt who visited Mexico presents with bloody diarrhea. → What infectious form is found in the stool? →
- 3. HYQ: 32-year-old male pt went camping in northern California 2 weeks ago, had a 2 day stint of diarrhea and now presents with symptoms of liver damage and jaundice →
- 4. What is the name of the following stage in the malaria life-cycle?
  - Looks like a diamond ring
  - Ruptures the cell host
  - Replicating intracellularly
  - Form injected from the Anopheles mosquito
  - Banana-shaped
- 5. HYQ: Patient returning from 2 week vacation in west Africa presents with typical malaria presentation and recurrent fever. → What is the mechanism responsible from this pt's recurrent fever? →

### Parasites: Helminths

- 5. What helminth matches the following statement?
  - · most common helminthic infection in the US
  - One-third of the world infected with it
  - Snail host, "swimmer's itch"
  - Most common predisposing factor for bladder CA in 3<sup>rd</sup> world countries
  - Contracted by eating undercooked fish and causes an inflammation of the biliary tract
  - Soil → enters through skin → venous blood supply → lungs → coughed into pharynx → swallowed into
    the intestines where they reside
  - Hookworm
  - Roundworm
  - Contracted by eating undercooked crabmeat and causes inflammation and secondary bacterial infection of the lung
  - Pork tapeworm
  - Responsible for lymphatic filariasis
  - · Adult pt from Mexico with new onset seizures and brain calcifications
  - Hematuria in patient from 3<sup>rd</sup> world country
- 7. What medication is used to treat the following parasitic infection?
  - Giardia, Entamoeba, Trichomonas
  - Most malarias
  - Plasmodium vivax or ovale
  - Resistant malarias
  - Most all flukes and tapeworms
  - · Hookworm, pinworm, roundworm
  - · Chagas disease
  - Best guess for roundworms
  - Leishmaniasis

)

)

)

)

)

)

)

) )

)

)

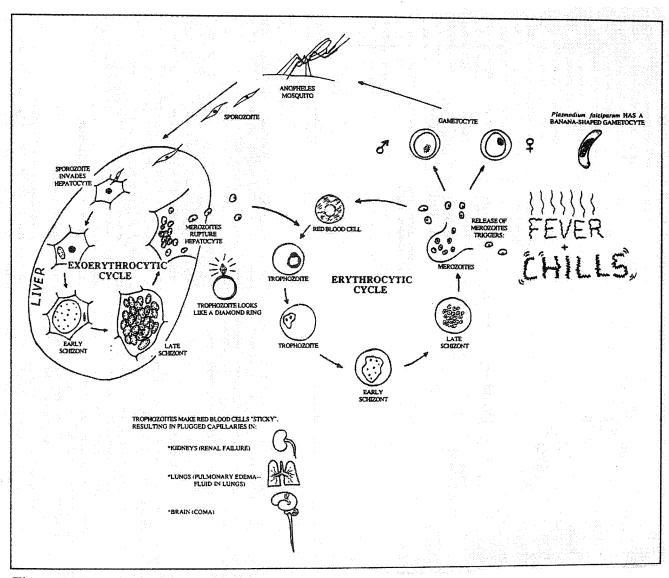


Figure 30-7

Used with permission from Gladwin M, Trattler B. Clinical Microbiology Made Ridiculously Simple, MedMaster inc.

- 8. What is the treatment for pediculosis capitis and pediculosis pubis?
  - Pediculosis capitis (caused by Pediculus humanus AKA lice) wash scalp normally then towel dry → saturate scalp with permethrin cream (OTC Nix 1%) or pyrethin (OTC Rid) for 10min then rinse → repeat in 1 week due to resistance (CDC rec.)
    - Malathion lotion 0.5% (Rx) may be used instead of permethrin
    - Lindane is not used due to potential neurotoxicity and widespread resistance
    - Invermectin can be used in resistant cases (not FDA approved). 200 mcg/kg po x1, repeated in 2wks
    - <u>If younger than 2 years</u>, then wet combing with conditioner or olive oil rather than insecticides performed q3-4 days for weeks
    - Children may return to school after the first treatment session (wet combing or insecticide)
  - Pediculosis pubis (caused by Phthirus pubis AKA "crabs") permethrin 1% cream (OTC Nix 1%) or pyrethin (OTC Rid) for 10min then rinse → repeat in 1 week
    - Malation or Invermectin can used as alternatives (see above)
    - Sexual partners need to be treated at the same time
    - Bedding and clothing should be machine washed and dried in a hot dryer, dry cleaned, or bagged for a min of 72 hrs

## Quick Quiz: Fungi & Parasites

- 1. Which antifungal fits the following statement?
  - Inhibits ergosterol synthesis
  - SE: arrhythmias and nephrotoxicity
  - · Deposits in keratin-containing tissues
  - Inhibits hormone synthesis and cytochrome P450
  - SE: liver dysfunction
- 2. Which fungus fits the following statement?
  - Causes "San Joaquin Valley fever"
  - Found in rural Latin America
  - A/w plant thorns and cutaneous injury
  - Found in states east of the Mississippi River
  - Found in bird and bat droppings
  - Mold form contains barrel-shaped arthroconidia
- 3. Which protozoa are responsible for the following diseases?
  - Chagas disease
  - Protozoal vaginitis
  - Malaria
  - Birth defects
  - Bloody diarrhea
  - · Foul-smelling diarrhea, flatulence, bloating
- 4. What medication is used to treat the following parasitic infection?
  - Giardia, Entamoeba, Trichomonas
  - Plasmodium vivax or ovale
  - Most all flukes and tapeworms
  - Hookworm, pinworm, roundworm
- 5. What organism is transmitted by the following vector?
  - Freshwater snail
  - Ixodes tick
  - Reduviid bug
  - Anopheles mosquito
  - Sandfly
  - Tsetse fly

)

)

## Viruses (FA p166 - FA p174)

- 1. Which DNA virus is associated with the following statement?
  - Erythema infectiosum (AKA fifth disease)
  - Heterophil-positive mononucleosis
  - · Can cause conjunctivitis or diarrhea
  - Enlarged cell with owl's eye inclusions
  - Identified with a Pap smear
  - Milkmaid's blisters
  - · Burkitt's lymphoma and nasopharyngeal carcinoma
  - Gingivostomatitis
  - Hides in sensory ganglia of S2 and S3
  - · Hides in trigeminal ganglia
  - · Hides in dorsal root ganglia
  - Viral family of JC virus
  - Downey cells
  - Human progressive multifocal leukoencephalopathy
  - Oral hairy leukoplakia
  - Multinucleate giant cells on Tzanck test
  - Only DNA virus that is not double-stranded
  - Roseola
  - Heterophil-negative mononucleosis
- 2. Which RNA virus matches the following statement?
  - · Hand, foot, and mouth disease
  - "Break bone fever"
  - Characteristic barking seal cough
  - African hemorrhagic fever
  - "Common cold"
  - · Fever, jaundice, black vomit
  - · Childhood diarrhea in winter months
  - Asthma-sounding infection in infants (esp. premies)
  - · Meningitis in summer months
  - Tourniquet test helps diagnose hemorrhagic disease
  - Infects motor neurons of the anterior horn
- HYQ: A 45-year-old male with squamous cell carcinoma of penis had exposure to what virus? →
- 4. HYQ: A 20-year-old college student presents with lymphadenopathy, fever, and hepatosplenomegaly. His serum agglutinates sheep red blood cells. → What cell type is infected? →
- 5. HYQ: The X-virus has one virulence factor that causes an upper respiratory tract infection (factor A) and one virulence factor the causes gastroenteritis (factor B). → In order to determine which segment of the X-virus gene determines the manifestation of the infection, researchers rearrange each of the virulence factors to each of the 3 segments: L, M, and N. → Which segment is most responsible for the clinical manifestation of a X-virus infection?

Segment L A B	<u>Segment M</u> A B	<u>Segment N</u> A B	Manifestation viral URI gastroenteritis
Α	Α	В	viral URI
В	Α	Α	viral URI
Α	Α	Α	viral URI
В	В	Α	gastroenteritis
В	В	В	gastroenteritis

- 6. HYQ: How does rabies virus travel through the CNS so that it can cause fatal encephalitis with seizures? →
- 7. HYQ: What is the characteristic shape of the rabies virus?

#### Kaposi's Sarcoma

- Low grade vascular tumor. Not a true malignancy.
- There are different types, one of which is the HIV associated
- Associated with HIV and more common in homosexual men
- Pathogenesis: lymphoangiogenic growth factors/cytokines: TNFα, IL-6, PDGF
- Histo: neovascularization and leukocyte infiltration
- Complications: lesions in lung → hemoptysis
- Treatment: HAART, liposomal doxorubicin (or daunorubicin), topical retinoic acid gel, intralesional vinblastine, interferon-alpha

### Dengue Fever

- Most prevalent mosquito-borne viral disease worldwide
- > 50 million annual, worldwide infections
- Disease severity ranges from mild to life-threatening
- Classic dengue fever = "Break Bone Fever": muscle/joint pain, headache, retro-orbital pain
- Hemorrhagic fever: developed by < 20% of dengue patients</li>
- Tourniquet Test:
- WHO field test for hemorrhagic fever
- BP inflated to a point between SBP and DBP
- If excess petechiae = increased capillary wall fragility and thrombocytopenia

### West Nile Virus

- Birds are the reservoir, and mosquitoes are the vectors. Humans, horses, and dogs are incidental hosts.
- Sx: usually only headache, malaise, back pain, myalgia, and anorexia for 3-6 days ("flu-like")
- Severe Sx in 1/150: meningitis +/- encephalitis including muscle weakness and flaccid paralysis (via anterior-horn involvement), alterations in consciousness, possibly death
- Dx: serology for IgM anti-WNV antibodies
- · Treatment: supportive

### Avian Influenza

- H5N1
- It is only spread from bird → human (but great fears of mutation that would allow human → human spread)
- Sx: URI, GI symptoms (diarrhea), fever, pancytopenia, elevated aminotransferases (ALT, AST)
- Dx: reverse transcriptase PCR or viral culture
- Rx: oseltamavir

## H1N1 Influenza

- "Swine Flu" (from two swine flu strains, one human strain, and one avian strain)
- Sx: typical flu + GI symptoms
- Rx: oseltamivir or zanamivir to high-risk or severely ill patients (but local surveillance data should guide drug choice)

)

)

)

)

)

)

)

)

) )

)

)

)

)

)

### Parainfluenza / Croup

- · Laryngo-tracheo-bronchitis
- Sx: characteristic barking seal cough, respiratory distress (may mimic asthma), inspiratory stridor
- Primarily ages 6m 3yrs. The leading cause of hospitalization in children younger than 4 years.
- Dx: clinical, x-ray may show steeple sign
- Rx: cool mist humidifier (no proven benefit), racemic epinephrine, one dose of dexamethasone, supportive, oxygen as needed

### **RSV** bronchiolitis

- Bronchiolitis +/- pneumonia
- Sx: characteristic brassy cough, wheezing, respiratory distress (may mimic asthma)
- Season: winter (same as flu season)
- Passive immunization with Palivizumab (monoclonal RSV immunoglobulin) monthly during the winter months in premature infants or infants with chronic lung disease
- Rx:
  - Albuterol or racemic epinephrine
  - Supplemental oxygen as needed
  - Steroids are not used (ineffective unless coexisting asthma)
  - Ribavirin is not generally used in children (unproven efficacy in children, AAP recommends against the use of ribavirin for RSV)
  - Ribavirin may be used in adults especially if RSV develops after a bone marrow transplant

## Antiviral Review (FA p195 – FA p197)

Which antiviral(s) matches the following statement?

- · Prophylaxis for influenza A
- Inhibits CMV DNA polymerase
- Used in treatment for chronic hepatitis C
- First-line for HSV or EBV
- Blocks viral penetration and uncoating
- · Treats both influenza A and B
- · Second-line for CMV retinitis
- · Derivative of amantadine with fewer side effects
- Inhibits viral DNA polymerase when phosphorylated by viral thymidine kinase

## Highly Active Antiretroviral Therapy (HAART) (FA p197)

## CCR5 Antagonists: Maraviroc

- Binds CCR5 on macrophages thereby inhibiting gp120 conformational change
- Useful in early HIV disease when virus is solely R5 phenotype

## Integrase Inhibitors: Raltegravir (FDA approved 2009)

- Inhibits HIV-1 integrase enzyme
- SE: unfavorable lipid profile

Protease Inhibitors: saquinavir, ritonavir, indinavir, nelfinavir, amprenavir

Side Effect	HIV Drug or Class
GI Intolerance	
Inhibit Cytochrome P450	
Lipodystrophy and hyperglycemia	
Pancreatitis	
Nephrolithiasis	

NRTI: zidovudine, didanosine, zalcitabine, stavudine, lamivudine, abacavir

Side Effect	HIV Drug or Class
Pancreatitis and peripheral neuropathy	
Hepatic steatosis	
Hypersensitivity Reactions	

NNRTI: nevirapine, declavirdine, efavirenz

Side Effect	HIV Drug or Class	
Rash		
False-positive drug test to		
cannabinoids		
Confusion		

## Which antiretroviral or antiretroviral class matches the following statement?

- SE: lactic acidosis
- SE: GI intolerance
- SE: pancreatitis
- · SE: peripheral neuropathy
- SE: megaloblastic anemia
- SE: rash
- SE: hyperglycemia, diabetes mellitus, and lipid abnormalities
- SE: bone marrow suppression
- Given to pregnant women with HIV
- Regimen for occupational HIV exposures
- A combination of different classes of medication used to attack the HIV at different points in its replication/infection cycle in order to control the infection and avoid resistance.

)

)

### **Quick Quiz: Viruses**

- 1. What virus fits the following statement? (FA p166 FA p174)
  - · Can cause conjunctivitis or diarrhea
  - Fever + jaundice + black vomit
  - Enlarged cell with owl's eye inclusions
  - Identified with a Pap smear
  - Barking seal cough
  - Brassy cough
  - Negri bodies
  - Hides in trigeminal ganglia
  - Diarrhea in children during winter months
  - 2 most common causes of common cold
  - Downey cells
  - Aseptic meningitis
- 2. What causes a steeple sign on X-ray?
- 3. What causes a thumb sign on X-ray?
- 4. What is the treatment for the different herpes viruses? (FA p196)
- 5. For what infections is interferon used? (FA p198)
- 6. Which antiviral(s) matches the following statement? (FA p195 FA p196)
  - Inhibits CMV DNA polymerase
  - Used in treatment for chronic hepatitis C
  - · Blocks viral penetration and uncoating
  - Treats both influenza A and B
  - Second-line for CMV retinitis
- 7. Identify the hepatitis B status of the following patients based on their hepatitis B serologic markers.

HepBsAg	<u>HepBsAb</u>	<u>HepBcAb</u>	<u>Status</u> .
Negative	Positive	Positive	
Negative	Negative	Positive	
Positive	Negative	Positive IgM	
Positive	Negative	Positive IgG	
Negative	Positive	Negative	

8. What are the two HIV envelope proteins and the drugs that interfere with them? (FA p173)

## Micro by Systems (FA p175 - FA p185)

- 1. What infectious agent most likely corresponds to the following statement?
  - Food poisoning as a result of mayonnaise sitting out too long
  - Diarrhea caused by Gram (-) nonmotile organism that does not ferment lactose
  - Rice-water stools
  - Diarrhea caused by a C or S-shaped organism
  - Diarrhea transmitted from pet feces
  - Food poisoning resulting from reheated rice (Chinese food)
  - Diarrhea caused by Gram (-) motile organism that doesn't ferment lactose
  - Most common cause of "travelers' diarrhea"
  - Diarrhea after a course of antibiotics
  - Diarrhea caused by Gram (-) lactose fermenting bacteria, no fever
  - Diarrhea caused by Gram (-) comma-shaped organism, no fever
  - Diarrhea + recent ingestion of water from a stream
  - Food poisoning from undercooked hamburger
- 2. Which infectious agent fits the following description?
  - · Common cause of pneumonia in immunocompromised pts
  - · Most common cause of atypical / walking pneumonia
  - Most common fungal infection of the lung in the Texas/Gulf Coastal region
  - Common causative agent for pneumonia in alcoholics
  - Can cause an interstitial pneumonia in bird handlers
  - Often the cause of pneumonia in a pt with a history of exposure to bats and bat droppings
  - Fungal cause of pneumonia in a pt who has recently visited South California, New Mexico, or West Texas
  - Pneumonia associated with "current jelly" sputum
  - Q fever
  - A/w pneumonia acquired from air conditioners
  - Most common cause of pneumonia in children 1 year old or younger
  - Most common cause of pneumonia in the neonate (B-28d)
  - Most common cause of pneumonia in children and young adults (including college students, military recruits, and prison inmates)
  - Common cause of pneumonia in pts with other health problems
  - Most common cause of viral pneumonia
  - Causes a wool-sorter's disease (a life-threatening pneumonia)
  - Endogenous flora in 20% of adults
  - Common bacterial cause of COPD exacerbation
  - Common pneumonia in ventilator pts and those with cystic fibrosis
  - Pontiac fever
- 3. What are the features of congenital syphilis?

Early manifestations (first 5 weeks of life)

- Hepatosplenomegaly, elevated LFTs
- Hemolytic anemia, jaundice
- Rash followed by desquamation of hands and feet
- Snuffles (blood-tinged nasal secretions)
- Radiographic changes at birth: metaphyseal dystrophy and periostitis

Late manifestations (if left untreated in the first 3 months of life)

- Hutchinson teeth (notching or blunting of the upper incisors)
- Saddle nose deformity
- Frontal bossing
- Saber shins (anterior bowing of the tibia)
- 4. Vaginal Discharge / Vaginitis

)

)

)

)

)

)

)

)

)

∣ pH	Historical Clues	Wet Prep
· ·		
		-
	pH	pH Historical Clues

_		:	41	D4	D = = = = =
υ.	rever	11 1	uie	Post-op	renou

Wind

Water

Wound

Walking

Wein

Wonder drugs

- 6. HYQ: An adolescent presents with cough and rust-colored sputum. → What does the gram stain of the sputum show? →
- 7. HYQ: A HIV (+) pt with a CD4 count of 250 presents signs of meningitis. Examination of the CSF reveals a heavily encapsulated organism. → What organism is responsible for the meningitis? →
- 8. HYQ: An older male patient has blood in his urine and renal stones. → What organism is most likely responsible for this pt's stones? →
- 9. HYQ: A 50-year-old patient recovered from abdominal surgery performed 2 days ago and has had an internal catheter in place since that time. He now has a fever of 100 degrees F. → What is the most likely cause of his fever? →

## Micro End Session Quiz

1.	What are the most common causes of UTI? (FA p177)
2.	What are the most common causes of pneumonia for the following pt populations? (FA p176)  6w – 18y  18y – 40y  40y – 65y  Elderly
3.	What findings would help you distinguish bacterial meningitis from fungal meningitis and a viral meningitis? (FA p177)
4.	What pathology fits the following high-yield statement (FA p524)  Signet-ring cells  Nutmeg liver  Maternal elevations of AFP  RBC casts in urine  Currant-jelly sputum  Dog or cat bite
5.	What are the TORCH infections? (FA p178)
6.	Which STD matches the following statement? (FA p181)  Clue cells  Painless genital ulcer  Flagellated cells  Strawberry cervix
7.	What CSF findings would you see in a pt with TB meningitis? (FA p177)
8.	<ul> <li>Which infectious agent fits the following description?</li> <li>Most common cause of atypical / walking pneumonia</li> <li>Common causative agent for pneumonia in alcoholics</li> <li>Can cause an interstitial pneumonia in bird handlers</li> <li>Often the cause of pneumonia in a pt with a history of exposure to bats and bat droppings</li> <li>Fungal cause of pneumonia in a pt who has recently visited South California, New Mexico, or West Texas</li> <li>Pneumonia associated with "current jelly" sputum</li> <li>Most common cause of pneumonia in children 1-year-old or younger</li> <li>Most common cause of pneumonia in the neonate (B-28d)</li> <li>Most common cause of pneumonia in children and young adults (including college students, military</li> </ul>
9.	recruits, and prison inmates)  Categorize the following agents as a protease inhibitor, NRTI, or NNRTI:  Ritonavir – Abacavir –  Didanosine – Lamivudine –
	Declavirdine –  Didanosine –  Declavirdine –  Nelfinavir –  Efavirenz –

### <u>Immunology</u>

- 1. What CD surface marker fits the following statement? (FA p208)
  - Displayed only by helper T cells
  - Displayed only by cytotoxic T cells (and suppressor T cells)
  - Found on all T cells (except NK cells)
  - Used to ID B cells
  - Found on all NK cells and binds the constant region of IgG
  - Inhibits compliment C9 binding
  - Endotoxin receptor found on macrophages
- 2. What <a href="mailto:cytokine(s)">cytokine(s)</a> matches the following statement? (FA p208)
  - Promotes B cell growth and differentiation
  - Produced by Th<sub>1</sub> cells
  - Produced by Th<sub>2</sub> cells
  - Involved in growth and activation of eosinophils
  - Secreted by helper T cells and activates macrophages
  - Inhibits macrophage activation
  - Pyogens secreted by monocytes and macrophages
  - Inhibits production of Th<sub>1</sub> cells
  - Inhibits production of Th<sub>2</sub> cells
  - Mediate inflammation
  - · Enhances synthesis of IgE and IgG
  - Enhances synthesis of IgA
  - · Released by virally infected cells
  - · Supports growth and differentiation of bone marrow stem cells
  - Supports T cell proliferation, differentiation, and activation
- 3. <u>V(D)J Recombination</u> Highlights (FA p205)
  - Rearrangements of the DNA segments named variable (V), diversity (D), and joining (J) compose the
    coding regions for each specific antigen receptor on B and T cells
  - The rearrangement process begins with breaks in the dsDNA at <u>Recombination Signal Sequences</u> (<u>RSSs</u>) that flank the V, D, and J coding regions
  - V(D)J recombination is initiated by the <u>recombination activating gene complex (RAG 1 and 2)</u> → RAG 1 and RAG 2 protein that recognize the RSSs
  - Mutations in either of the RAG genes in mice → inability to initiate V(D)J rearrangements → arrest of B
    and T cell development
- 4. Which immunoglobulin isotype fits the following statement? (FA p206)
  - Associated with allergies because it is bound by mast cells and basophils and causes them to degranulate and release their histamine
  - Comprises 70-75% of the total immunoglobulin pool
  - Present in large quantities on the membrane of many B cells
  - · Crosses the placenta and, additionally, confers immunity to neonates in the first few months of life
  - Can occur as a dimer
  - Largely confined to the intravascular pool and is the predominant early antibody frequently seen in the immune response to infectious organisms with complex antigens
  - Distributed evenly between the intravascular and extravascular pools
  - The predominant immunoglobulin in mucoserous secretions such as saliva, colostrum, milk, tracheobronchial secretions, and genitourinary secretions
  - Can be a pentamer

### Immunology (continued)

- 5. Paroxysmal Nocturnal Hemoglobinuria (PNH) (FA p352)
  - Hemosiderinuria
  - Chronic intravascular hemolysis
  - Thrombosis
  - Dx: Ham's test
  - Rx:
- 6. Erythroblastosis Fetalis (FA p353)
  - Maternal antibodies to fetal RBC antigen
  - The most common antibody is Rh-D
  - In Rh(-) moms, dose anti-Rh-D immunoglobulin at 28wks, at any traumatic event (MVA), and within 3d of delivery
  - Clinical features in the neonate:
    - Anemia due to hemolysis of RBC by maternal Ab
    - Jaundice → possible kernicterus
    - Hydrops fetalis (generalized fetal edema)
    - IU death
- 7. Which type of hypersensitivity is responsible for the following clinical problem? (FA p211)
  - Poststreptococcal glomerulonephritis
  - Asthma
  - Rheumatic fever
  - Tuberculosis skin test
  - Allergies, anaphylaxis, and hay fever
  - Polyarteritis nodosa
  - Serum sickness
  - ABO blood type incompatibility
  - Poison ivv
  - Eczema
  - Contact dermatitis
  - Goodpasture's syndrome
- 8. Elevated ESR (FA p223)
  - Polymyalgia rheumatica
  - Temporal arteritis
  - · Disease activity in RA and SLE
  - Infection, Inflammation (eg, osteomyelitis)
  - Malignancy
- 9. HYQ: Which complement is responsible for neutrophil chemotaxis →

## <u>Immunodeficiencies</u>

- 10. HYQ: A young child presents with tetany from hypocalcemia and candidiasis resulting from immunosuppression. → What cell type is deficient? →
- 11. HYQ: A young child has recurrent lung infections and granulomatous lesions. → What is the defect in neutrophils? →
- 12. HYQ: A mother brings in her 2-year-old child who has had multiple viral and fungal infections and is found to be hypocalcemic. → Which of the 3 types of germ cells (ecto-, endo-, and mesoderm) gives rise to the missing structure in this child? →
- 13. HYQ: A child has an immune disorder in which there is a repeated *Staph*. Abscesses. → It is found that the neutrophils fail to respond to chemotactic stimuli. → What is the most likely diagnosis? →

)

)

)

)

)

)

)

)

)

)

)

)

)

)

)

)

)

)

)

)

)

## **Immunodeficiencies**

## Bruton's Agammaglobulinemia

- X-linked (Boys)
- <u>B</u> cell deficiency → defective tyrosine kinase gene → low levels of all Ig's
- Recurrent <u>Bacterial infections after 6m</u>

## Thymic aplasia (DiGeorge)

- 3<sup>rd</sup> and 4<sup>th</sup> pouches fail to develop
  - No thymus → no T cells
  - No PTH's → Iow Ca<sup>2+</sup> → tetany
- Congenital defects in heart / great vessels
- · Recurrent viral, fungal, protozoal infections
- 90% have a chrom 22q11 deletion (detect with FISH)

## Severe Combined Immunodeficiency (SCID)

- Defect in early stem cell differentiation
- Can be caused by at least 7 different gene defects;
  - Adenosine deaminase deficiency
- Last defense is cytotoxic NK cells

#### Presentation Triad

- 1. Severe recurrent infections
  - -Chronic mucocutaneous Candidiasis
  - -Fatal or recurrent RSV, VZV, HSV, measles, flu, parainfluenza
  - -PCP pneumonia
- 2. Chronic diarrhea
- 3. Failure to thrive
- No thymic shadow on newborn CXR

## **Chronic Mucocutaneous Candidiasis**

- T cell dysfunction v. C. albicans
- Rx: ketoconazole

## X-linked Immunodeficiencies

- Wiskott- Aldrich
- Bruton's Agammaglobulinemia
- <u>Chronic Granulomatous Disease (+/-)</u>
- Hyper-IgM syndrome (3 types) ↑IgM, ↓Ig's
  - X-linked → no CD ligand
  - AR → no CD40
  - NEMO deficiency

#### Wiskott

#### Aldrich

### **Immunodeficiency**

## Thrombocytopenia and purpura

### **Eczema**

## Recurrent pyogenic infections

- No IgM v. capsular polysaccharides of bacteria
- Low IgM, high IgA
- X-linked

### Ataxia-telangiectasia

- IgA deficiency
- Cerebellar <u>a</u>taxia, and poor smooth pursuit of moving target w/ eyes
- Telangiectasias of face > 5yo
- † CA risk: lymphoma & acute leukemias
- Radiation sensitivity (try to avoid x-rays)
- +/- ↑αfp in children > 8m
- Ave age of death 25 y/o

#### Selective Immunoglobulin Deficiencies

- IgA deficiency is most common
  - Most appear healthy
  - Sinus and lung infections
  - 1/600 European descent
  - Associated with atopy, asthma
  - Possible anaphylaxis to blood transfusions and blood products

#### IL-12 receptor deficiency

Mycobacterial infections

#### **Immunodeficiencies** (continued)

#### **Phagocyte Deficiencies**

- Chronic granulomatous disease
- Chédiak-Higashi disease
- Job's syndrome
- Leukocyte adhesion deficiency syndrome

#### **Chronic Granulomatous Disease (CGD)**

- Lack of NADPH oxidase activity → impotent phagocytes
- Susceptible to organisms with catalase (S. aureus, E. coli, Klebsiella spp., Aspergillus spp., Candida spp.)
- Dx: (-) nitroblue tetrazolium (NBT) dye
  - No yellow to blue-black oxidation
- Prophylactic TMP-SMX
- INFy also helpful

#### Chédiak-Higashi Disease

- Defective LYST gene (lysosomal transport)
- Defective phagocyte lysosome → giant cytoplasmic granules in PMNs are diagnostic

#### Presentation Triad:

- Partial albinism
- Recurrent respiratory tract and skin infections
- · Neurologic disorders

#### Job Syndrome

- Hyperimmunoglobulin E syndrome
- Deficient INFy → PMNs fail to respond to chemotactic stimuli (C5a, LTB<sub>4</sub>)
- · High levels of IgE and Eosinophils

#### Presentation Triad:

- Eczema
- Recurrent <u>cold</u> Staph. aureus abscesses (think of biblical Job with boils)
- Course facial features: broad nose, prominent forehead ("frontal bossing"), deep set eyes, and "doughy" skin
- Also common to have retained primary teeth resulting in 2 rows of teeth

#### **Leukocyte Adhesion Deficiency Syndrome**

- Abnormal integrins → inability of phagocytes to exit circulation
- Delayed separation of umbilicus

)

)

)

)

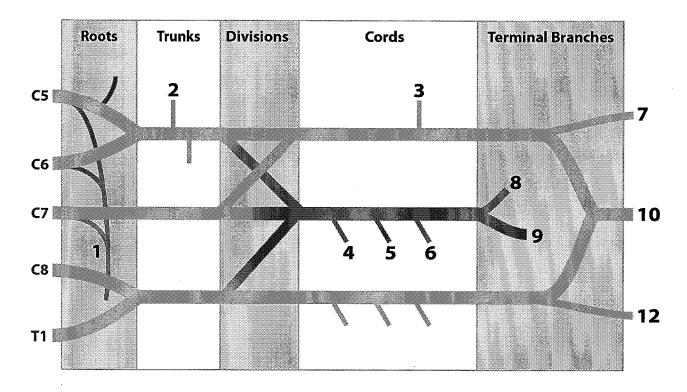
)

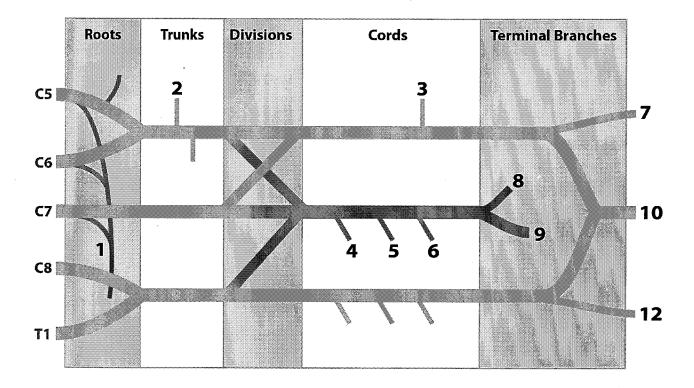
)

)

)

<u>ım</u>	munology Quiz
1.	What would you expect to see in a pt with Wiscott-Aldrich syndrome? (FA p214)
2.	What is the cause of chronic granulomatous disease? What infections are these individuals susceptible to? (FA p214)
3.	In what disease would you see the following antibodies? (FA p212)  Anti-mitochondrial  Anti-TSH receptor  Anti-centromere  Anti-basement membrane  Anti-neutrophil
4.	Which type of hypersensitivity is responsible for the following clinical problem? (FA p210)  Asthma  Tuberculosis skin test  Allergies, anaphylaxis, and hay fever  ABO-blood type incompatibility  Poison ivy  Eczema  Goodpasture's syndrome
5.	What cytokine(s) matches the following statement? (FA p208)  • Promotes B cell growth and differentiation  • Produced by Th₁ cells  • Produced by Th₂ cells  • Secreted by helper T cells and activates macrophages  • Pyogens secreted by monocytes and macrophages  • Enhances synthesis of IgE and IgG  • Enhances synthesis of IgA  • Released by virally infected cells
6.	What drugs are composed of antibodies against TNF? (FA p393)
7.	How does the mechanism of type II hypersensitivity differ from the mechanism of type III hypersensitivity? (Fp210)
8.	HYQ: A patient suffers from recurrent <i>Neisseria</i> infections. → What complement proteins are deficient? →
9.	HYQ: A 45-year-old female complains of malar rash and arthritis. → The presence of which antibodies are specific for SLE? →
10.	HYQ: After bone marrow transplantation, a patient suffers from dermatitis, enteritis, and hepatitis. → What disease process is occurring? →





#### **Epidemiology** (FA p50 – FA p56)

 What is the sensitivity, specificity, positive and negative predictive value using antibodies to X to detect disease X?

	Autoimmune Disease X		
	Present	Absent	
Antibody to X	800	200	
Antibo Absent	100	1400	

#### 2. Attributable risk (AR) (FA p52)

- AR = incidence of disease in the exposed group incidence of disease in the unexposed group
- Example: In a population of fornicators, 30% have HPV infection. In a population of non-fornicators, only 5% have HPV infection. The attributable risk of fornication to HPV is 25%.

#### 3. Number Needed to Treat (NNT)

- NNT = 1/absolute risk reduction
- Number of patients you would need to treat in order to save/effect one life
- · Important number to help determine if a drug should be used or is cost effective
- Example: If out of 10,000 pts that took t-PA during a STEMI, 100 were saved by the t-PA, then the NNT is 100. In other words, you would need to treat 100 pts in order to save/effect 1 life.
- 4. What is the absolute risk reduction and number needed to treat in the following example: In a study where 100 patients received medication Z to prevent the development of diabetes and 200 patients did not receive the medication, 10 patients in the experimental group developed diabetes and 40 patients in the control group developed diabetes?
- 5. HYQ: A physician is looking for risk factors for pancreatitis. He interviews 100 hospitalized pts with pancreatitis and 100 hospitalized pts without pancreatitis. → What type of study is this? →
- 6. HYQ: A new glucose test arrives and you decide to see how well it works. There is a standard substance provided that has 90 mg/dL of glucose. Your repeated measurements of the substance reveal the following values: 54, 56, 55, 54, 53, 56, 55, and 54. → What can you say about the precision and accuracy of your new glucose test? →
- 7. HYQ: A group of people that smoke and that do not smoke is followed over twenty years. Every two years, it is determined who develops cancer and who does not. → What type of study is this? →
- 8. HYQ: A certain screening test has a 1% false-negative rate. → What is the sensitivity of the test? →
- 9. HYQ: The prevalence of varicella in population A is 2 times the prevalence of varicella in population B. The incidence is the same in populations A and B. → What can be assumed about the disease duration in population A versus population B? →

#### **Epidemiology** (continued)

#### 10. Examples of Bias:

- <u>Selection bias</u> In a trial of a new anticancer drug, only the patients with end-stage disease are selected to receive the new drug. → What about the ones with early-stage disease? A questionnaire of risk factors for MI is sent-out to survivors of MI. → What about those that did not survive the MI?
- <u>Berkson's bias</u> Studies performed on patients that have been hospitalized…bias of symptoms, severity of disease, access to care, popularity of the institution, etc.
- Recall bias Asking parents of autism patients what happened in the 3 days before their child developed autism.
- Sampling bias A study performed in China may not be generalizable to the US population.
- <u>Late-look bias</u> (see Recall Bias).
- <u>Procedure bias</u> The positive benefit of a new drug during a study simply may have been due to the fact that study participants were required to attend clinic monthly and therefore received better health care.
- <u>Confounding bias</u> Are asbestos miners more likely to have cancer because they mine asbestos or because they are more likely to smoke?
- <u>Lead-time bias</u> While test PSA-xyz may detect prostate cancer before it is detected by a traditional PSA, early detection using PSA-xyz does not increase cancer survival compared to traditional PSA.
- <u>Pygmalion effect</u> An orthopedic surgeon performing a study on arthroscopic knee surgery. A
  chiropractor performing a study on the positive effects of cervical manipulation.
- <u>Hawthorn effect</u> In studying the effects a daily multivitamin has on longevity, the study group not only takes the daily multivitamin, but also starts to consume multiple other vitamins on a daily basis.

#### 11. Confidence Interval

- Dr M: "My study shows that drug x reduces the risk of prostate cancer by 10%."
- Student P: "Does drug x actually reduce the risk of prostate cancer by 10% or was it a flawed study?"
- Dr M: "There is honestly no way that I can know if my study of 1,000 patients reflects the reality of the entire population. Also, there may be some error somewhere in my study."
- Student P: "So, do you have any confidence at all that what you found in your study reflects reality?"
- Dr M: "I am 95% confident that drug x truly does reduce the risk of prostate cancer by somewhere in the interval of 8-12%."
- Student P: "Where did you come-up with 8-12%?"
- Dr M: "Using the standard deviation of the data from the study and the sample size of the study, I determined what the standard error of the mean is. I then took the standard error of the mean from my study and multiplied it by 1.96. That number turned out to be 2, so I can be 95% confident that drug X truly does reduce the risk of prostate cancer by 10% +/- 2."
- Student P: "Where did you come up with 1.96?"
- Dr M: "When you want a confidence interval of 95%, you always use 1.96."
- Student P: "What if you wanted a confidence interval of 90% or 99%?"
- Dr M: "For 90% I would use 1.645 x SEM, and for 99% I would use 2.57 SEM."
- 12. What is the equation for determining the confidence interval?
- 13. In a study of USMLE scores at a particular medical school, the mean score is 230 and the standard deviation is 20. Knowing that the sample size is 100, calculate the 95% confidence interval.
- 14. What is the 99% confidence interval in this same study?
- 15. In a study of USMLE scores at a particular medical school, the mean score is 230 and the standard deviation is 20. Knowing that the sample size is 16, calculate the 95% confidence interval.

..)

)

)

)

)

)

)

)

)

)

)

)

)

)

)

)

Important Prevention Measures	<u> </u>
Diabetes	Serum glucose levels, HbA1C, urine microalbumin, serum lipids, BP, foot exams, dilated eye exam, influenza and pneumococcal vaccines
High-risk sexual behavior	HIV and syphilis screening, Hepatitis B vaccine, GC/Ch screen, Pap smear, HPV screen and vaccine, counsel on STDs and condom use

Address quitting at each encounter, avoid vitamin A supplementation, avoid OCPs in women over age 35, abdominal ultrasound in males 65-75 to r/o AAA,

influenza and pneumococcal vaccines

### Medical Care Payments

**Smoking** 

#### What is the world without insurance?

- Physicians can charge whatever they want to patients. Patients pay because it is their health.
- Patients sometime incur excessive unforeseen medical expenses.

Insurance Terms You Need To Know - Table #1

<u> </u>	Institution 1 cm 10 theed 10 thow 1 able #1			
Premium	The amount the insured person has to pay the insurance company (usually paid monthly).			
Co-pay	The amount the insured person pays at the time of service (e.g., \$30 for a clinic visit or \$15 for a particular drug)			
Deductable	The amount an insured person must pay "out-of-pocket" before the health insurance begins to pay.			

<u>Health Insurance - Private Pay Insurance - Third-party payer</u>

Party	Financial Duty	Risk	Reward
Patient	- Monthly premiums - Co-pays - Deductable	Paying more to insurance than what is received in medical care	Financial benefit if the cost of medical care exceeds what is paid to insurance
Insurance	- Health care expenses of patient beyond what the patient pays	Paying more for a patient's medical care than what is received as payment by the patient	Financial benefit if the patient pays more than the cost of medical care

#### What is the world with only health insurance?

- Health care providers can charge whatever they want to insurance companies. Insurers pay because they agreed to.
- Insurance companies end up receiving too little funds from patients to pay excessive costs to health care providers.

#### Insurance Terms You Need To Know - Table #2

Pre-existing condition	A condition that a patient is known to have that is not covered by health insurance.
Lifetime maximum	The maximum amount that an insurance company agrees to pay as specified in the plan that is purchased.
Network	The group of healthcare providers that has agreed to a reduced payment in order to have access to a larger number of patients.

#### Health Maintenance Organization (HMO)

- PCP is the gatekeeper to more specialized care.
- In order for medical expenses to be covered, the provider has to be "In-network".

#### Preferred Provider Organization (PPO)

- There is no gatekeeper to the specialist.
- Patient can see whomever they want; however, the cost is higher for "Out-of-network" medical care.

#### What is the world with only HMOs and PPOs?

- The HMO and PPO drive down the payments to physicians.
- The patient pays more and more for less and less medical care.
- The physicians begin to raise their fees to adjust for decreasing compensation.

#### Insurance Terms You Need to Know - Table #3

Formulary	The medications for which insurance companies will pay.		
Utilization management	Evaluation of the appropriateness, necessity, and efficiency of health care services.		
Resource-Based Relative Value Scale	A scale that determines what a physician should be paid for a very specific procedure (CPT code) or service in a specific region of the country based on physician work, regional practice expense, and regional malpractice expense.		

# Health Plan - Managed Care Organizations (MCO) - Health Care Organizations

Organization that attempts to maximize quality of care and minimize cost of care by techniques such as
encouraging patients and physicians to choose less costly care, controlling inpatient admissions and
lengths of stay, and emphasizing preventive medicine.

#### What about those without access to care?

- Medicare
- Medicaid
- Children's Health Insurance Plan (CHIP)
- City, County, or State funded health networks
- Federally funded teaching hospitals
- Federally funded VA hospitals
- Universal health care

#### How are physicians compensated?

Fee-for-service	Payment is provided for a	Surgical procedure
	specified service	<ul> <li>Clinic visit (e.g., 99211 – 99215)</li> </ul>
	'	<ul> <li>Inpatient visit (e.g., 99231 – 99233)</li> </ul>
Capitation	Fixed payment for a period of	ER shift / Minor emergency shift
	time or number of patients	Concierge practice
		• HMO
Salary	Specified amount regardless of	Universities
	work performed	<ul> <li>Hospital administration</li> </ul>
		Base salary
Pay for	Payment is increased if a	Increased pay by the health care organization for
performance	physician meets pre-	meeting preventive medicine targets (vaccines,
•	established targets	colonoscopy, HgA1C)

<b>Ethics</b>	FΔ	n57 –	FΔ	n59)
		DJ: —	1 /	$\mathbf{v} \cdot \mathbf{v} \cdot \mathbf{v}$

- 16. HYQ: You have to deliver bad news to a pt of yours who you have just discovered to have lung cancer. →
  The pt is a 52-year-old male in marketing that has smoked 1 pack a day for the past 25 years, exercises regularly, and maintains a healthy diet. → After you disclose the bad news the pt replies, "How can this be? I'm a healthy guy. I eat right, watch my weight, and exercise regularly." → What is the most appropriate next response? →
- 17. HYQ: You find yourself attracted to your 24-year-old patient. → How do you handle the situation? →
- 18. HYQ: A patient had made it clear to you on previous visits that if something should happen to him that he would not want surgery. The pt now comes to you with a condition that requires surgery, and because of his condition, he is incapable of providing for you his present feelings on the matter. His friend relays to you that the man has told him numerous times that he does not want surgery. His wife later shows up and tells you to do everything you can do to save her husband's life including surgery. 

  What should you do?
- 19. HYQ: A 68-year-old man is diagnosed with incurable glioblastoma multiforme. → His family asks you, the doctor, not to tell the patient. → How do you handle the situation? →
- 20. HYQ: A 36-year-old female has a first degree relative who had breast cancer at age 40. You recommend that she receive a mammogram, but she refuses to have one because she says it is too painful. → What do you do? →
- 21. HYQ: A 72-year-old man in the hospital with an MI refuses to take his aspirin on the grounds that it makes him feel "funny". → What do you do?
- 22. HYQ: How should you handle a situation where you smell alcohol on a physician's breath while that physician is practicing medicine? →

# **Epidemiology and Ethics Quiz** (FA p50 – FA p59)

1.	What are the equations for sensitivity, specificity, positive predictive value, and negative predictive value? (FA p51)
2.	What are the equations for odds ratio, relative risk, attributable risk, and number needed to treat? (FA p52)
3.	The small town of Mickey City (pop. 8,000) is immediately adjacent to factories where asbestos products are produced. During the past year, the prevalence of mesothelioma has been 16 cases. In the town of Donaldville (pop. 6,000) 15 miles upwind of (and theoretically safely distant from) Mickey City, there was a prevalence of 3 cases during the same year. What is the relative risk of mesothelioma for the population of Donaldville?
4.	What is the difference between a case-control study, a cohort study, and a clinical trial? Which studies use odds ratios, and which use relative risks? (FA p50)
5.	In a normal Gaussian curve, what percentage of the sample population falls 1 standard deviation, 2 standard deviations, and 3 standard deviations? (FA p54).
6.	What should you do if a minor requests birth control during a clinic visit in the absence of her parents? (FA p59)
7.	What are the leading causes of death in ages 1-14 and in ages 25-64? (FA p56)

## **Development & Physiology** (FA p60 – FA p63)

<ol> <li>Complete t</li> </ol>	he following chart of dev	•		
3m	gross motor rolls over	verbal •	fine motor	self-care
	TOIIS OVE	•	hands together	
6m	•	•	•	•
12m	•	1-3 words	•	drinks from cup
15m	walk backward, run	•	•	•
18m	•	•	4 cube tower	•
<b>2</b> y	jump up	half understandable	6 cube tower	washes/dries hands
<b>3</b> y	•	•	•	•
<b>4</b> y	•		•	
5y			copies square	

- 2. HYQ: A mother presents with her 1-year-old child that can stand alone, has just learned to walk, and has a 5 word vocabulary. She would like to know if her child is developmentally normal and when she can begin toilet training. →
- 3. HYQ: A 2-year-old child speaks in short sentences of 2-3 words but cannot identify colors or recite his ABCs. The mother is concerned that he is not developing normally. → What do you tell the mother? →
- 4. HYQ: A girl can speak in complete sentences, has an imaginary friend, and considers boys to be "yucky". → How old is she? →

#### 5. Tanner Stages

	Boy genitalia development	Girl breast development	Pubic Hair
Stage 1	Prepubertal	Prepubertal	Prepubertal
Stage 2	Enlargement of scrotum and testes	Bud with elevation of breast and papilla Areola enlarges	Sparse long, slightly pigmented hair
Stage 3	Enlargement of penis (length first)	Further enlargement	Darker, coarser, and more curled
Stage 4	Penis – growth in breadth and development of glans Testes – enlarge Scrotum – larger and darker	Areola and papilla form a secondary mound above the level of the breast	Adult hair in type but covering a smaller area
Stage 5	Adult	Mature – only papilla projects as areola recesses	Adult in type and quantity

Female development: Breast development (11) → Growth spurt (12) → Menarche (13) Male development: Stage 2 (12) → Growth spurt (14-15)

#### 6. Car Seats

- < 1 yr and < 20 lbs. → Infant seat in back seat facing backwards
- 1-4 yr and > 20 lbs. → sits in back seat but still in car seat, now have option of facing forward
- Once forward-facing car seat is outgrown (4yrs and 40 lbs) → booster seat in the back
- Keep in booster seat until the belt fits correctly (usually 4' 9" and 8-12 yr) → then belted with a lap/shoulder belt in the back seat until 13 years of age

#### **Development & Physiology** (continued)

- 7. At what point does <u>grief/bereavement</u> become pathological? Grief becomes pathological when any of the following are found:
  - Depression criteria met for at least 2 weeks after the first 2 months following the loss
  - · Generalized feelings of hopelessness, helplessness, worthlessness, and guilt
  - Suicidal ideation
  - Distressing feelings do not diminish in intensity by 6 months
  - Inability to move-on, trust others, and re-engage in life by 6 months
- 8. HYQ: A 60-year-old businessman complains of a lack of successful sexual contacts with women and a lack of ability to reach full erection. One year ago, he had a heart attack. → What might be the cause of his problem? →
- 9. HYQ: During what sleep stage would a man have variable BP, penile tumescence, and variable EEG? →
- 10. What are the components of good sleep hygiene in the treatment of insomnia?
  - Keep a consistent sleep schedule and avoid daytime naps
  - Dark, quite room The darker the room, the better. Wear sleep masks and earplugs if necessary
  - Limit caffeine and alcohol at least 4-6 hrs prior to bedtime
  - Avoid TV, computer, and video games for at least 1-2 hrs prior to bedtime
  - Exercising early in the day
  - Cool temperature
  - Reserve bed for sleep and sex only
  - Avoid pets in bed
  - Avoid eating before bedtime

11. What medications are common in the treatment of insomnia? What makes each one unique?

What medications are common in the treatment of insomina: What makes each one unique:		
Melatonin	Non-addictive, OTC, vivid dreams, safe for < 3 months	
Valerian	OTC herbal remedy, studies show no benefit	
Antihistamines (Benadryl, Tylenol PM,	Commonly used by patients first-line, a/w poor sleep quality,	
doxylamine)	not for long-term use, anticholinergic side effects (avoid in the	
	elderly)	
Trazadone	Antidepressant, increases REM sleep, small risk of priapism	
TCA's such as amitriptyline, doxepin	Antidepressant, small risk of arrhythmias (obtain EKG prior to use), anticholinergic side-effects (avoid in the elderly)	
Long acting benzos such as temazepam, lorazepam, clonazepam, diazepam, chlordiazepoxide	Addictive, short-term only (< 35 days)	
Zolpidem (Ambien), Zaleplon (Sonata)	Act at the benzo receptor, short-term only (< 35 days), rebound insomnia when discontinued	
Eszopiclone (Lunesta)	May be used long-term (FDA 2004)	
Ramelteon (Rozerem)	Nonaddictive because it works at melatonin receptors instead of GABA/benzo receptors, avoid if hepatic insufficiency, long-term studies are lacking	

#### 12. Restless Leg Syndrome

- The sensation of unpleasant paresthesias that compels the patient to have voluntary, spontaneous, continuous leg movements
- Usually a primary, idiopathic disorder
- Secondary RLS can result from iron deficiency, end-stage renal disease, diabetic neuropathy,
   Parkinson's disease, pregnancy, rheumatic diseases (RA), varicose veins, caffeine intake, etc.
- Treatment: pramipexole or ropinirole qHS (or levodopa/carbidopa), iron replacement, avoid caffeine, clonazepam qHS, gabapentin, opioids

)

#### **Development & Physiology** (continued)

- 13. What is the treatment for narcolepsy?
  - Avoidance of drugs that cause sleepiness
  - Scheduled naps (once or twice a day for 10-20 min)
  - Stimulants modafinil is first-line
  - Support group attendance
  - If cataplexy → venlafaxine, fluoxetine, or atomoxetine
  - Sodium oxybate (GHB) can assist in sleep and reduce cataplexy
- 14. At what age should nocturnal enuresis be treated? What are the treatment options?
  - Enuresis cannot be diagnosed until 5 years of age (chronological and developmental)
  - Treatment is usually delayed until the child is at least 7 years of age
  - <u>First-line → Behavioral interventions</u>:
    - Start toilet training if not yet attempted
    - Motivational therapy (e.g., star charts)
    - Restrict fluids before bed (with a compensatory increase in daytime fluids)
    - Night time chaperone to the toilet or scheduled wakening to avoid using alarm clock
    - <u>Enuresis alarm</u> (pad with alarm device) in bed for classic conditioning. This is most effective long-term therapy.
  - Second-line → Pharmacologic interventions:
    - High likelihood of recurrence upon discontinuation
    - Imipramine (Tofranil) for short-term (up to 6 weeks)
    - <u>Desmopressin (DDAVP)</u> orally (FDA 12-2007 → intranasal desmopressin is no longer indicated for enuresis due to risk of hyponatremic seizures)
    - <u>Indomethacin</u> suppository

# **Development & Physiology Quiz** (FA p60 – FA p63)

1.	What factors are taken into consideration when giving a newborn an Apgar score?
2.	What is the definition of low birth weight? What complications are a/w low birth weights?
3.	<ul> <li>Based on the following milestones, how old are the following children?</li> <li>Jumps up, 6 cube tower, eats with spoon, 2-3 word sentences</li> <li>Regards face, responds to sound, not yet able to roll over</li> <li>Stands with support, 1-3 words, stranger anxiety, drinks from a cup</li> <li>Rides tricycle, understandable sentences, plays board-games</li> </ul>
4.	What is the differential diagnosis for sexual dysfunction?
5.	At what age can children stop using a booster seat?
6.	What EEG waveforms correspond to the different stages of sleep?
7.	What drugs are used to shorten Stage 4 sleep?
8.	What controls extraocular movements during REM sleep?
9.	What is the "key" to initiating sleep? What is the principle neurotransmitter involved in REM?
10.	What is the pathway by which retinal information induces the release of melatonin? (FA p63)

#### Psychology (FA p438 - FA p440)

#### Ego Defenses Quick Quiz

- 1. Which mature defense mechanism fits the following statement?
  - Voluntarily choosing not to think about a piece of bad news
  - Indiana Jones using comedy to express feelings of discomfort
  - Arsonist donates money to the fire department
  - Using ones aggression to succeed in business ventures
  - Realistically planning for future inner discomfort
  - Consciously postponing an inner conflict until after a big project is completed
  - Redirecting impulses to a socially favorable object
- 2. Which immature defense mechanism fits the following statement?
  - · Not acknowledging a piece of bad news, as though it was never said
  - Involuntary withholding of a feeling from conscience awareness
  - A veteran that can describe horrific war details without any emotion
  - A child abuser was himself abused as a child
  - Man yells at his family when he has a bad day at work
  - A closet homosexual hates homosexuals because of the way they "make" him feel
  - Using intellectual processes to avoid affective expression; Dr. Frasier Crane
  - Belief that people are either all good or all bad
  - Expressing aggression through passivity, masochism, and turning against self
  - · Believing an external source is responsible for an unacceptable inner impulse
  - Changing ones character or personal identity to avoid emotional distress
  - Returning to an earlier level of maturation to avoid the conflict at the current maturational level; stressed children wet the bed
  - Offering an explanation for an unacceptable attitude/belief/behavior
  - A thought that is avoided is replaced by an unconscious emphasis on the opposite
  - Converting mental conflicts into bodily symptoms
  - Temporarily inhibiting thinking but continuing to build more tension
  - Avoiding interpersonal intimacy to resolve conflict and obtain gratification
  - · Extreme forms can result in multiple personalities
  - Chronically giving into an impulse to avoid tension from an unexpressed unconscious wish; tantrums
- 3. HYQ: A 65-year-old asks her husband to stay in the hospital overnight with her because she is afraid to be alone. → What defense mechanism is she exhibiting? →
- 4. HYQ: Which defense mechanism underlies all other defense mechanisms? →
- 5. HYQ: A 60-year-old man, admitted for chest pain, jumps out of bed and does 50 push-ups to show the nurses he has not had a heart attack. → What defense mechanism is he using? →

#### Psychiatry (FA p441 – FA p451)

#### Axis

- I Psych d/o
- II MR and PDOs
- III General Medical Condition
- IV Psychosocial
- V Global Assessment of Function
- 1. What defense mechanism fits the following statement? (FA p440)
  - Voluntarily choosing not to think about a piece of bad news
  - Not acknowledging a piece of bad news, as though it was never said
  - Involuntary withholding of a feeling from conscience awareness
  - A veteran that can describe horrific war details without any emotion
  - A child abuser was himself abused as a child
  - Man yells at his family when he has a bad day at work
- 2. HYQ: When a young monkey is separated from its mother, it becomes withdrawn, socially isolated, and grooms poorly. → It is thought that this behavior is the monkey equivalent of what human problem? →
- 3. Stimulants Used in ADHD
  - Methylphenidate (Ritalin) and Dextroamphetamine (Adderall)
    - Amphetamine, increases pre-synaptic norepinephrine vesicle release
  - Atomoxetine (Strattera)
    - Norepinephrine reuptake inhibitor
  - Other clinical uses of stimulants
    - Narcolepsy (modafinil), obstructive sleep apnea an excessive daytime sleepiness, major depressive disorder
- 4. What are some of the characteristic features of autism?
  - "Living in his own world"
  - Symptoms evident prior to age 3
  - Lack of responsiveness to others, poor eye contact, absence of social smile
  - Impairments in communication, language delay, repetitive phrases
  - Peculiar repetitive, ritualistic habits (e.g., spinning around, hand flapping)
  - Fascination with specific, seemingly mundane objects (vacuum cleaners, sprinklers)
  - Usually below normal intelligence
- 5. What are the characteristic features of Rett's disorder?
  - females with normal birth and development for the first 6 months of life

#### Stage I

- deceleration of head growth between ages 5 months and 4 years
- developmental arrest between 6-18 months
- social withdrawal and communication dysfunction

#### Stage II

- loss of acquired purposeful hand skills between ages 6-30 months
- stereotypic hand movements usually midline (e.g., washing, wringing, squeezing) and constant during waking hours
- gait and truncal apraxia between ages 1-4 years

#### Stage III

- pseudostationary phase beginning between 2-10 years
- some improvement in behavior, hand use, and communication skills
- more prominent motor dysfunction and seizures

#### Stage IV

- onset after age 10
- increased rigidity, bradykinesia, reduced mobility

)

)

)

)

)

)

)

)

)

)

#### **Psychiatry** (continued)

- 6. Which childhood psychiatric disorder matches the following statement?
  - Females only, loss of previously acquired purposeful hand skills between 6-30 months
  - Impairments in social interactions, communications, play, repetitive behaviors
  - · Impairment in social interaction (but not avoidance), no language delay
  - Stereotyped hand movements
  - Ignoring the basic rights of others
  - Characterized by hostility, annoyance, vindictiveness, disobedience, and resentfulness
  - Multiple motor and vocal tics
  - · Impulsive and inattentive
  - 7-year-old that avoids going to school to stay home with parent
- 7. HYQ: A 4-year-old girl complains of pain in her genitalia. On exam, a discharge is noticed and a smear of the discharge shows *N. gonorrhoeae.* → How was she infected? →
- 8. What are the most common causes of mental retardation?
  - Down syndrome, Fragile X syndrome, Rett syndrome
  - Congenital hypothyroidism
  - Fetal alcohol syndrome and other prenatal toxin exposures (lead, mercury, valproate)
  - · Perinatal hypoxia or infection
  - Postnatal causes: trauma/abuse, CNS hemorrhage, hypoxia (e.g., near-drowning), toxins, psychosocial deprivation, malnutrition, intracranial infection, and CNS malignancy

#### 9. Trichotillomania

- · Compulsive nervous hair pulling
- More common in young girls
- Examination reveals unusual patterns of broken hairs of varying length → "wire brush" feel
- Treatment: Education → Cognitive behavioral therapy → fluoxetine or clomipramine

#### Eating Disorders (FA p449)

- 10. HYQ: A 15-year-old girl of normal height and weight for her age has enlarged parotid glands but no other complaints. The mother confides she found laxatives in the daughter's closet. → What is the diagnosis? →
- 11. What electrolyte changes are seen in patients with excessive purging over time?

#### 12. Binge Eating Disorder

- Purging is not present
- Expression of deeper psychological problems
- Many actually have negative feelings toward food

#### 13. Compulsive Eating Disorder

- Purging is not present
- Type of obsessive-compulsive disorder
- Much time is spent thinking and fantasizing about food

#### Psychiatry Basics (FA p441 – FA p444)

- 14. What neurotransmitter changes do you see with the following diseases? (FA p442)
  - · Anxiety disorders
  - Depression
  - Mania
  - Alzheimer
  - Huntington's
  - Schizophrenia
  - Parkinson's

#### **Psychiatry** (continued)

- 15. HYQ: A 72-year-old patient of yours is not able to recall 3 objects on a mini-mental status exam. When asked what he would do if he smelled smoke in a movie theater, he replies that he would yell "fire." When asked what a table and chair have in common, he replies that they both have 4 legs are made of wood. The family reports that for the past year someone has had to stay with him at all times for his own safety and that he stays awake all day and sleeps well at night. → What is the most likely diagnosis in this pt? →
- 16. HYQ: A 72-year-old patient of yours is brought into the clinic by his family because of strange behaviors over the past week. She has been very agitated recently, takes many naps during the day, occasionally urinates on herself, and has had a poor appetite. It is difficult for you to administer the MSE because she is unable to focus her attention on the questions. → What is the most likely diagnosis? →

#### Schizophrenia (FA p444, FA p448) and Neuroleptics (FA p453)

- 17. What is the difference between the following disorders?
  - Schizotypal
  - Schizophrenia
  - Schizoaffective
  - Schizoid
  - Schizophreniform
- 18. What are some of the positive symptoms of schizophrenia? What are some of the negative symptoms?
- 19. Categorize the following antipsychotics in the appropriate category as neuroleptics (low, moderate, or high potency) or atypical antipsychotics: olanzapine, thioridazine, quetiapine, molindone, chlorpromazine, haloperidol, fluphenazine, loxapine, risperidone, thiothixene, trifluoperazine, clozapine, aripiprazole

Neuroleptic (high potency)

Neuroleptic (low potency)

Neuroleptic (moderate potency)

Atypical antipsychotic

- 20. What are the clinical features of neuroleptic malignant syndrome? How is it treated?
- 21. HYQ: You are on-call and receive a call from a nurse asking if she can give some sleep medicine or diphenhydramine to an elderly pt with mild dementia who is currently hospitalized for MI. → What do you give the patient? →

#### Mania (FA p445) and Lithium (FA p453)

- 22. What are the criteria for the diagnosis of mania? (DIG FAST)
- 23. What is the milder form of bipolar disorder?
- 24. What mood stabilizers are used in the treatment of bipolar disorder?
- 25. What are the potential SE of lithium?

)

)

)))

)

)

) )

)

)

) )

)))

Psychiatry (continued)	
<u>Depression (FA p445) and Antidepressants (FA p454 – FA p456)</u> 26. What are the criteria for the diagnosis of major depressive episode	? (SIG E CAPS)
27. What is atypical depression?	
28. What is the milder form of depression?	
29. A patient mentions that he has had thoughts of suicide. What ques how high-risk he is? (SAD PERSONS)	tions should you ask to help determine
30. HYQ: A patient tries to commit suicide by slitting her wrists. → After what question would you ask the pt in order to determine her level of life? →	
31. HYQ: A 28-year-old woman has symptoms of mild depression for 6	years. → What's the diagnosis? →
32. HYQ: Two months after the loss of her spouse, a 42-year-old femal and sleeping. She sleeps only 2-3 hours each night. → What would	
33. What is the mechanism of action of the following medication class? SSRI-	
SNRI-	
TCA-	
MAOI-	
Benzodiazepines- Barbiturates-	
Typical neuroleptics- Atypical neuroleptics-	
34. Categorize the following antidepressants as either a SSRI, TCA, Manortriptyline, selegiline, buproprion, mirtazapine, fluvoxamine, clomipramine, imipramine, amitriptyline, nefazodone, milnacipra paroxetine, tranylcypromine, duloxetine, citalopram, desvenlafa	loxepin, phenelzine, fluoxetine, an, desipramine, sertraline, venlafaxine,
SSRI -	NDRI - SNRI -
TCA -	
MAOI -	Tetracyclic -

#### **Psychiatry** (continued)

- 35. Which antidepressant matches the following statement?
  - SE: priapism
  - Lowers the seizure threshold
  - Works well with SSRIs and increases REM sleep
  - Appetite stimulant that is likely to result in weight gain
  - · Can be used for smoking cessation
  - Can be used for bedwetting in children
- 36. What are the symptoms of TCA overdose?
- 37. What are the symptoms of serotonin syndrome?
- 38. What happens if you ingest tyramine while on MAOIs?

#### Anxiety Disorders (FA p447) and Buspirone (FA p454)

- 39. HYQ: A patient on whom you wish to obtain an MRI tells you that he cannot go through with it because of claustrophobia. → What can you do to help this pt? →
- 40. HYQ: A young woman that is anxious about receiving her first pap smear is told to relax and to imagine going through the steps of the exam. → What does this process exemplify? →
- 41. HYQ: A woman has flashbacks about her boyfriend's death one month ago following a hit-and-run accident. She often cries and wishes for the death of the culprit. → What is the diagnosis? →
- 42. HYQ: A nurse has episodes of hypoglycemia. Blood analysis reveals no elevation in C-protein. → What is her diagnosis? →

#### Somatoform & Personality Disorders (FA p447 – FA p449)

- 43. What somatoform disorder matches the following description?
  - Unexplained pain
  - Patient with normal anatomy is convinced a part of their anatomy is abnormal
  - Unexplained loss of sensory or motor function (tests and PE are negative)
  - Unwavering belief by the pt that she has a specific disease (despite medical reassurance)
  - Unexplained complaints in multiple organ systems
  - False belief of being pregnant
- 44. What personality disorder fits the following statement?
  - Excessive need to be taken care of, submissive and clinging behavior, low self-confidence, fears of separation and losing support
  - · Grandiosity, feels he is entitled to things, lack of empathy
  - Suicide attempts (→ 15% mortality), unstable mood and behavior, sense of emptiness and loneliness, impulsiveness
  - Distrustful, suspicious, litigious
  - Lifelong voluntary social withdrawal, no psychosis, emotional expression is limited (restricted range of affect)
  - Feelings of inadequacy, hypersensitive to rejection or criticism, socially inhibited, shy
  - Constant mood of unhappiness and pessimism
  - Odd appearance, thoughts, and behavior; no psychosis; social awkwardness
  - Controlling, perfectionistic, orderly, stubborn, indecisive
  - Criminality, unable to conform to social norms, disregard for others' rights
  - Excessively dramatic, emotional, and extroverted; sexually provocative behavior; unable to maintain intimate relationships

# Psychiatry (continued) Psychology & Psychiatry

)

)

)

)

)

)

)

)

)

)

)

)

)

)

)

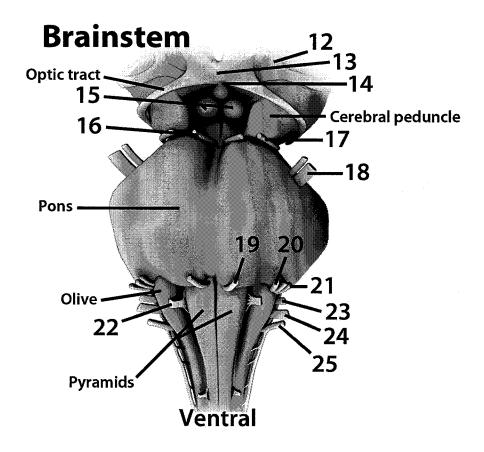
)

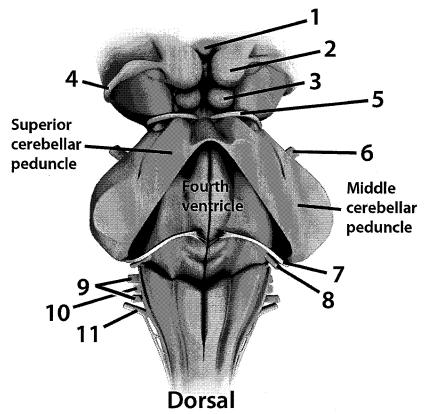
)

)

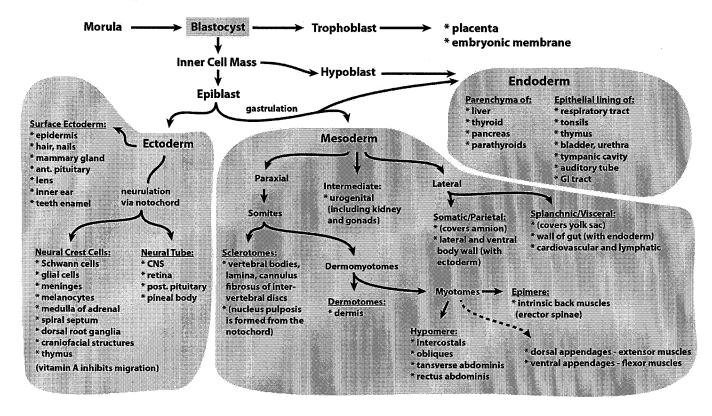
45	5. HYQ: A 40-year-old woman tells you during one of her office visits that she is in love with you. You refer her to someone else, and she attempts suicide. → What type of personality disorder does this pt have? →
46	6. HYQ: A 30-year-old woman tells you during one of her office visits that you are the best doctor she's ever had but that your nurse is very disrespectful. On a subsequent visit, she threatens to change doctors because you do not feel a particular lab test is necessary. Additionally, you notice several symmetrical cuts on her left forearm which she attributes to cat scratches. → What type of personality disorder does this person have? →
47	7. HYQ: A 55-year-old woman comes to your office wearing all black including a black miniskirt and black feather boa. She also is wearing an excessive amount of lipstick, and you notice her having conversations with many of the other patients in the waiting room. → What type of personality disorder do you suspect in this patient? →
48	3. HYQ: A person demands only the best and most famous doctor in town. → What is the personality disorder does this person have? →
49	9. What are the Cluster A personality disorders?
	What are the Cluster B personality disorders?
	What are the Cluster C personality disorders?
	ubstance Abuse (FA p450-451)
50	O. What medications are effective in helping to prevent relapse in recovering alcoholics?  • is the tried and true best relapse prevention  •  •
	Acamprosate (Campral)
5	<ol> <li>What drug is causing the following symptoms in the following pts?</li> <li>Post-op constipation and/or respiratory depression</li> <li>Severe depression, headache, fatigue, insomnia/hypersomnia, hunger</li> <li>Pinpoint pupils, N/V, seizures</li> <li>Belligerence, impulsiveness, nystagmus, homicidal ideations, psychosis</li> <li>Headache, anxiety/depression, weight gain</li> <li>Anxiety/depression, delusions, hallucinations, flashbacks</li> <li>Euphoria, social withdrawal, impaired judgment, hallucinations</li> <li>Pobound anxiety, tempore, seizures, life throatening</li> </ol>

- Rebound anxiety, tremors, seizures, life-threatening Anxiety, piloerection, yawning, fever, rhinorrhea, nausea, diarrhea





#### Basic Embryology (FA p118 – FA p134)



- 1. HYQ: A pt with an aganglionic colon and other neural crest derivative deficiencies. → What other findings would you expect to see? →
- 2. HYQ: Which of the following drugs is contraindicated in pregnancy? →
- 3. OB Safe Medications
  - Class A: nystatin (vaginal),
  - <u>Class B</u>: acetaminophen, diphenhydramine, ondansetron, meclizine,
     <u>PCN/ampicillin/cephalosporins/piperacillin</u>, macrolides (erythromycin, azithromycin), nitrofurantoin, metronidazole, H2-blockers/PPIs, calcium antacids, insulin, metformin, methyldopa,
  - <u>Class C</u>: pseudoephedrine, promethazine, demerol/morphine/hydrocodone, nystatin (oral), hydralazine, nifedipine, labetalol, docusate sodium, heparin

(A - safety established in human studies; B - presumed safety based on animal studies; C - no human or animal studies show an adverse effect/uncertain safety; D - human risk, but benefit may outweigh risk; X - contraindicated, risk clearly outweighs benefit)

#### 4. Homeobox (HOX) Genes

- Blueprint for skeletal morphology
- Code for transcription regulators
- Mutation in Homeobox HOXD-13 → synpolydactyly (extra fused digit between 3<sup>rd</sup> and 4<sup>th</sup> fingers)
- Retinoic acid alters HOX gene expression

- 5. In monozygotic twins, twin placentation is determined by timing of egg division:
  - Diamniotic / dichorionic placentation- division occurs prior to morula stage (within 3 days of fertilization)
  - Diamniotic / monochorionic placentation- division occurs 4-8 days post-fertilization (blastocyst)
  - Mono/mono (one placenta) occurs with division 8-12 days after fertilization (epiblast/hypoblast)
    - One yolk sac and 2 fetal poles = monoamnionicity
    - Cord entanglement = monoamnionicity
  - Division at or after 13 days → conjoined twins
- 6. <u>Amniocentesis</u>
  - Performed at 15-17 weeks for genetic evaluation (in third trimester for lung maturity eval)
  - Indications:
- Evaluation of lung maturity (lecithin: sphingomyelin ratio ≥ 2.5)
- > 35-year-old (offered for eval of possible trisomy/genetic defects)
- Abnormal maternal serum triple or quad screen
- In Rh-sensitized pregnancy to detect fetal blood type or fetal hemolysis
- Risks: 1-2% maternal/fetal hemorrhage, 0.5% fetal loss
- 7. Chorionic Villous Sampling
  - Performed at 10-12 weeks
  - Risks: 1% fetal loss, 1% inability to diagnose NTD, limb defects if done < 9 weeks</li>

#### Embryologic Cardiovascular Development (FA p122 – FA p127)

- 8. Outline the pathway by which the ventricles and their outflow tracts are separated.
  - Ventricular chamber lays anteriorly in the S-shaped heart tube → muscular ventricular septum forms which begins to divide the ventricles
  - Truncoconical swellings (ridges) of the truncus arteriosus meet, fuse, and zip (both superiorly and inferiorly) in a 180 degree turn to form the spiral septum (AKA aorticopulmonary septum)
  - Inferior portion of spiral septum meets with muscular ventricular septum to divide the ventricles and form the aorta and pulmonary arteries
- 9. Describe how the ventricles are remodeled in order to form the atrioventricular valves.
  - Myocardium erodes → ventricles enlarge as a result → residual mesodermal tissue becomes fibrous and forms chordae tendineae
  - Formation of papillary muscles and AV valves
- 10. Name 6 different truncoconical (spiral) septum defects.
  - Finestrae

- · Persistent truncus arteriosus
- Ventricular septal defect (VSD)
- Transposition of the great vessels (RV → aorta, LV→ PA)

Tetralogy of Fallot

- Dextrocardia
- 11. Outline the pathway by which the heart tube forms the atria of the four-chambered heart.

Tube grows, elongates, and folds into an S-shape  $\rightarrow$  atrial chamber lays posteriorly in S, and ventricular chamber lays anteriorly in S  $\rightarrow$  atrial chamber grows and incorporates superior vena cava and pulmonary vein  $\rightarrow$  septum primum forms  $\rightarrow$  septum secundum forms incompletely (leaving a hole called foramen ovale) and cell death in septum primum forms a hole called ostium secundum

- What divides the right and left atria?

Septum primum and septum secundum

How is blood shunted from the right atrium to the left atrium in an embryo?

Through the foramen ovale (of the septum secundum) and ostium secundum (of the septum primum)

- 12. What are the 3 possible causes of an atrial septal defect?
  - Ostium secundum gets too big and overlaps foramen ovale
  - Absence of septum secundum
  - Neither septum secundum nor septum primum develop
- 13. What structure grows to close the opening/canal between the atrial chamber and ventricular chamber into two smaller openings?

Superior and inferior endocardial cushion (which later give rise to the septum intermedium)

)

)

)

)

)

)

)

)

)

)

)

)

)

)

)

What genetic abnormality is commonly associated with endocardial cushion defects? Trisomy 21 (Down syndrome) **Embryology Quick Quiz #1** 14. What developmental structure matches the following description? Supplies oxygenated blood to the fetus Removes nitrogenous waste from the fetal bladder Fetal placental structure that secretes hCG Maternal component of the placenta Returns deoxygenated blood from the fetal internal iliac arteries 15. Which embryologic structure of the heart gives rise to the following adult structure? Ascending aorta and pulmonary trunk Coronary sinus SVC Smooth parts of the left and right ventricle Smooth part of the right atrium Trabeculated left and right atrium Trabeculated parts of the left and right ventricle 16. What structure divides the truncus arteriosus into the aortic and pulmonary trunks? What is the cellular origin of this structure? 17. What is order of fetal erythropoiesis? 18. Which bones in adults synthesize RBCs? 19. HYQ: Which fetal vessel has the highest oxygenation → 20. What adult structures are derived from the 3<sup>rd</sup>, 4<sup>th</sup> and 6<sup>th</sup> aortic arches? (FA p127) Congenital Heart Pathology (FA p267 – FA p269) 21. Ebstein's anomaly Associated with maternal lithium use Tricuspid leaflets are displaced into right ventricle, hypoplastic right ventricle, tricuspid regurg or stenosis 80% have a patent foramen ovale with a  $R \rightarrow L$  shunt Dilated right atrium → increased risk of SVT and WPW Physical exam: widely split S2, tricuspid regura Rx: PGE, digoxin, diuresis, propranolol for SVT **Embryology Quick Quiz #2** 22. HYQ: A 45-year-old male presents with a BP of 160/90 on the right arm and 170/92 on the left arm. There are no palpable pulses in the feet/ankle. → What problem does this pt most likely have? → 23. HYQ: Describe blood flow thru a PDA → 24. What heart defect is a/w the following disorder? (FA p269) Chromosome 22q11 deletions Down syndrome Congenital rubella Turner's syndrome Marfan's syndrome 25. What problems are offspring of diabetic mothers at higher risk for?

#### Embryology Quick Quiz #3 (FA p126 – FA p134)

- 26. HYQ: Monozygotic twins are delivered. One is pale and has a hematocrit of 15%, and the other is flushed with a hematocrit of 55%. → What is the cause of these features? →
- 27. HYQ: A child presents with cleft-lip. → Which embryonic process failed? →
- 28. What nerves innervate the branchial arches? Later, what structures are derived from these arches?
- 29. From which branchial pouch is the following structure derived?
  - Middle ear and eustachian tubes
  - Superior parathyroids
  - Inferior parathyroids
  - · Epithelial lining of the palatine tonsil
  - Thymus
- 30. What cranial nerves innervate the tongue in the following ways?
  - Taste in the anterior 2/3
  - Taste in posterior 1/3 (main innervater)
  - Motor
  - Sensation in the anterior 2/3
  - Sensation in the posterior 1/3
- 31. What abnormalities are often found with an Arnold-Chiari malformation? (FA p127)
- 32. What are the classic presenting symptoms of a syringomyelia? (FA p127)
- 33. How does the presentation of a branchial cleft cyst (FA p127) differ from that of a thryoglossal duct cyst? (FA p130)

#### GI & Renal Congenital Pathology (FA p130 – FA p133)

#### 34. Abdominal Wall Defects

#### Omphalocele

- Defect in abd wall; extruding viscera covered by sac (sac composed of peritoneum and amnion)
- Liver often found protruding
- Other anomalies common (50%)

(GI, GU, CV, CNS, MS)

#### Gastroschisis

- Defect in abd wall; extruding viscera not covered by sac
- Liver never found protruding
- Other anomalies less common (10-15%)
- Defect lateral to umbilicus (R > L)

Rx: reduction and closure (silo if necessary)

- 35. Annular Pancreas
  - Two-thirds of patients remain asymptomatic throughout their life
  - Symptom onset can occur at any age of life and depends on the severity of duodenal constriction
  - Children present with gastric outlet obstruction (bilious vomiting, feeding intolerance, abdominal distention)
  - In infants, it is a/w maternal polyhydramnios, Down syndrome, esophageal and duodenal atresia, imperforate anus, and Meckel's diverticulum
  - Adults usually present at 20-50 years of age with abdominal pain, postprandial fullness and nausea, peptic ulceration, pancreatitis, and rarely biliary obstruction

)

)

)

)

)

)

)

)

)

)

)

)

)

#### Congenital Reproductive Pathology (FA p134, FA p485 – FA p487)

- 36. Exstrophy of the bladder congenital gap in the anterior bladder wall and abdominal wall in front of it → exposure of the bladder interior to the outside world
- 37. Cryptorchidism (FA p495)
  - Failure of testis to descend into scrotum
  - Usually unilateral
  - Descent usually complete in 1<sup>st</sup> year of life
  - 35x increased risk of malignant tumor in the undescended testicle (usually a germ cell tumor)
- 38. HYQ: A 23-year-old pt presents with one testicle. → What is this pt at risk for? →
- 39. HYQ: A 24-year-old male develops testicular cancer. → Metastatic spread occurs by what route? →
- 40. HYQ: A 16-year-old female pt presents with amenorrhea. → It is later discovered that this pt lacks a uterus and uterine tubes, and there are two round structures in the midline just superior to the labia majora. → What is most likely the cause of this pt's amenorrhea? →
- 41. Sudden Infant Death Syndrome (SIDS)
  - Usually occurs at 2-4 months old
  - · Usually occurs while infant is sleeping
  - Maternal risk factors: low SES, age <20, drugs/cigarettes during pregnancy</li>
  - Infant risk factors: low birth weight, female, premature, prior sibling with SIDS
  - Preventive measures: "back to bed," pacifier when sleeping, fan in the room

#### **Embyrology End of Topic Quiz**

- 1. What is the female homologue to the following male structure? (FA p134)
  - Scrotum
  - Prostate gland
  - Glans penis
  - Corpus spongiosum
  - Bulbourethral glands
  - Ventral shaft of the penis
- 2. What gene codes for testes determining factor? (FA p133)
- 3. What reproductive pathology matches the following statement?
  - Female with short stature + no Barr body
  - Chromosomal XXY
  - Chromosomal XO
  - · Presence of ovaries, but male genitalia
  - Unable to generate DHT
  - · Both ovarian and testicular tissues are present
  - Webbing of the neck
  - Male with Barr body in PMNs
  - Ambiguous genitalia until puberty, then masculinization
- 4. Congenital most commons:
  - Most common cause of early cyanosis
  - Most common cause of late cyanosis
  - · Most common cause of primary amenorrhea
  - Most common chromosomal disorder
  - Most common cause of congenital mental retardation
  - Second most common cause of congenital mental retardation
  - Most common lethal genetic disease of Caucasians
  - Most common cause of congenital malformations in US
- 5. What germ layer gives rise to the following adult structures? (FA p119)
  - Retina
  - Salivary glands
  - Pancreas
  - Muscles of the abdominal wall
  - Thymus
  - Spleen
  - Aorticopulmonary septum
  - Anterior pituitary
  - Posterior pituitary
  - Bones of the skull
  - Cranial nerves
- 6. What is the most common type of TE fistula? (FA p131)
- 7. What is Potter's syndrome? (FA p132)
- 8. What is the classic presentation of congenital pyloric stenosis? (FA p131)
- 9. List as many teratogens as you can. (FA p120)

)

)

)

)

)

)

)

)

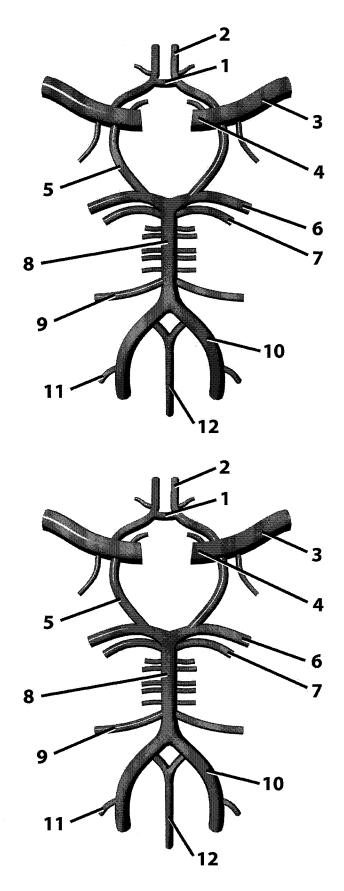
)

)

)

)

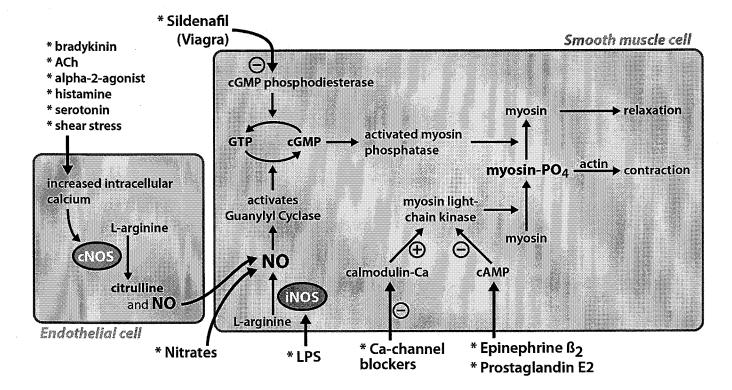
# Circle of Willis (FA p405)



	)
	í
	)
	~ ^ )
	)
	· · · )
	)
	)
	)
	)
	)
	)
	)
	)
	· )
	)
	~) )
	)
	)
	)
	)
	)

#### **CV Physiology and Antiarrhythmics** (FA p254 – FA p266) (FA p284 – FA p286)

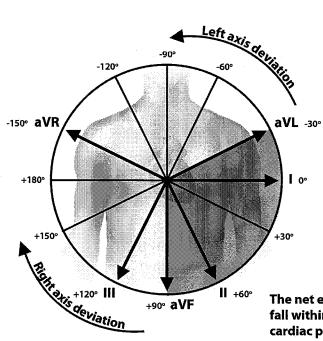
- 1. What are the primary mechanisms of action of the different classes of antiarrhythmics?
  - · Class I-
  - · Class II-
  - · Class III-
  - · Class IV-
- 2. HYQ: How does increasing the diameter of a vessel by two times affect the resistance of that vessel? →



1

# Cardiac Physiology Quiz 1 (FA p254 – FA p261)

1.	Diagram the phases of a myocardial action potential and describe which ion channels are responsible for each phase.
2.	What is the pulse pressure in a pt with systolic BP of 150 and a MAP of 90?
3.	What is the basic equation for cardiac output? What is the Fick principle?
4.	What factors affect stroke volume?
5.	What heart sound is a/w dilated congestive heart failure? What heart sound is a/w chronic hypertension?
6.	What gives rise to the jugular venous a, c, and v waves?
7.	What is the heart ejection fraction?
8.	What physiology accounts for the automaticity of the AV and SA nodes?
9.	With what type of congenital heart defect would increasing afterload be beneficial?
10.	Where does the QRS complex fall in relation to valvular dynamics?
11.	When does isovolumetric contraction take place?
12.	What pathology matches the following statement? (FA p524)  • Focal myocardial inflammation with multinucleate giant cells  • Eosinophilic, cytoplasmic globules in liver near nucleus  • Desguamated epithelial casts in sputum



# Common conditions that result in axis deviation:

#### Left axis deviation

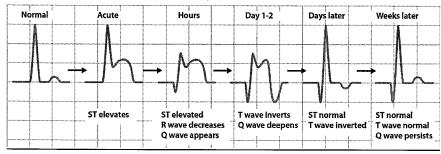
- Inferior wall myocardial infarction
- Left anterior fascicular block
- Left ventricular hypertrophy (sometimes)
- . LBBB
- High Diaphragm

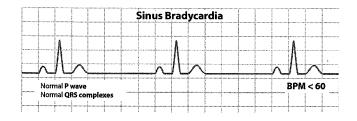
#### Right axis deviation

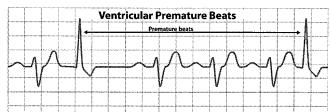
- Right ventricular hypertrophy
- Acute right heart strain (ex. massive pulmonary embolism)
- Left posterior fascicular block
- . RBBB
- Dextrocardia

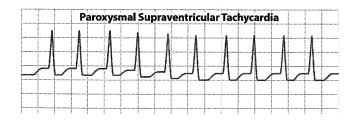
The net electrical signal (cardiac axis) will fall within the shaded region in normal cardiac physiology.

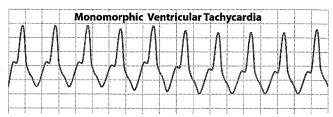
#### **Evolution of Myocardial Infarction**

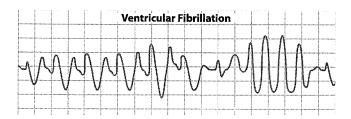












Cardiac Physiology Quiz 2	: EKG, Cardiovascular	Pressures (FA p	p262 – FA p265),	, (FA p284 – FA p286)
---------------------------	-----------------------	-----------------	------------------	-----------------------

1.	Describe how heart failure, liver failure, infections and toxins, and lymphatic blockage would affect the Starling forces of fluid movement through capillaries.
2.	What are the two different types of second degree AV block? How do they differ?
3.	What is the mechanism of action of each class of antiarrhythmic?
4.	Outline the mechanism by which the kidneys regulate BP.
5.	What are normal BPs in the right and left ventricles?

- 6. What substances act on smooth muscle myosin light-chain kinase? How does this effect blood pressure?
- 7. Describe the chain of events in which hypotension causes a reflex tachycardia.

# <u>CV Path/Pharm Part 1: HTN, Anti-HTN drugs, Atherosclerosis, Chest Pain, Angina</u> (FA p269 – FA p273) (FA p280 – FA p281)

- 1. What would you most suspect the cause of hypertension to be in a pt with the following clinical clues?
  - Paroxysms of increased sympathetic tone: anxiety, palpitations, diaphoresis
  - Age of onset between 20 and 50
  - Elevated serum creatinine and abnormal urinalysis
  - Abdominal bruit
  - BP in arms > legs
  - Family history of HTN
  - · Tachycardia, heat intolerance, diarrhea
  - Hyperkalemia
  - Episodic sweating and tachycardia
  - Abrupt onset in a pt younger than 20 or older than 50, and depressed serum K<sup>+</sup> levels
  - Central obesity, moon-shaped face, hirsutism
  - Normal urinalysis and normal serum K+ levels
  - Young individual with acute onset tachycardia
  - Hypokalemia
  - Proteinuria

2. Which antihypertensive class or drug fits the following side effect?

First dose orthostatic hypotension	
Ototoxic (especially with aminoglycosides)	
Hypertrichosis	
Cyanide toxicity	
Dry mouth, sedation, severe rebound HTN	
Bradycardia, impotence, asthma exacerbation	
Reflex tachycardia	
Cough	
Avoid in patients with sulfa allergy	
Possible angioedema	
Possible development of drug-induced lupus	
Hypercalcemia, hypokalemia	

- 3. Which antihypertensives are safe to use in pregnancy?
- 4. HYQ: While on an ACE inhibitor, a patient develops a cough. → What is a good replacement drug, and why doesn't it have the same side effects? →
- 5. Which lipid-lowering agent matches the following description? (FA p282)
  - SE: facial flushing
  - SE: elevated LFTs, myositis
  - SE: GI discomfort, bad taste
  - Best effect on HDL
  - Best effect on triglycerides/VLDL
  - Best effect on LDL/cholesterol
  - Binds C. diff. toxin
- 6. HYQ: A 50-year-old man starts on lipid-lowering medication. Upon his first dose, he develops a rash, pruritis, and diarrhea. → What drug is he taking? →
- 7. HYQ: How can the flushing reaction of niacin be prevented?
- 8. HYQ: What is the mechanism of action of the cardiac glycosides (digoxin, digitoxin)?
- 9. HYQ: An abdominal aortic aneurysm (AAA) is most likely a consequence of what process? →

10. What are the 5 deadly causes of acute chest pain?
11. HYQ: A patient with poorly managed HTN has acute, sharp substernal pain that radiates to the back and progresses over a few hours. → Death occurs in a few hours. → Diagnosis? →
12. Evolution of an MI:  • 0-4 hrs  • 4-24 hrs  • 2-4 days  • 5-10 days  • 10+ days
<ul> <li>13. What is the most likely cause of chest pain in the following scenarios?</li> <li>ST segment elevation only during brief episodes of chest pain</li> <li>Patient is able to point to localize the chest pain using one finger</li> <li>Chest wall tenderness on palpation</li> <li>Rapid onset sharp chest pain that radiates to the scapula</li> <li>Rapid onset sharp pain in a 20-year-old and a/w dyspnea</li> <li>Occurs after heavy meals and improved by antacids</li> <li>Sharp pain lasting hours-days and is somewhat relieved by sitting forward</li> <li>Pain made worse by deep breathing and/or motion</li> <li>Chest pain in a dermatomal distribution</li> <li>Most common cause of non-cardiac chest pain</li> <li>Acute onset dyspnea, tachycardia, and confusion in a hospitalized pt</li> <li>Pain began the day following an intensive new exercise program</li> </ul>
14. HYQ: During a high school football game, a young athlete collapses and dies immediately. → What type of cardiac disease did he have? →
Myocarditis     Generalized inflammation of the myocardium (not resulting from ischemia)     Most common cause in US:     Histo: diffuse interstitial infiltrate of cells with myocyte
Cardiovascular Pharmacology  Minoxidil (Rogaine)  • Mechanism of action: opens potassium channels and hyperpolarizes smooth muscle, resulting in relaxation of vascular smooth muscle  • Therapeutic use: severe hypertension (topical application for hair loss)  • Toxicity: hypertrichosis, hypotension, tachycardia (reflexive)  Calcium Channel Blockers (CCB)- nifedipine, verapamil, diltiazem  Non-dihydropyridine CCB: verapamil, diltiazem  • Mechanism of action: block calcium-channels at pacemaker cells (FA p286)  • Therapeutic use: hypertension, agging, arrhythmias
<ul> <li>Therapeutic use: hypertension, angina, arrhythmias</li> <li>Toxicity: cardiac depression, AV-block, flushing, dizziness, constipation</li> <li>Dihydropyridine CCB: nifedipine, amlodipine, felodipine, nicardipine, nisoldipine</li> <li>Mechanism of action: act on vascular smooth muscle to cause venous dilation and decrease preload</li> <li>Therapeutic use: hypertension, angina, vasospasm (Prinzmetal's angina, Raynaud's disease) esophageal spasm</li> <li>Toxicity: peripheral edema, flushing, dizziness, constipation, tachycardia (reflexive)</li> </ul>

#### **Chest Pain and MI**

**EKG Changes with MI** (Always obtain a previous EKG for comparison!)

- ST segment elevation of at least 1mm in 2 contiguous leads
- T wave inversion
- new LBBB
- new Q waves (at least 1 block wide or 1/3 height of the total QRS complex)

# <u>Arteries – Walls – EKG Leads</u>

Artery	Wall Perfused	EKG Leads
Left anterior descending	Anterior wall	V1-V4, V5
Left circumflex	Lateral wall	aVL, V5, V6
Right coronary	Inferior wall*	II, III, aVF
Right coronary	Posterior wall	R precordial EKG: V4

<sup>\*</sup> Always obtain a right-sided EKG (V1-V6 on right chest) in inferior wall MI → if ST segment elevation in V4, then posterior right ventricle also affected. This indicates a "right-sided MI"→ Fluid and avoid nitroglycerin..

# **CV Path Part 2: Murmurs and CHF** (FA p259)

15.	What defect is associated with the following type of mu	rmur?
]	Crescendo-decrescendo systolic murmur best heard	innar:
ı	in the 2 <sup>nd</sup> -3 <sup>rd</sup> right interspace close to the sternum	
İ	Early diastolic decrescendo murmur heard best along	
	the left side of the sternum	
İ	Late diastolic decrescendo murmur heard best along	
	the left side of the sternum	
ı	Pansystolic (AKA holosystolic or uniform) murmur	
	best heard at the apex and often radiates to the left	
	axilla	·
ŀ	Late systolic murmur usually preceded by a mid-	
	systolic click	
ı	Crescendo-decrescendo systolic murmur best heard	
	in the 2 <sup>nd</sup> -3 <sup>rd</sup> left interspaces close to the sternum	
ŀ	Pansystolic (AKA holosystolic or uniform) murmur	
	best heard along the left lower sternal border and	
ľ	generally radiates to the right lower sternal border	
-		
	Rumbling <u>late diastolic murmur</u> with an <u>opening snap</u>	
-	Panavatalia (AKA halaavatalia ay yaifayas)	
	Pansystolic (AKA <u>holosystolic</u> or uniform) murmur best heard at the 4 <sup>th</sup> -6 <sup>th</sup> left intercostal spaces	
1	Dest neard at the 4 -6 leπ intercostal spaces	
	Continuous machine-like murmur (in systole and	
-	diastole)	
	High-pitched diastolic murmur a/w a widened pulse	
L	pressure	
16.	What are the most common causes of aortic stenosis?	
17.	What heart sounds are considered benign when there i	s no evidence of disease?
18.	HYQ: Know the classic descriptions of heart murmurs!	→ Murmur heard best in left lateral decub. position. →
19.	HYQ: An 80-year-old man presents with a systolic creselikely cause? →	cendo-decrescendo murmur. → What is the most
20.	What are the signs of right-sided heart failure? What a	re the signs of left-sided heart failure?
21.	What medications are used to treat chronic heart failure	e? What medications are used for acute HF?

# CV Path Part 3: Inflammatory Heart Disease, Shock, and Vasculitis

(FA p275 – FA p276) (FA p277 – FA p279)

- 21. What are the typical signs and symptoms of endocarditis? .
  - · Fever, chills, weakness, anorexia
  - New regurgitation heart murmur or heart failure
    - Mitral valve is most common
    - Tricuspid is most common in IV drug users → septic pulmonary infarcts
  - · Splinter hemorrhages in fingernails
  - Osler's nodes (painful red nodules on finger and toe pads)
  - Roth spots (retinal hemorrhages with clear central areas)
  - Janeway lesions (erythematous macules on palms and soles)
  - Signs of embolism: brain infarct → focal neuro defects, renal infarct → hematuria, splenic infarct → abdominal or shoulder pain
  - Systemic immune reaction: glomerulonephritis, arthritis
- 22. How does SVR and CO change in the following types of shock? (FA p224)

SVR CO Rx

- Hypovolemia
- Heart failure
- Sepsis/anaphylaxis
- Neurogenic
- 23. What are the diagnostic criteria (Jones criteria) for rheumatic fever?

If evidence of a group A Strep infection, there is a high probability of acute rheumatic fever if a patient has two major criteria and one minor criterion.

#### Major criteria:

- Joints (migratory polyarthritis)
- Heart (pancarditis)
- Nodules (subcutaneous)
- Erythema marginatum (serpiginous skin rash)
- Sydenham's chorea (chorea of the face, tongue, upper-limb)

Minor criteria: arthralgia, fever, elevated ESR or CRP, prolonged PR interval on EKG

24. Kussmaul's sign vs. pulsus paradoxus:

	Kussmaul's sign	Pulsus paradoxus
Event	JVD with inspiration	Decreased SBP by more than
		10 mmHg with inspiration
Mechanism	Decreased capacity of RV	Decreased capacity of LV
Disease	Constrictive pericarditis >> tamponade	Cardiac tamponade >> pericarditis

- 25. HYQ: An IV drug user presents with chest pain, dyspnea, tachycardia, and tachypnea. → What is most likely the cause? →
- 26. HYQ: A patient in a MVA presents with chest pain, dyspnea, tachycardia, and tachypnea. → What is the most likely cause? →
- 27. HYQ: A post-op patient presents with chest pain, dyspnea, tachycardia, and tachypnea. → What is the most likely cause? →
- 28. HYQ: A young girl with congenital valve disease is given penicillin prophylactically. In the ER, bacterial endocarditis is diagnosed. → What is the next step in her management? →
- 29. Under what circumstances might you see pulsus paradoxus?

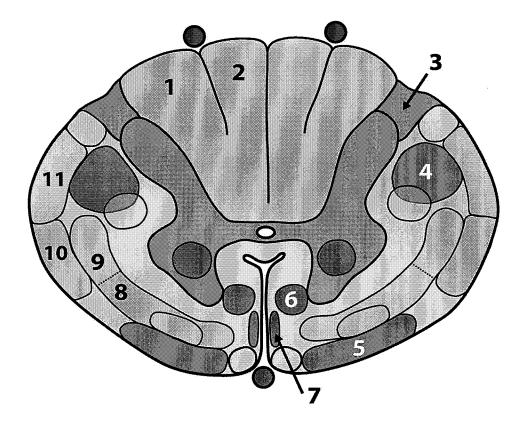
30. Wh	at heart pathology fits the following statement?				
[	Diffuse myocardial inflammation with necrosis and				
	mononuclear cells			·	
	Focal myocardial inflammation with multinucleate giant				
	cells				
	Fever + IVDA + new heart murmur				
	rever + IVDA + new near mumur				
	Chest pain and course rubbing heart sounds in pt with				
	Cr of 5.0				
	Tree-barking of the aorta				
	Child with fever, joint pain, cutaneous nodules 4 weeks				[.
	after a throat infection				
	ST elevations in all EKG leads				
	Disordered growth of myocytes				
	EKG shows electrical alternans	· · · · · · · · · · · · · · · · · · ·			
	Ento onomo diodinario				
31 W/	ich type of vasculitis fits the following description?				
01. 441	Weak pulses in upper extremities				
	weak puises in upper extremities				
	No	1*(*-	•		
	Necrotizing granulomas of lung and necrotizing glomerul				
	Necrotizing immune complex inflammation of visceral/rer	nai			
	vessels				
	Young male smokers				
	Young Asian women				
	Young asthmatics				
	Infants and young children; involved coronary arteries				
	Most common vasculitis				
	A/w hepatitis B infection				
	Occlusion of ophthalmic artery can lead to blindness				
	Perforation of nasal septum		· · · · · · · · · · · · · · · · · · ·		
	Unilateral headache, jaw claudication				
ļ					
32 \N/F	sich vacquiar tumor fits the following description? (EA p.270	<b>)</b>			
JZ. VVI	ich vascular tumor fits the following description? (FA p279 Benign raised red lesion about the size of a mole in older				
}	patients				
	Raised, red area present at birth, increases in size initiall	У			
1	then regresses over months to years				
	Lesion caused by lymphoangiogenic growth factors in an				
	infected HIV pt				
	Polypoid red lesion found in pregnancy or after trauma				
	Benign, painful, red-blue tumor under fingernails				
	Cavernous lymphangioma a/w Turner's syndrome				
	•				
	Skin papule in AIDS pt caused by Bartonella				
L		1.			1

1. What is the classic presentation of pt with temporal arteritis? What lab finding helps diagnose temporal arteritis? 2. What are the differences between acute and subacute bacterial endocarditis? 3. What are the Jones criteria for the diagnosis of acute rheumatic fever? 4. Why do the kidneys retain fluid in CHF pts? 5. What defect is associated with the following type of murmur? • Crescendo-decrescende systolic murmur best heard in the 2° -3° -3° right interspace close to the sternum • Rumbling late diastolic murmur with an opening snap • Pansystolic (AKA plosystolic or uniform) murmur best heard at the 4° -5° left intercostal spaces • Continuous machine-like murmur (in systole and diastole) 6. What are the common causes of restrictive cardiomyopathy? 7. What is Dressler's syndrome? 8. What are the two most common complications after an MI? 9. Evolution of an MI: • 0-4 hrs • 4-24 hrs • 4-47 hrs •	<u> </u>	ardiac Pathology Quiz	
<ol> <li>What are the Jones criteria for the diagnosis of acute rheumatic fever?</li> <li>Why do the kidneys retain fluid in CHF pts?</li> <li>What defect is associated with the following type of murmur?         <ul> <li>Crescendo-decrescendo systolic murmur best heard in the 2<sup>nd</sup>-3<sup>rd</sup> right interspace close to the sternum Rumbling late diastolic murmur with an opening snap</li> <li>Pansystolic (AKA holosystolic or uniform) murmur best heard at the 4<sup>th</sup>-6<sup>th</sup> left intercostal spaces</li> <li>Continuous machine-like murmur (in systole and diastole)</li> </ul> </li> <li>What are the common causes of restrictive cardiomyopathy?</li> <li>What is Dressler's syndrome?</li> <li>What are the two most common complications after an MI?</li> <li>Evolution of an MI:         <ul> <li>0-4 hrs</li> <li>4-24 hrs</li> <li>2-4 days</li> <li>5-10 days</li> </ul> </li> <li>What are the most common locations for atherosclerosis?</li> <li>HYO: An adult patient with a history of hypertension presents with a sudden sharp, tearing pain radiating to the back. → What would you expect to see on CXR? →</li> <li>HYQ: On auscultation of a patient, you hear a pansystolic murmur at the apex with radiation to the axilla. → What is the most likely cause of this murmur? →</li> <li>HYQ: A 25-year-old pregnant woman in her 3<sup>rd</sup> trimester has a normal BP when standing and sitting. When supine, her BP drops to 90/50. → What is the diagnosis? →</li> <li>What pathology matches the following scenario? (FA p525)         <ul> <li>"Onion-skin" periosteal reaction</li> <li>Pseudopalisading tumor cell arrangement</li> </ul> </li> </ol>	1.		gnose temporal
<ol> <li>Why do the kidneys retain fluid in CHF pts?</li> <li>What defect is associated with the following type of murmur?         <ul> <li>Crescendo-decrescendo systolic murmur best heard in the 2<sup>nd</sup>-3<sup>rd</sup> right interspace close to the sternum.</li> <li>Rumbling late diastolic murmur with an opening snap.</li> <li>Pansystolic (AKA holosystolic or uniform) murmur best heard at the 4<sup>th</sup>-6<sup>th</sup> left intercostal spaces.</li> <li>Continuous machine-like murmur (in systole and diastole).</li> </ul> </li> <li>What are the common causes of restrictive cardiomyopathy?</li> <li>What is Dressler's syndrome?</li> <li>What are the two most common complications after an MI?</li> <li>Evolution of an MI:         <ul> <li>0-4 hrs</li> <li>4-24 hrs</li> <li>2-4 days</li> <li>5-10 days</li> <li>10+ days</li> </ul> </li> <li>What are the most common locations for atherosclerosis?</li> <li>HYQ: An adult patient with a history of hypertension presents with a sudden sharp, tearing pain radiating to the back. → What would you expect to see on CXR? →</li> <li>HYQ: On auscultation of a patient, you hear a pansystolic murmur at the apex with radiation to the axilla. → What is the most likely cause of this murmur? →</li> <li>HYQ: A 25-year-old pregnant woman in her 3<sup>rd</sup> trimester has a normal BP when standing and sitting. When supine, her BP drops to 90/50. → What is the diagnosis? →</li> <li>What pathology matches the following scenario? (FA p525)         <ul> <li>"Onlon-skin" periosteal reaction</li> <li>Pseudopalisading tumor cell arrangement</li> </ul> </li> </ol>	2.	What are the differences between acute and subacute bacterial endocarditis?	
<ol> <li>What defect is associated with the following type of murmur?         <ul> <li>Crescendo-decrescendo systolic murmur best heard in the 2<sup>nd</sup>-3<sup>rd</sup> right interspace close to the sternum</li> <li>Rumbling late diastolic murmur with an opening snap</li> <li>Pansystolic (AKA holosystolic or uniform) murmur best heard at the 4<sup>th</sup>-6<sup>th</sup> left intercostal spaces</li> <li>Continuous machine-like murmur (in systole and diastole)</li> </ul> </li> <li>What are the common causes of restrictive cardiomyopathy?</li> <li>What is Dressler's syndrome?</li> <li>What are the two most common complications after an MI?</li> <li>Evolution of an MI:         <ul> <li>0-4 hrs</li> <li>4-24 hrs</li> <li>2-4 days</li> <li>5-10 days</li> <li>10+ days</li> </ul> </li> <li>What are the most common locations for atherosclerosis?</li> <li>HYQ: An adult patient with a history of hypertension presents with a sudden sharp, tearing pain radiating to the back. → What would you expect to see on CXR? →</li> <li>HYQ: On auscultation of a patient, you hear a pansystolic murmur at the apex with radiation to the axilla. → What is the most likely cause of this murmur? →</li> <li>HYQ: A 25-year-old pregnant woman in her 3<sup>rd</sup> trimester has a normal BP when standing and sitting. When supine, her BP drops to 90/50. → What is the diagnosis? →</li> <li>What pathology matches the following scenario? (FA p525)         <ul> <li>"Onion-skin" periosteal reaction</li> <li>Pseudopalisading tumor cell arrangement</li> </ul> </li> </ol>	3.	What are the Jones criteria for the diagnosis of acute rheumatic fever?	
<ul> <li>Crescendo-decrescendo systolic murmur best heard in the 2<sup>nd</sup>-3<sup>rd</sup> right interspace close to the sternum Rumbling late diastolic murmur with an opening snap Pansystolic (AKA holosystolic or uniform) murmur best heard at the 4<sup>th</sup>-6<sup>th</sup> left intercostal spaces</li> <li>Continuous machine-like murmur (in systole and diastole)</li> <li>What are the common causes of restrictive cardiomyopathy?</li> <li>What is Dressler's syndrome?</li> <li>What are the two most common complications after an MI?</li> <li>Evolution of an MI: <ul> <li>0-4 hrs</li> <li>4-24 hrs</li> <li>4-24 hrs</li> <li>2-4 days</li> <li>5-10 days</li> <li>10+ days</li> </ul> </li> <li>What are the most common locations for atherosclerosis?</li> <li>What are the most common locations for atherosclerosis?</li> <li>HYQ: An adult patient with a history of hypertension presents with a sudden sharp, tearing pain radiating to the back. → What would you expect to see on CXR? →</li> <li>HYQ: On auscultation of a patient, you hear a pansystolic murmur at the apex with radiation to the axilla. → What is the most likely cause of this murmur? →</li> <li>HYQ: A 25-year-old pregnant woman in her 3<sup>rd</sup> trimester has a normal BP when standing and sitting. When supline, her BP drops to 90/50. → What is the diagnosis? →</li> <li>What pathology matches the following scenario? (FA p525)</li> <li>"Onion-skin" periosteal reaction</li> <li>Pseudopalisacing tumor cell arrangement</li> </ul>	4.	Why do the kidneys retain fluid in CHF pts?	
<ol> <li>What is Dressler's syndrome?</li> <li>What are the two most common complications after an MI?</li> <li>Evolution of an MI:         <ul> <li>0-4 hrs</li> <li>4-24 hrs</li> <li>2-4 days</li> <li>5-10 days</li> <li>10+ days</li> </ul> </li> <li>What are the most common locations for atherosclerosis?</li> <li>HYQ: An adult patient with a history of hypertension presents with a sudden sharp, tearing pain radiating to the back. → What would you expect to see on CXR? →</li> <li>HYQ: On auscultation of a patient, you hear a pansystolic murmur at the apex with radiation to the axilla. → What is the most likely cause of this murmur? →</li> <li>HYQ: A 25-year-old pregnant woman in her 3<sup>rd</sup> trimester has a normal BP when standing and sitting. When supine, her BP drops to 90/50. → What is the diagnosis? →</li> <li>What pathology matches the following scenario? (FA p525)         <ul> <li>"Onion-skin" periosteal reaction</li> <li>Pseudopalisading tumor cell arrangement</li> </ul> </li> </ol>	5.	<ul> <li><u>Crescendo-decrescendo</u> systolic murmur best heard in the 2<sup>nd</sup>-3<sup>rd</sup> right interspace cl</li> <li>Rumbling <u>late diastolic murmur</u> with an <u>opening snap</u></li> <li>Pansystolic (AKA <u>holosystolic</u> or uniform) murmur best heard at the 4<sup>th</sup>-6<sup>th</sup> left interced</li> </ul>	
<ol> <li>What is Dressler's syndrome?</li> <li>What are the two most common complications after an MI?</li> <li>Evolution of an MI:         <ul> <li>0-4 hrs</li> <li>4-24 hrs</li> <li>2-4 days</li> <li>5-10 days</li> <li>10+ days</li> </ul> </li> <li>What are the most common locations for atherosclerosis?</li> <li>HYQ: An adult patient with a history of hypertension presents with a sudden sharp, tearing pain radiating to the back. → What would you expect to see on CXR? →</li> <li>HYQ: On auscultation of a patient, you hear a pansystolic murmur at the apex with radiation to the axilla. → What is the most likely cause of this murmur? →</li> <li>HYQ: A 25-year-old pregnant woman in her 3<sup>rd</sup> trimester has a normal BP when standing and sitting. When supine, her BP drops to 90/50. → What is the diagnosis? →</li> <li>What pathology matches the following scenario? (FA p525)         <ul> <li>"Onion-skin" periosteal reaction</li> <li>Pseudopalisading tumor cell arrangement</li> </ul> </li> </ol>	6.	What are the common causes of restrictive cardiomyopathy?	
<ul> <li>9. Evolution of an MI: <ul> <li>0-4 hrs</li> <li>4-24 hrs</li> <li>2-4 days</li> <li>5-10 days</li> <li>10+ days</li> </ul> </li> <li>10. What are the most common locations for atherosclerosis?</li> <li>11. HYQ: An adult patient with a history of hypertension presents with a sudden sharp, tearing pain radiating to the back. → What would you expect to see on CXR? →</li> <li>12. HYQ: On auscultation of a patient, you hear a pansystolic murmur at the apex with radiation to the axilla. → What is the most likely cause of this murmur? →</li> <li>13. HYQ: A 25-year-old pregnant woman in her 3<sup>rd</sup> trimester has a normal BP when standing and sitting. When supine, her BP drops to 90/50. → What is the diagnosis? →</li> <li>14. What pathology matches the following scenario? (FA p525)</li> <li>"Onion-skin" periosteal reaction</li> <li>Pseudopalisading tumor cell arrangement</li> </ul>	7.	What is Dressler's syndrome?	
<ul> <li>0-4 hrs</li> <li>4-24 hrs</li> <li>2-4 days</li> <li>5-10 days</li> <li>10+ days</li> </ul> 10. What are the most common locations for atherosclerosis? 11. HYQ: An adult patient with a history of hypertension presents with a sudden sharp, tearing pain radiating to the back. → What would you expect to see on CXR? → 12. HYQ: On auscultation of a patient, you hear a pansystolic murmur at the apex with radiation to the axilla. → What is the most likely cause of this murmur? → 13. HYQ: A 25-year-old pregnant woman in her 3 <sup>rd</sup> trimester has a normal BP when standing and sitting. When supine, her BP drops to 90/50. → What is the diagnosis? → 14. What pathology matches the following scenario? (FA p525) <ul> <li>"Onion-skin" periosteal reaction</li> <li>Pseudopalisading tumor cell arrangement</li> </ul>	8.	What are the two most common complications after an MI?	
<ul> <li>11. HYQ: An adult patient with a history of hypertension presents with a sudden sharp, tearing pain radiating to the back. → What would you expect to see on CXR? →</li> <li>12. HYQ: On auscultation of a patient, you hear a pansystolic murmur at the apex with radiation to the axilla. → What is the most likely cause of this murmur? →</li> <li>13. HYQ: A 25-year-old pregnant woman in her 3<sup>rd</sup> trimester has a normal BP when standing and sitting. When supine, her BP drops to 90/50. → What is the diagnosis? →</li> <li>14. What pathology matches the following scenario? (FA p525)</li> <li>• "Onion-skin" periosteal reaction</li> <li>• Pseudopalisading tumor cell arrangement</li> </ul>	9.	<ul> <li>0-4 hrs</li> <li>4-24 hrs</li> <li>2-4 days</li> <li>5-10 days</li> </ul>	
<ul> <li>the back. → What would you expect to see on CXR? →</li> <li>12. HYQ: On auscultation of a patient, you hear a pansystolic murmur at the apex with radiation to the axilla. → What is the most likely cause of this murmur? →</li> <li>13. HYQ: A 25-year-old pregnant woman in her 3<sup>rd</sup> trimester has a normal BP when standing and sitting. When supine, her BP drops to 90/50. → What is the diagnosis? →</li> <li>14. What pathology matches the following scenario? (FA p525)</li> <li>"Onion-skin" periosteal reaction</li> <li>Pseudopalisading tumor cell arrangement</li> </ul>	10	). What are the most common locations for atherosclerosis?	
<ul> <li>What is the most likely cause of this murmur? →</li> <li>13. HYQ: A 25-year-old pregnant woman in her 3<sup>rd</sup> trimester has a normal BP when standing and sitting. When supine, her BP drops to 90/50. → What is the diagnosis? →</li> <li>14. What pathology matches the following scenario? (FA p525)</li> <li>"Onion-skin" periosteal reaction</li> <li>Pseudopalisading tumor cell arrangement</li> </ul>	11	. HYQ: An adult patient with a history of hypertension presents with a sudden sharp, tearir the back. → What would you expect to see on CXR? →	ng pain radiating to
supine, her BP drops to 90/50. → What is the diagnosis? →  14. What pathology matches the following scenario? (FA p525)  • "Onion-skin" periosteal reaction  • Pseudopalisading tumor cell arrangement	12	2. HYQ: On auscultation of a patient, you hear a pansystolic murmur at the apex with radiate What is the most likely cause of this murmur? →	ion to the axilla. →
<ul><li> "Onion-skin" periosteal reaction</li><li> Pseudopalisading tumor cell arrangement</li></ul>	13	3. HYQ: A 25-year-old pregnant woman in her 3 <sup>rd</sup> trimester has a normal BP when standing supine, her BP drops to 90/50. → What is the diagnosis? →	and sitting. When
	14	<ul><li> "Onion-skin" periosteal reaction</li><li> Pseudopalisading tumor cell arrangement</li></ul>	

# Spinal Cord Overview

Which spinal tract conveys the following information?

- · Touch, vibration, and pressure sensation
- Voluntary motor command from motor cortex to body
- Voluntary motor command from motor cortex to head/neck
- Alternate routes for the mediation of voluntary movement
- Pain and temperature sensation
- Important for postural adjustments and head movements
- Proprioceptive information for the cerebellum



Basic Oncology (FA p225 - FA p230)

Text Correlation: Robbins and Cotran Pathologic Basis of Disease - Chapter 7 Neoplasia

<u>Protooncogenes</u>

· Normal cellular genes that regulate cell proliferation and differentiation that can become oncogenes

**Oncogenes** 

- Genes that promote autonomous cell growth in cancer cells by promoting cell growth in the absence of normal mitotic signals
  - Oncoproteins produced from these genes are devoid of important regulatory elements

RAS Oncogene

- Mutations in RAS is the most common oncogene abnormality in human tumors
- 15-20% of all human tumors contain mutated versions of RAS proteins
- K-RAS mutation  $\rightarrow$  colon, lung, and pancreatic tumors (<u>K</u>olon, pan<u>K</u>reatic)
- H-RAS mutation → bladder and kidney tumors (<u>H</u>ematuria)
- N-RAS mutation → melanomas, hematologic malignancies

Retinoblastoma

- ¼ of cases are bilateral (both eyes), and all bilateral cases are inherited point mutations.
- The other 3/4 of cases are unilateral (one eye), most of these are sporadic mutations.
- Overall, sporadic mutations account for about 60% of the mutations in the Rb gene, and these are always unilateral. In other words, 40% of retinoblastomas are inherited (which results in either bilateral or unilateral retinoblastoma).
- In order for the mutation to occur, there must be mutations to both alleles (AKA "two-hits").
  - In the heritable form, one of those hits comes from the parent gene, and the other hit arises sporadically.
  - In the somatic/sporadic form, both hits arise sporadically.

p53

- Acts through p21 to cause cell-cycle arrest
- Involved at the G1/S checkpoint and G2/M checkpoint
- Causes apoptosis by inducing the transcription of pro-apoptotic genes (such as BAX)
- Mutations in this gene allow the cell to progress through the checkpoint despite the presence of DNA damage/mutations

#### Oncogenic Bacteria and Protozoa

- Strep. bovis →
- H. pylori →
- Schistosoma hematobium →
- Clonarchis sinesis →

# Basic Oncology Quiz (FA p225 - FA p230)

- 1. What neoplasms are associated with the following conditions?
  - Hashimoto's thyroiditis
  - Down's syndrome
  - Plummer-Vinson syndrome
  - Tuberous sclerosis
  - Ataxia telangectasia
  - Paget's disease of bone
- Among men and among women, compare the most common cancers and the most common cancers causing mortality.
- 3. What type of cancer is a/w the following tumor suppressor genes?
  - Rb
  - DPC
  - p53
  - APC
  - WT1
  - BRCA1 and BRCA2
- 4. Which neoplasm is a/w the following statement?
  - Nitrosamines
  - Asbestos
  - Naphthalene
  - Arsenic
  - EBV
  - HPV
  - Schistoma haematobium
- 5. Which tumor marker would you use to follow the following cancer?
  - Hepatocellular carcinoma (Hep B and C patients)
  - Ovarian cancer
  - Pancreatic cancer
  - Melanoma
  - Colon cancer
  - Astrocytoma
- 6. What is the most common cause of hypercalcemia? What cancers may cause hypercalcemia?
- 7. What neoplasm is most commonly responsible for the following paraneoplastic syndrome?
  - ACTH → Cushing's syndrome
  - Erythropoietin → polycythemia
  - ADH → SIADH

)

)

)

)

)

)

)

)

)

# Cancer Drugs (FA p364 - FA p368)

Which anticancer drug fits the following description?

- Forms a complex between topoisomerase II and DNA
- Alkylates DNA, toxicity → pulmonary fibrosis
- Fragments DNA, toxicity → pulmonary fibrosis
- Blocks purine synthesis, metabolized by xanthine oxidase
- Cross-links DNA, nephrotoxic, ototoxic
- Nitrogen mustard, alkylates DNA (electrophil that binds DNA)
- · Folic acid analog that inhibits dihydrofolate reductase
- Prevents tubulin disassembly
- Intercalates DNA, produces oxygen free radicals, cardiotoxic
- DNA alkylating agents used in brain cancer
- Prevents tubulin assembly
- Inhibits thymidylate synthase → decreased nucleotide synthesis
- SERM- blocks estrogen binding to ER(+) cells
- · Mechanism similar to antivirals acyclovir and foscarnet
- Mechanism similar to fluoroquinolones
- Mechanism similar to trimethoprim
- Monoclonal antibody against HER-2 (erb-B2)
- Free radical induced DNA strand breakage
- Inhibitor of PRPP synthetase
- · Reversible with leucovorin
- · Treatment for choriocarcinoma
- Treatment for AML
- Treatment for CML
- · Prevents breast cancer
- · Treatment for testicular cancer
- Applied topically for AKs and Basal cell cancers
- Treatment for childhood tumors (Ewing's sarcoma, Wilm's tumor, rhabdomyosarcoma)
- · Inhibits ribonucleotide reductase
- SE of hemorrhagic cystitis
- Antibody against Philadelphia chromosome

What are the potential side effects of prednisone use?

#### The Thalamus (FA p399)

- Somatosensory from body (via medial lemniscus and spinothalamic)
- Communications with prefrontal cortex
- Cerebellum (dentate nucleus) and basal ganglia → motor cortex
- Trigeminothalamic and taste pathways to somatosensory cortex
- Retina → occipital lobe
- Basal ganglia → prefrontal, premotor, and orbital cortices
- Mamillothalamic tract → cingulate gyrus (part of Papez circuit)
- Integration of visual, auditory, and somesthetic input
- Memory loss results if destroyed
- (Auditory info) brachium of inferior colliculus → primary auditory cortex

Connective & Musculoskeletal Tissue (FA p371, FA p372 – FA p393) (FA p216)

Nonepithelial / Nonjunctional Adhesion Mechanisms

Oncology, MS, and Derm

Copyright © 2011, All Rights Reserved, Doctors In Training.com, LLC

- Cadherins
- ICAMs
- Integrins
- Selectins
- 1. HYQ: Hemidesmisome, cadherin, integrin, ICAM-1. Which joins only cells of the same type and does not attach cells to the basement membrane? →
- HYQ: Where does new bone formation take place in growing long bones? →
- 3. HYQ: A football player who was kicked in the leg suffers from a damaged medial meniscus. → What else is likely to have been damaged? →
- 4. Which muscles of the rotator cuff are responsible for the following actions? (FA p371)
  - Initial 15 degrees of arm abduction
  - Lateral rotation of arm
  - Medial rotation of arm
- 5. What is the difference between a dislocated shoulder and a separated shoulder?

Dislocated-

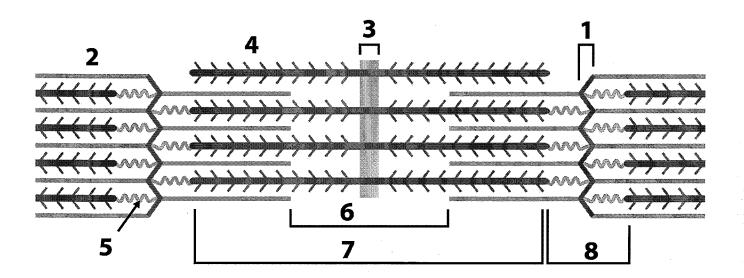
head of humerus rotates out of glenoid cavity

Separated-

clavicle separates from acromion and coracoid process of the scapula

- 6. What structures can be damaged in an anterior shoulder dislocation?
  - Axillary nerve and posterior circumflex artery
  - Supraspinatous tendon
  - Anterior glenohumeral ligaments and glenoid labrum separation from the articular surface of the anterior glenoid neck (AKA Bankhart lesion)
  - Posterolateral humeral head defect (due to abrasion against the anterior rim of the glenoid) (AKA Hill-Sack lesion)
- 7. Label the following sarcomere:

#### Sarcomere



- 8. Osteoporosis Treatment
  - Stop smoking, stop alcohol consumption, stop steroids (if able), avoid PPI and H2-blockers if possible
  - <u>Exercise</u> (aerobic, resistance, and weight bearing)

)

)

)

)

) )

- · Fall risk assessment at home
- Vitamin D supplementation
- <u>Calcium</u> supplementation
- Bisphosphonates (inhibit osteoclastic resorption, ↓ fracture risk by 40-50%)
- <u>PTH</u> (anabolic agent that stimulates osteoblasts) for moderate-severe OP treatment: <u>Teriparatide</u> decreases hip fracture rate by 53%, duration of therapy not to exceed 2yrs, must use biphos after stopping PTH to maintain BMD
- <u>Testosterone replacement</u> for men with low testosterone (relatively unresearched but theoretically a good idea; OP with testosterone deficiency should still be treated with bisphosphonates.
- Conjugated estrogen (WHI trial → hip fx reduction of 33%) USPSTF recommends not using estrogen for the sole purpose for fx reduction risk due to risk of other SE (MI and CVA). May use with bisphosphonate. Accelerated bone loss is seen after withdrawal of estrogen therapy.
- <u>SERM: Raloxifene</u> decreases vertebral fx by 40% in women with OP, no effect on risk of nonvertebral fx risk, reduces risk of breast CA.
- <u>Miacalcin (calcitonin)</u> inhibits osteoclasts, dosed nasally or SC/IM, not as effective as bisphos.; in fact, overall effectiveness is questionable
- <u>Combination</u> therapy (i.e., bisphosphonate + Raloxifene)

# Osteitis fibrosa cystic (AKA von Recklinhausen disease of bone)

- A bony manifestation of an endocrine disorder
- Can be caused by:
  - Hyperparathyroidism
    - High PTH → high serum calcium, low serum phosphate, high alkaline phosphatase
    - Type 1A pseudohypoparathyroidism (AKA Albright's Hereditary Osteodystrophy)
    - PTH resistance at the renal tubules → low serum calcium and high phosphate
    - Low calcium → high PTH
- High PTH → excess osteoclastic activity → <u>"Brown tumors" in bone</u> which are cystic spaces lined by osteoclasts filled with fibrous stroma and blood
- DEXA scan reveals low bone mineral density, but the mechanism of bone loss is different from OP
- 9. Which bony disease fits the following description?
  - · Reversible when vitamin D is replaced
  - · Excess osteoclastic activity results in disorganized bony architecture
  - Bone is replaced by fibroblasts, collagen, and irregular bony trabeculae
  - · Soft bones due to defective mineralization of osteoid
  - Failure of bone resorption → thickened and dense bones
  - · Genetic deficiency of carbonic anhydrase II

# 10. Fill-in the following table (FA p380):

	Serum Ca	Serum Phos	Alk Phos	PTH
Paget's Disease				
Osteomalacia / Rickets				
Osteitis fibrosa cystica				
Osteoporosis				
Osteopetrosis				

- 11. Which primary bone tumor fits the following description? (FA p381 FA p382)
  - Most common malignant primary bone tumor of children
  - Most common malignant primary bone tumor in adults
  - Most common benign bone tumor
  - 11:22 translocation
  - Soap-bubble appearance on x-ray
  - · Onion-skin appearance of bone
  - May actually be a hamartoma
  - Codman's triangle on x-ray
  - Associated with Gardner's syndrome

- 12. HYQ: A man presents with pain and swelling of the knees, subcutaneous nodules around the joints and Achilles tendon, and exquisite pain in the metatarsophalangeal joint of his right big toes. → Biopsy reveals needle-like crystals. → What is the diagnosis? →
- 13. HYQ: treatment of acute gout exacerbation →

#### 14. SLE = 4/11

#### Skin

- Malar rash
- Discoid rash
- Photosensitivity
- · Oral ulcers

#### -Itis

- Arthritis (nonerosive, 2 joints)
- Serositis (pleuritis, pericarditis)
- (+) ANA

#### **Disorders**

- Renal (proteinuria, cellular casts)
- Neuro (seizures, psychosis)
- Heme (hemolytic anemia, leukopenia, lymphopenia, thrombocytopenia)
- Immune (antiphospholipid Ab (+), anti-dsDNA, anti-Smith, false (+) VDRL)

#### 15. Sarcoid

Granulomas

RA

Uveitis (eye)

Erythema nodosum (tibial)

Lymphadenopathy (hilar, bilateral)

Idiopathic

Not TB

Gamma globulinemia

(ACE increase)

- 16. HYQ: A patient has difficulty swallowing, distal cyanosis in cold temperatures, and anti-centromere antibodies.
  - → What else would you expect to see in this pt? →
- 17. HYQ: A patient presents with photosensitivity, arthritis, renal disease and recurrent oral ulcers is taking primaquine and NSAIDS. → What type of check-up should she be receiving twice a year →
- 18. HYQ: A 30 year-old woman presents with a low grade fever, a rash across her nose that gets worse when she is out in the sun, and widespread edema. → What blood test would you order to confirm your clinical suspicion? →
- 19. HYQ: A CT scan of the chest reveals bilateral hilar lymphadenopathy. → What is the diagnosis? →
- 20. HYQ: A 75 year-old man presents with acute knee pain and swelling. An X-ray reveals absence of erosion of the joint space and calcium deposits in the menisci. → What is the diagnosis, and what would you find on aspiration of the joint? →

# 21. Fibromyalgia

- Excess muscular tenderness in 11 of 18 particular sites
- Chronic generalized pain, fatigue, sleep disturbances, HA, cognitive difficulty, mood disturbances
- 30% also have depression and/or anxiety
- Pharm treatment
  - FDA approved: pregabalin, milnacipran (1/2009)
  - Traditional (non-FDA approved): amitryptiline, low dose analgesic, fluoxetine
- Nonpharm treatment: reassurance that it is a real disease and that it is benign, exercise and stretching, sleep, relaxation techniques, stress reduction

)

)

)

)

)

)

)

)

)

)

)

)

)

#### 22. Psoriasis Treatment Options -

- Treatment Options (effectiveness commonly wanes, so rotate therapies about q-year)
- <u>Topical steroids</u> NEVER give oral steroids to someone with psoriasis!
- Calcipotriene (vitamin D3 analog that inhibits epidermal cell proliferation)
  - Most worldwide prescribed single-agent treatment for psoriasis
- <u>Tazarotene (Tazorac)</u> (topical retinoid → normalizes keratinocyte proliferation)
- <u>Coal tar</u> (suppresses DNA synthesis)
  - Brown tar (liquor carbonis detergens, LCD) comes in moisturizers, soaks, or ointments
  - Black tar (crude coal tar) comes as 2%, 5%, or 10% (FDA ruled 5% or less not carcinogenic)
  - Use with UV therapy (Goeckerman therapy) for mod-severe psoriasis
  - Must be left on for at least 4 hours. Stains clothes and sheets.
- Anthralin
  - It is messy (purple-brown staining of skin (reversible) and everything), irritating, and moderate efficacy
  - Absorption occurs within 1 hour → may shower an hour after application
- Salicylic acid (keratolytic used to remove excess scale)
- <u>UV therapy</u>- for pts with more than 10% (refer to a Dermatologist)
- Soriatane (acitretin)
  - Use if > 10% BSA
  - CBC, LFTs, Lipids q1m x 3 then q3m
  - Absolute contraindication in pregnancy!
- Kenalog injections into dermis
- <u>Etanercept</u>: Anti-TNF agent approved for use in mod-severe psoriasis (see Rheum. section)
- Others agents (if refractory to Soriatane or UV light): oral retinoids, methotrexate, cyclosporine

#### 23. Acne

Pathophysiology	Treatment
Hyperkeratosis	
Sebum overproduction	
Propionibacterium acnes proliferation	
Inflammation	

## 24. Atopic dermatitis (AKA eczema) Treatment:

- Switching to a moisturizing soap (Dove, Aveeno) and adding an OTC emollient may be all that is needed for maintenance and mild cases
- Calcineurin inhibitors: tacrolimus (Protopic) or pimecrolimus (Elidel)
- Topical Steroids
- Antibiotics for open lesions (cover Staph. aureus and Strep. spp.)
- Antihistamines
- Leukotriene inhibitors (Montelukast) theoretical efficacy supported by weak studies
- UV light therapy
- Systemic steroids (1-2mg/kg/d in children then taper) only in severe cases and only for short duration
- For very severe cases, consider methotrexate, cyclosporin, azathioprine

# 25. Which skin disorder matches the following statement? (FA p388 – FA p389)

- Pruritic, purple, polygonal papules
- · Life threatening rash w/ bulla
- Pruritis a/w asthma
- Pruritic vesicles a/w celiac disease
- Allergy to nickel
- Thickened scar esp. around face/chest
- Antibodies against epidermal basement membrane
- Antibodies against epidermal cell surface
- Parakeratotic scaling
- Keratin-filled cysts
- Sand-paper; predisposition to squamous cell cancer
- Skin rash and proximal muscle weakness
- Honey-crusting lesions common about the nose and lips
- Hyperkeratosis and koilocytosis
- Histology shows palisading nuclei

# **Connective / Musculoskeletal Quiz**

1.	<ul> <li>Which anticancer drug fits the following description? (FA p216)</li> <li>Fragments DNA, toxicity → pulmonary fibrosis</li> <li>Blocks purine synthesis, metabolized by xanthine oxidase</li> <li>Folic acid analog that inhibits dihydrofolate reductase</li> <li>Prevents tubulin disassembly</li> <li>DNA alkylating agents used in brain cancer</li> <li>SERM- blocks estrogen binding to ER(+) cells</li> </ul>
2.	What are the manifestations of CREST scleroderma? (FA p387)
3.	What are the manifestations of sarcoidosis? (FA p386)
4.	What are the classic symptoms of Sjögren's syndrome? (FA p383)
5.	What pathology matches the following statement? (FA p521 – FA p531)  Signet ring cells in the ovary Signet rings in RBCs  Smudge cell Spike and dome of glomerulus on EM Tram track of glomerulus on light microscopy Strawberry tongue Most common location of tophi
6.	<ul> <li>Which skin disorder matches the following statement? (FA p388 – FA p389)</li> <li>Pruritic, purple, polygonal papules</li> <li>Pruritic vesicles a/w celiac disease</li> <li>Antibodies against epidermal cell surface</li> <li>Parakeratotic scaling</li> <li>Keratin-filled cysts</li> <li>Skin rash and proximal muscle weakness</li> </ul>
7.	What drugs can be used in the treatment of gout? (FA p393)
8.	What is the mechanism of treating acetaminophen overdose? (FA p392)
9.	What are the risk factors for osteoporosis? (FA p379) What measures can be taken to prevent osteoporosis?
10.	What drugs are known for causing drug-induced lupus? (FA p385)

#### **Endocrine Basics**

- 1. What hormone has the following action(s)?
  - Stimulates bone and muscle growth
  - Stimulates milk production and secretion
  - Stimulates milk secretion during lactation
  - Responsible for female secondary sex characteristics
  - Stimulates metabolic activity
  - Increases blood glucose level and decreases protein synthesis
  - · Responsible for male secondary sex characteristics
  - Prepares endometrium for implantation / maintenance of pregnancy
  - Stimulates adrenal cortex to synthesize and secrete cortisol
  - Stimulates follicle maturation in females and spermatogenesis in males
  - Increases plasma calcium, increases bone resorption
  - Decreases plasma calcium, increases bone formation
  - Stimulates ovulation in females and testosterone synthesis in males
  - Stimulates thyroid to produce TH and uptake iodine
- 2. From where is the following hormone secreted?
  - Growth hormone (GH)
  - Thyroid hormone
  - Glucocorticoids (cortisol)
  - Progesterone
  - Prolactin
  - Oxytocin
  - Atrial natriuretic hormone (ANH)
  - Glucagon
  - Testosterone
  - Follicle-stimulating hormone (FSH)
  - Vasopressin (ADH)
  - Calcitonin
  - Thyroid-stimulating hormone (TSH)
  - Epinephrine and norepinephrine
  - Insulin
  - Estradiol
  - Estriol
  - Estrone
  - Estrogen in males
  - Parathyroid hormone (PTH)
  - Somatostatin
  - Luteinizing hormone (LH)
  - Mineralocorticoids (aldosterone)
  - Adrenocorticotropic hormone (ACTH)
- 3. Hormone MOA. (FA p295)

#### **Pituitary**

Pituitary Anatomy (FA p288) and Hormone Regulation (FA p290) Prolactin Regulation (FA p290)

Pituitary Adenoma (FA p300)

Hyperprolactinemia (see below)

Sheehan's Syndrome

Acromegaly (FA p300)

GH & Somatostatin (FA p305, see below)

# **ACTH** and MSH

ACTH is synthesized as part of a large precursor called proopiomelanocortin (POMC), which also contains the sequences for other hormonal peptides, including the lipotropins, melanocyte-stimulating hormones (MSH) and beta-endorphin.

# Hyperprolactinemia (FA p290) (FA p299) (FA p484)

- Causes
  - Pregnancy / Nipple stimulation
  - Stress (physical or psychological)
  - Prolactinoma (a/w bitemporal hemianopia)
  - Dopamine antagonists: antipsychotics (haloperidol, respiridone), domperidone, metoclopramide, methyldopa
- Premenopausal female symptoms hypogonadism → infertility, oligo/amenorrhea; rarely galactorrhea
- Postmenopausal female symptoms none since already hypogonadal
- Male symptoms hypogonadism (low testosterone) → decreased libido, impotence, infertility (low sperm counts), gynecomastia, rarely galactorrhea

# Somatostatin (FA p305) (FA p317)

- Produced throughout the GI tract but notably by D cells in gut mucosa and pancreatic islet cells
- Also produced throughout the nervous system
- In the CNS, PNS, and peripheral organs somatostatin decreases endocrine and exocrine secretion, reduces splanchnic blood flow, reduces gastrointestinal motility and gallbladder contraction, and inhibits secretion of most gastrointestinal hormones
- Clinical Uses for somatostatin analogs (octreotide, somatostatin LAR, and lanreotide-P):
  - <u>Pituitary Excesses</u>: acromegaly, thyrotropinoma, ACTH-secreting tumors
  - GI endocrine excess: Zollinger-Ellison Syndrome, carcinoid syndrome, VIPoma (AKA pancreatic cholera), glucagonoma, insulinoma
  - Certain diarrheal diseases
  - Need to reduce splanchnic circulation: portal hypertension (bleeding varices), bleeding peptic ulcers
- HYQ: A 50 year-old female complains of double vision, amenorrhea, and headaches. → What is the most likely diagnosis? →
- 5. HYQ: A patient's MRI reveals replacement of tissue in the sella turcica with CSF. → What is the most likely clinical presentation? →
- 6. HYQ: What hormones arise from the anterior pituitary? →
- 7. HYQ: Which hormones share a common alpha subunit? →

)

) )

)

)

)

)

)

)

)

) )

# PTH and Calcium Calcium Phys/Metabolism (FA p293 – FA p294 and FA p380) Sign/Symptoms of Hyperparathyroidism (see below) Calcium Path (FA p293) 8. Signs/Symptoms of Primary Hyperparathyroidism Bones Abdominal Groans Psychic moans Other Hypercalcemia 90% · Primary hyperparathyroidism Solitary parathyroid adenoma (85%) Parathyroid hyperplasia (15%) Malignancy Squamous cell cancers (especially lung)(via PTH-related peptide) Renal cell carcinoma Breast cancer matastasis Multiple myeloma (via local osteolytic factors) 10% Excess vitamin D ingestion • Excess antacid ingestion = milk-alkali syndrome Granulomatous dz (excess vitamin D due to sarcoid or TB)

Hypocalcemia

- Hypoparathyroidism
  - Parathyroidectomy (from damage during thyroidectomy)
  - Autoimmune destruction of parathyroids

Thiazide diuretics → decreased renal excretion of calcium

- Pseudohypoparathyroidism (kidneys unresponsive to PTH)

Increased bone turnover (hyperthyroidism, vitamin A intoxication, immobilization)

- DiGeorge syndrome
- Poor calcium intake
- Vitamin D deficiency
  - Nutritional deficiency and paucity of sunlight
  - Chronic renal failure
- Acute Pancreatitis

# Calcium Quiz

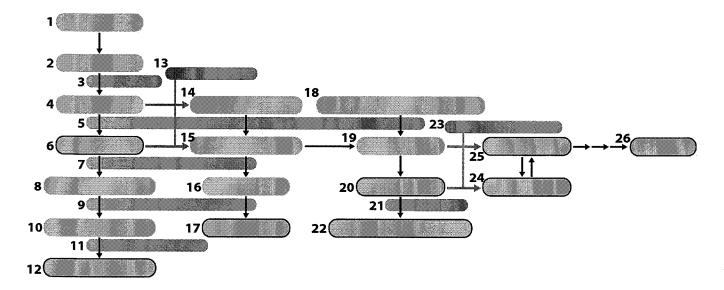
1.	What are the 3 functions of vitamin D?
2.	How does PTH affect calcium? How does PTH affect phosphate?
3.	What cells secrete calcitonin?
4.	What are two signs of hypocalcemia?
5.	What are two the most common causes of primary hyperparathyroidism?
6.	What is the underlying cause of renal osteodystrophy? How will serum Ca, Phos, Alk Phos, and PTH levels compare to normal levels with this disease?
7.	What agents can be used to treat osteoporosis?
8.	In Osteomalacia and Rickets, how will serum Ca, Phos, Alk Phos, PTH, urine Ca, and urine Phos compare to normal values?
9.	Which hormones work via tyrosine kinase second messengers?
10	Which cancers are associated with hypercalcemia?
11	HYQ: A young woman is found to have short stature and shortened 4 <sup>th</sup> and 5 <sup>th</sup> metacarpals. → What endocrine disorder is most likely responsible for these manifestations? →
12	What is the mechanism of action of the bisphosphonates?
13	What are some possible causes of hypocalcemia?

Thy Thy Cau	rroid Proid Phys (FA p295) Proid Path (FA p297 - FA p300) Proid Path (FA p205)
9.	Classification of eye changes in Graves' disease
	1
	2
	3
	4
	5
	6
	What would you suspect to be the cause of hyperthyroidism in a pt presenting with the symptoms of hyperthyroidism in addition to the following findings? (FA p297 − FA p298)  Extremely tender thyroid gland  Pretibial myxedema  Pride in recent weight loss, medical professional  Palpation of single thyroid nodule  Palpation of multiple thyroid nodules  Recent study using IV contrast dye (iodine)  Eye changes: proptosis, edema, injection  History of thyroidectomy or radio-ablation of thyroid  HYQ: A 35 year-old female presents with diffuse goiter and hyperthyroidism. → What are the most likely
11.	relative values of TSH and thyroid hormones? →
12.	HYQ: A 48 year-old female has been suffering with progressive lethargy and extreme sensitivity to cold temperatures. $\rightarrow$ What is the most likely diagnosis? $\rightarrow$
13.	<ul> <li>What type of thyroid cancer matches the following statement?</li> <li>Most common type of thyroid cancer (70-75%)</li> <li>Second most common type of thyroid cancer (10%)</li> <li>Activation of receptor tyrosine kinases</li> <li>Hashimoto's thyroiditis is a risk factor</li> <li>Cancer arising from parafollicular C cells</li> <li>Commonly associated with either a RAS mutation or a PAX8-PPAR gamma 1 rearrangement</li> <li>Commonly associated with rearrangements in RET oncogene or NTRK1</li> <li>Most common mutation in the BRAF gene (serine/threonine kinase)</li> </ul>

#### **Adrenals**

Adrenal Anatomy (FA p288) Adrenal Phys (FA p291) Cortisol (FA p292) Adrenal Path (FA p296 – FA p297) Glucocorticoids (FA p305)

# 14. Steroid Synthesis (FA p291)



- 15. What features characterize a deficiency in 3 β-hydroxysteroid dehydrogenase?
  - Inability to produce
  - .
- What features characterize a deficiency in 17 α-hydroxylase?
  - Inability to produce sex hormones and cortisol →
  - Increased production of mineralocorticoids (i.e. aldosterone) → sodium and fluid retention →
- What features characterize a deficiency in 21 α-hydroxylase?
  - Inability to produce cortisol →
  - Inability to produce mineralocorticoids →
  - Increased production of sex hormones →
- What features characterize a deficiency in 11 β-hydroxylase?
  - Inability to produce
  - Increased production of deoxycorticosterone (a weak mineralocorticoid) →
  - Increased production of sex hormones →
- 16. HYQ: An adult male with elevated serum cortisol levels and signs of Cushing's syndrome undergoes a dexamethasone suppression test. 1 mg of dexamethasone does not decrease cortisol levels, but 8 mg does. → What is the diagnosis →
- 17. HYQ: A very tan child with a pale mother presents to your clinic and is found to be hypotensive. → What is the most likely diagnosis? →

# Pancreas and DM

Pancreas Anatomy (FA p288 - FA289) Diabetes Path (FA p300 - FA p302) Diabetes Drugs (FA p304)

# Common causes of DKA (usually excess glucagon, catecholamines, or corticosteroids)

- Infection (pneumonia, gastroenteritis, UTI)
- Medication reduction or omission
- Severe medical illness (MI, CVA, trauma)
- Undiagnosed DM
- Dehydration
- · Alcohol or drug abuse
- Corticosteroids

#### **Newer DM Agents**

# Sitagliptin (Januvia) and Saxagliptin (Onglyza)

- Inhibitors of dipeptidyl peptidase IV (DPP-IV) which affects Glucagon-like peptide (GLP-1) among other hormones
- Prolongs incretin actions, which decreases glucagon secretion and increases insulin secretion, delays gastric emptying

# Exenatide (Byetta) and Liraglutide (Victoza)

- Exenatide is an analog of Exendin, a hormone (derived from Gila monster saliva), a hormone with actions similar to GLP-1
- Liraglutide is a synthetic analog of human GLP-1
- Mimic the actions of incretins, which decrease glucagon secretion and increase insulin secretion, delay gastric emptying.
- Not approved for use while on insulin therapy
- SE: possibly increased risk of acute pancreatitis.

# Pramlintide (Symlin)

- Amylin analog, normally secreted with insulin, decreases glucagon secretion and gastric emptying
- Used only in patients taking insulin but in either type 1 or type 2 DM patients

18. Which of the oral agents used in the control of type II diabetes has the following characteristics? (FA p304)

nich of the oral agents used in the control of type II diabetes	has the following characteristics? (FA p304)
lactic acidosis is a rare but worrisome side effect	
most common side effect is hypoglycemia	
often used in combination with any of the other oral agents	
also help lower triglycerides and LDL cholesterol levels	
not safe in settings of hepatic dysfunction or CHF	
should not be used in pts with elevated serum creatinine	
should not be used in pts with liver cirrhosis, elevated serum creatinine, or inflammatory bowel disease	
hepatic serum transaminase levels should be carefully monitored when using these agents	
not associated with weight gain, often used in overweight diabetics	
metabolized by liver; excellent choice in pts with renal disease	
primarily effects postprandial hyperglycemia	
MOA: closes K channel on β cells → depolarization → Ca influx → insulin release	
MOA: inhibits $\alpha$ -glucosidase at intestinal brush border	
MOA: agonist at PPARγ receptors → improved target cell response to insulin	

- 19. HYQ: A 28 year-old male with normally well managed IDDM comes in with DKA. → He recently has been suffering from a cold and is taking OTC cold medicine. → What is the cause of his DKA →
- 20. HYQ: How is hemoglobin glycosylated in DM to form HA1c? →

# Metabolic Syndrome Diagnostic Criteria (ATPIII Clinical Criteria, Circulation 2005;11:1883)

Diagnosis based on any 3 of the following:

- Abdominal obesity: Waist circumference > 40in (102cm) in men, or > 35in (88cm) in women (IDF criteria is ≥ 94cm in men, and ≥80cm in women) (Recognize that not all metabolic syndrome pts are overweight!)
- Triglycerides ≥ 150 mg/dl
- HDL <40mg/dl in men, or <50mg/dl in women
- BP ≥ 130/85
- <u>Fasting serum glucose</u> ≥ 100mg/dl (or 2hr post oral glucose ≥ 140 mg/dl)

### **NASH: Nonalcoholic Steatohepatitis**

- Most common causes: Obesity, DM II, Hyperlipidemia, Insulin-resistance
- Due to insulin-resistance at the liver → excess lipid accumulation in the liver
- Can progress to cirrhosis, lead to hepatocellular carcinoma, worsen Hep C progression
- Suspect if chronically elevated ALTs

# **Diagnosis**

- Liver US, CT scan, or MRI can make the diagnosis.
- Magnetic resonance spectroscopy (MRS) is the gold standard
- Liver biopsy can also make the diagnosis. It is the only manner to identify those at risk for disease progression

# **Treatment**

- Avoidance of all alcohol
- Weight loss most likely beneficial, but no proven benefit
- Control any diabetes mellitus aggressively to keep HbA1C < 7.0</li>
- TZDs (Avandia, Actos) improves LFTs and possible histology improvement
- Metformin shows improvement in animal studies

# Weight Loss Drugs

# Orlistat

- Alters fat metabolism by inhibiting pancreatic lipases
- Used for long-term obesity management (in conjunction with modified diet)
- Side effects include steatorrhea, GI discomfort, and reduced absorption of fat-soluble vitamins Sibutramine
- Sympathomimetic serotonin and norepinephrine reuptake inhibitor
- Used for short-term and long-term obesity management
- Side effects include hypertension and tachycardia, headache
- Avoid SSRIs or MAOIs
- Contraindicated in CAD, cerebrovascular disease, CHF, arrhythmia

#### ADH: DI & SIADH (FA p300)

**GI Hormones:** Carcinoid & ZE Syndrome (FA p302)

# Wallenberg's Syndrome (FA p405)

What causes and what are the symptoms of lateral medullary syndrome (AKA Wallenburg's syndrome)? Damage to which areas cause these symptoms?

Caused by occlusion of one of the posterior inferior cerebellar arteries (PICA) → unilateral infarct of lateral portion of rostral medulla (AKA posterior inferior cerebellar artery (PICA) syndrome)

- Loss of pain and temp. over contralateral body (spinothalamic tract damage)
- Loss of pain and temp. over ipsilateral face (trigeminothalamic tract damage)
- Hoarseness, difficulty swallowing, loss of gag reflex (nucleus ambiguus: glossopharyngeal and vagus damage)
- Ipsilateral Horner's syndrome (descending sympathetic tract)
- Vertigo, nystagmus, nausea/vomiting (vestibular nuclei damage)
- Ipsilateral cerebellar deficits (i.e. ataxia, past pointing) (inferior cerebellar peduncle damage)

# **Endocrine Quiz**

- 1. Which type of diabetes mellitus fits the following descriptions? (FA p300 FA p302)
  - A/w obesity
  - May cause ketoacidosis
  - Strong genetic predisposition
  - A/w HLA DR 3 & 4
- 2. What tumor locations are a/w the 3 different types of multiple endocrine neoplasias? (FA p303)
- 3. What are the clinical manifestations of Addison's disease? What is the cause of Addison's disease? (FA p296)
- 4. Which of the oral agents used in the control of type II diabetes has the following characteristics? (FA p304)
  - Lactic acidosis is a rare but worrisome side effect
  - Most common side effect is hypoglycemia
  - MOA: closes K channel on β cells → depolarization → Ca influx → insulin release
  - MOA: inhibits α-glucosidase at intestinal brush border
  - MOA: agonist at PPARy receptors
- 5. What is the mechanism of action of propylthiouracil? What other drug works like PTU? What are their side effects? (FA p305)
- 6. What cell type produces PTH? What cell type produces calcitonin? (FA p293)
- 7. What cancers are associated with RET gene mutation?
- 8. What are the symptoms of 21 α-hydroxylase deficiency? Of 11 β-hydroxylase deficiency? (FA p291)
- 9. What primary hormone is increased or decreased in the following diseases? (FA p298 FA p299)

  <u>Disease</u>

  Hormone that is increased or decreased

Cushing's syndrome –

Conn's syndrome -

Addison's disease –

Graves' disease -

- 10. What would you suspect to be the cause of hyperthyroidism in a pt presenting with the symptoms of hyperthyroidism in addition to the following findings? (FA p298)
  - Extremely tender thyroid gland
  - Palpation of single thyroid nodule
  - Palpation of multiple thyroid nodules
  - Recent study using IV contrast dye (iodine)
  - Eye changes: proptosis, edema, injection
- 11. What is the most common: (FA p527 FA p531)
  - Chronic arrhythmia
  - Bacteria in GI tract
  - Gynecologic malignancy

- Primary cardiac tumor in children
- Breast cancer

)

)

)

)

)

)

)

)

)

)

)))

)

.

)

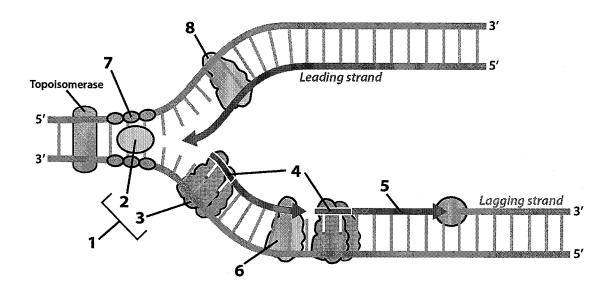
# **<u>Biochem.- DNA/RNA/Proteins</u>** (FA p66 – FA p75)

<ol> <li>What are the differences between carbamoy</li> </ol>	l phosphate s	vnthetase (CPS	5) I and CPS II?
---	---------------	----------------	------------------

	CPS I	CPS II
Location		
Pathway		
Nitrogen source		

- 2. What is the rate-limiting step in purine synthesis? In pyrimidine synthesis?
- 3. HYQ: What are the sources of carbons in the formation of purines? What are the carbon sources in pyrimidine synthesis?
- 4. What accounts for the positive charge of histones? What accounts for the negative charge of DNA?
- 5. How many adenine residues are found in a molecule of DNA if one strand contains A=2000, G=500, C=1500, and T=1000?
- 6. What stand of DNA nucleotides opposes this DNA strand: 5'-ATTGCGTA-3'?
- 7. Which medication matches the following statement?
  - Inhibits riboneucleotide reductase
  - Inhibits dihydrofolate reductase
  - Inhibits thymidylate synthase
  - · Inhibits inosine monophosphate dehydrogenase
  - Inhibits PRPP synthetase
- 8. What are the characteristic features of orotic aciduria?
- 9. HYQ: How does UV light damage DNA?
- 10. What eukaryotic DNA polymerase matches the following description?
  - Replicates lagging strand, synthesizes RNA primer
  - Repairs DNA
  - Replicates mitochondrial DNA
  - Replicates leading strand DNA

11. Label the players on the following simplified model of DNA replication.



# 12. DNA Repair Defects

- Xeroderma pigmentosum hypersensitivity to UV light → 1000 x increased risk of skin cancers
- Ataxia-telangiectasia sensitivity to ionizing radiation, immunodeficiency, ataxia beginning at 1-2 yrs
- <u>Bloom's syndrome</u> hypersensitivity to sunlight, leukemias and lymphomas are common, average age of cancer onset is 25
- Hereditary Nonpolyposis Colorectal Cancer (HNPCC)
- BRCA1 and BRCA2

# 13. Regulation of Transcription

- Operon structural genes that are transcribed + promoter region + all regulatory regions
- <u>Transcription factors</u> must bind to the <u>promoter region (-25 Hogness/Pribnow/TATA box and -75 CAAT box)</u> in order for transcription to take place
  - Common structural motifs: leucine zipper, helix-loop-helix, helix-turn-helix, zinc finger
- Operator region binds repressor (stops transcription, see lac operon), or inducer (starts transcription), located between the promoter region and start site
- Response elements: Enhancer region and Repressor region increase or decrease the rate of transcription when bound by protein factors; location may be close to, far from, or within the promoter region
- Lac operon example

#### 14. Termination of Prokaryotic RNA Transcription

- Recognition of termination region in DNA (ρ -independent mechanism)
  - GC rich DNA → GC same strand binding forms stem-loop in RNA (hairpin appearance) → pause in RNA polymerase → subsequent weak RNA bonds (uracil rich region) → separation of RNA polymerase
- Rho (ρ) factor of *E. coli* (an RNA dependent ATPase)

)

)

)

)

)

) )

)

)

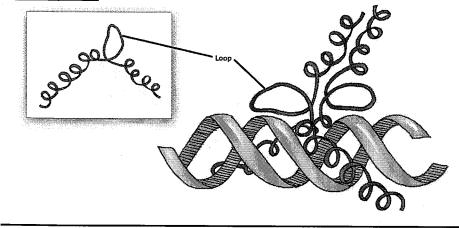
)

)

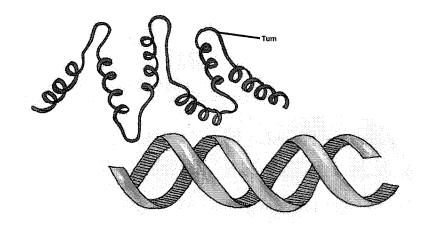
)

)

# Helix-Loop-Helix



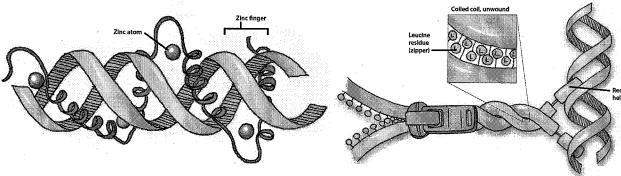
# Helix-Turn-Helix (Tryptophan Repressor Protein)



# Other DNA Binding Motifs

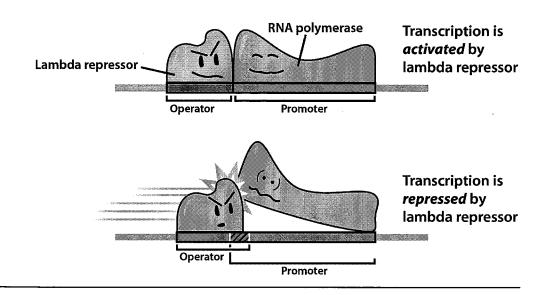
# **Zinc Finger Motif**

**Leucine Zipper Protein** 

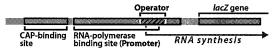


# Operon Control Mechanisms

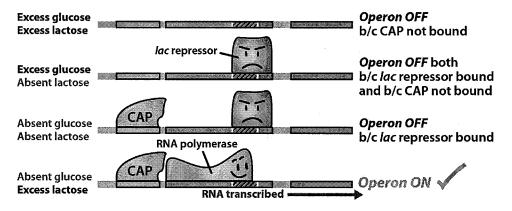
Some regulatory proteins can act as either transcription activators or repressors depending on their exact binding site on DNA.



# **lac Operon**(Controls expression of β-galactosidase)



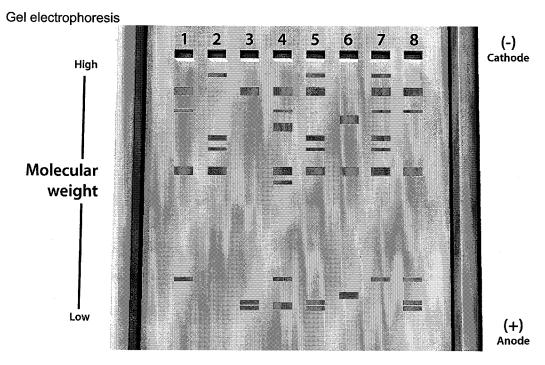
# 



The prokaryotic cell derives its energy from glucose metabolism. In environments of low glucose concentration, the cell has the capability to make  $\beta$ -galactosidase, an enzyme that cleaves lactose into glucose and galactose, thereby making more energy available. Of course, if no lactose is present, then the costly activity of making  $\beta$ -galactosidase is useless. The cell uses CAP (catabolite activating protein) and the *lac* repressor to determine when to begin manufacturing the costly  $\beta$ -galactosidase. CAP facilitates RNA polymerase binding and promotes  $\beta$ -galactosidase production, but is inhibited by excess glucose levels. The *lac* repressor cannot bind to the operator site and inhibit  $\beta$ -galactosidase production in the presence of lactose.

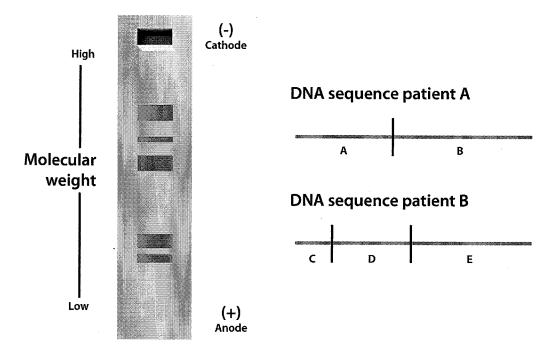
<u>Qui</u>	ick Quiz: Biochem – DNA, RNA, Proteins
1.	<ul> <li>Which antibiotic matches the following description? (FA p75)</li> <li>Inhibits 50S peptidyltransferase (FA p75)</li> <li>Binds 50S, blocking translocation (FA p75)</li> <li>Bind 30S, preventing attachment of tRNA (FA p74)</li> <li>Inhibits prokaryotic RNA polymerase (FA p72)</li> <li>Inhibits prokaryotic topoisomerase (FA p70)</li> <li>Inhibits prokaryotic dihydrofolate reductase (FA p68)</li> </ul>
2.	What are the 3 different mechanisms cells employ to break down proteins? (FA p75)
3.	What enzyme catalyzes peptide bond formation during protein synthesis? (FA p75)
4.	What enzyme matches amino acids to tRNA? (FA p74)
5.	What are the mRNA stop codons? (FA p72)
6.	What are the different RNA polymerases in eukaryotes? (FA p72)
7.	HYQ: What amino acid frequently has more coding sequences in the mRNA than are represented in the peptide that is created from that mRNA? →
8.	HYQ: How is hnRNA processed before it leaves the nucleus? (FA p72)
9.	What is the characteristic sequence of the promoter region? What does a mutation in the sequence cause (FA p72)
10.	What enzyme is deficient in Lesch-Nyhan syndrome? What is the treatment? (FA p69)
11.	What structural motifs allow for proteins to bind to DNA?

# **Genetics** (FA p81 – FA p89)



1. If well 1 contains DNA sample A, well 2 contains DNA sample B, and well 3 contains DNA sample C; then what can you say about wells 4, 5, 6, 7, and 8?

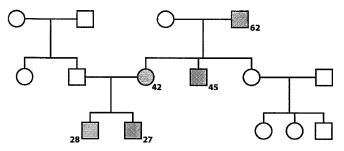
# **DNA** sequences



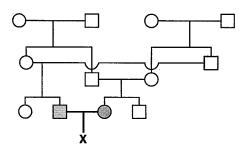
# Genetics (FA p81 - FA p89)

# Mitochondrial inheritance defects

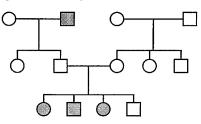
- Mitochondrial myopathies (ragged-red muscle fibers seen on biopsy)
- Leber's hereditary optic neuropathy
- Leigh syndrome (subacute sclerosing encephalopathy)
- 2. The numbers in this diagram indicate the age of disease presentation. What is the name of this phenomenon?



3. What is the likelihood that child X will have the genetic mutation?



4. If the shaded boxes indicate a phenotypic expression of a genetic mutation, what is the name given to this phenomenon?



5. What is the frequency of the BB phenotype and the Bb phenotype if the frequency of allele B is 70%?

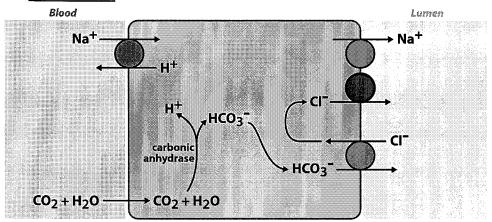
#### Prader-Willi Syndrome (FA p84)

- Deletion of proximal portion of chrom 15q11-q13 from paternal origin
- Presents in infancy: hypotonia, poor feeding, characteristic facial features (almond shaped eyes, downward turned mouth)
- Sx: hyperphagia, obesity, short stature (partial GH deficiency), MR, behavior disorders (tantrums, skin-picking, OCD), hypogonadotrophic hypogonadism → genital hypoplasia, osteoporosis, delayed menarche
- Dx: confirmed with FISH (fluorescence in-situ hybridization)
- · Rx: limit access to food, GH if short stature

# **Genetics Worksheet** (FA p86 – FA p88)

- 6. What autosomal dominant disease fits the following statement?
  - · A/w floppy mitral valve, dissecting aortic aneurysm, berry aneurysm
  - A/w mitral valve prolapse, liver disease, berry aneurysms
  - Neural tumors and pigmented iris hamartomas
  - Very strong association with colon cancer
  - MI before age 20
  - Hemangioblastomas of retina/cerebellum/medulla
  - · Increased MCHC, hemolytic anemia
  - · Bilateral acoustic neuromas
  - Facial lesions, seizure d/o, cancer risk
  - · Caudate atrophy, dementia
  - · Cystic medial necrosis of the aorta
  - · Defect of fibroblast growth factor (FGF) receptor 3

#### 7. Cystic Fibrosis



- 8. Hint for X-linked diseases: <u>Fabry's</u> Tale: <u>Duke the Muscular</u> <u>Hunter Brutally Lys</u>ed the <u>Albino Gopher without aWAre it was a Fragile Hemophiliac!</u>
- 9. Classify the following disorders as either autosomal dominant, autosomal recessive, or X-linked recessive. glycogen storage dz, fragile X, polycystic kidney disease (adult and infant), PKU, hereditary spherocytosis, Duchenne's MD, familial adenomatous polyposis, Lesch-Nyhan, Bruton's, Huntington's, thalessemias, sickle cell, Wiscott-Aldrich, Von Recklinghausen's, Von-Hippel Lindau, hemophilia, mucopolysaccharidosis, familial hypercholesterolemia, sphingolipidosis, Marfan's, cystic fibrosis, hemochromatosis, G6PD-defic.

Autosomal Dominant	Autosomal Recessive	X-linked recessive

Ŀ	<u>ysosomal Storage Diseases (</u> FA p111)
1.	Which lysosomal storage disease is a/w renal failure?
2.	What are the only two X-linked recessive lysosomal storage diseases? What is the method of inheritance of the others?
3.	What is the most common lysosomal storage disease?
4.	Which lysosomal storage diseases are a/w an early death (usually by age 3)?
5.	Which lysosomal storage disease is a <u>demyelinating</u> disease?
6.	How might <u>corneal clouding</u> and <u>mental retardation</u> help distinguish between the mucopolysaccharidoses? Hurler's – Hunter's – Scheie's – (I-cell) –
7.	<ul> <li>Which lysosomal storage disease is characterized by the following enzyme deficiency?</li> <li>α-L-iduronidase</li> <li>Iduronate sulfatase</li> <li>Arylsulfatase A</li> <li>α-galactosidase A</li> <li>Galactocerebrosidase (→ galactocerebroside accumulation)</li> <li>β-glucocerebrosidase (→ glucocerebroside accumulation)</li> <li>Hexosaminidase</li> <li>Sphingomyelinase (→ sphingomyelin accumulation)</li> </ul>
8.	Characterized by an accumulation of <u>GM2 ganglioside</u> .
9.	Characterized by an accumulation of <u>dermatin sulfate</u> .
10	0. Which are particularly common among <u>Ashkenazi Jews</u> ?
1 <sup>.</sup>	1. Which has characteristic " <u>crinkled paper cytoplasm</u> "?
12	2. What is the differential diagnosis for a <u>cherry-red spot</u> on the retina?
•	cell disease (FA p77)  Deficiency in mannose phosphorylation no mannose-6-phosphate to target lysosomal proteins → secretion out of cell instead of into lysosomes death by age 8  (+) corneal clouding, coarse facies, HSM, skeletal abnormalities, restricted joint movement, +/- MR

# **Biochemistry - Genetics Quiz**

- 1. What is the probability that a female heterozygous for an X-linked disease will pass it on to her son?
- 2. What is the probability that a female heterozygous for an X-linked disease that mates with a normal male will have a carrier daughter?
- 3. What is the probability that a female carrier of an X-linked disease will have a child with that disease assuming she mates with a normal male?
- 4. If an symbolizes a recessive disease, what is the likelihood that parents Aa and Aa will have a phenotypically normal child?
- 5. Cystic fibrosis is an autosomal recessive disorder. Two parents that are heterozygous for cystic fibrosis have a normal, nonaffected child. What is the probability that the child is homozygous normal?
- 6. Upon examination of a pedigree, you note that both males and females are affected with a disease in every generation. What type of genetic disease is this?
- 7. What is the frequency of the Aa genotype and the AA genotype if the frequency of allele A is 0.9%?
- 8. If 49% of a particular population is homozygous for a curly hair gene that is dominant to a straight hair gene, what percentage of the population has curly hair?
- 9. What is the name of the genetic disease the fits the following description?
  - A/w floppy mitral valve, dissecting aortic aneurysm, berry aneurysm
  - A/w mitral valve prolapse, liver disease, berry aneurysms
  - Hemangioblastomas of retina/cerebellum/medulla
  - Increased MCHC, hemolytic anemia
  - Café-au lait spots + soft tissue growths
  - Macroorchidism and autism
  - Endocardial cushion defects are common
  - Recurrent pulmonary infections, steatorrhea
  - Multiple fractures, easily confused with child abuse
  - A/w Alzheimer's after age 35
  - Prone to bilateral acoustic Schwannomas
  - Excess fibro-fatty tissue deposits amongst muscle
- 10. What test is used to diagnose cystic fibrosis? Which gene is defective? (FA p87)
- 11. What is the difference between Southern Blot, Northern Blot, and Western Blot? (FA p81)
- 12. Which lysosomal storage disease matches the following statement? (FA p111)
  - Accumulation of GM2 ganglioside
  - A/w renal failure
  - · Accumulation of dermatin sulfate
  - Deficiency in hexosaminidase
- 13. HYQ: Two pts have the same mutation on chromosome 15 but have different phenotypic expressions. One pt received the mutation from the father while the other received the mutation from the mother. → What is this an example of? →
- 14. HYQ: Frequency of CFTR mutation X in pts with cystic fibrosis is 0.1. Cystic fibrosis can be caused by either mutation X or mutation Y in the CFTR gene. → What percentage of cystic fibrosis pts are homozygotes for mutation Y? →

)

)

)

)

)

)

)

)

)

)

)

)

)

)

)

)

# Cellular Biology (FA p66 – FA p80, FA p220 – FA p222, FA p391)

#### 1. Cell Cycle Basics (FA p76)

(Robbins and Cotran Pathologic Basis of Disease, 7th ed. p289-292)

- Cyclins + cyclin-dependent kinases (CDK) phosphorylate target proteins to drive the cell cycle
- All cyclins are degraded by ubiquitin protein ligase when their cell-cycle specific job is complete
- p21, p27, and p57 bind to and inactivate cyclin-CDK complexes (p53 controls the activation of p21)
- Cyclin D binds/activates CDK4 → phosphorylation of Rb protein → Rb protein is released from transcription factor E2F → with E2F unbound, the cell is free to transcribe/synthesize components needed for progression through the S phase (cyclin E, DNA polymerase, thymidine kinase, dihydrofolate
- Cyclin E binds/activates CDK2 → the cell is allowed to progress into S phase
- Cyclin A CDK2 complex → mitotic prophase
- Cyclin B CDK1 complex activated by cdc25 → breakdown of nuclear envelope (nuclear lamin breakdown) and initiation of mitosis

# 2. Chaperones and Heat Shock Proteins:

Chaperones assist in the proper folding and transport of polypeptides across the ER, Golgi, and beyond. Some chaperones are synthesized constantly and are involved in normal intracellular protein trafficking. Others chaperones are induced by stress such as heat (heat shock proteins hsp70, and hsp90). These chaperones "rescue" shock-stressed proteins from misfolding. If the folding process is not successful, the chaperones facilitate degradation of the damaged protein. This degradative process often involves ubiquitin (also a heat shock protein), which is added to the abnormal protein and marks it for degradation by the ubiquitin-proteasome complex.

- 3. HYQ: What protein is involved in transporting an endocytosed vesicle from the plasma membrane to the endosome? →
- 4. HYQ: What molecule targets proteins in the endoplasmic reticulum for lysosomes? →

#### 5. Intermediate Filaments Structural Component of:

- Vimentin - Connective tissue (fibroblasts, leukocytes, endothelium) (Support cellular membranes and keep certain organelles fixed within cytoplasm)
- Desmin

- Muscle cells (smooth, skeletal, and heart)

Cytokeratin

- Epithelial cells (keratin in desmosomes and hemidesmosomes)
- Glial fibrillary acid proteins (GFAP)
- Astrocytes, Schwann cells, and other neuroglia
- Peripherin
- Neurons
- Neurofilaments (L, M, H (molecular wt) Axons within neurons
- Nuclear lamins (A, B, C)
- Nuclear envelope and DNA within

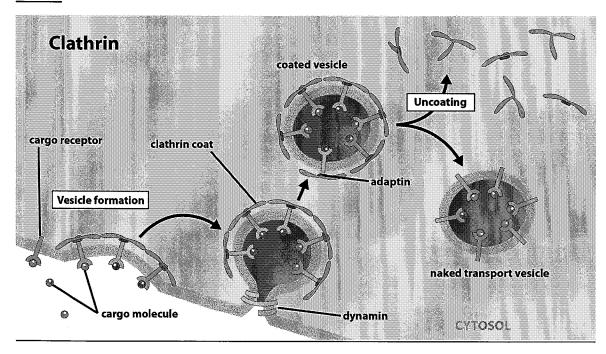
# 6. Tyrosine kinase receptor

- Transmembrane receptors that bind an extracellular ligand then intracellularly transfer a phosphate group (phosphorylate) from ATP to selected tyrosine side chains on specific cellular proteins including itself (autophosphorylation). The first step in the signaling cascade that is initiated by tyrosine kinase receptors is autophosphorylation.
- PDGF and other growth factor receptors: single-pass transmembrane protein
- Insulin and IGF-1 receptors:
  - $2\alpha$  subunits (bound by disulfide bonds) bind extracellular ligand
  - 2β subunits tyrosine kinase activity

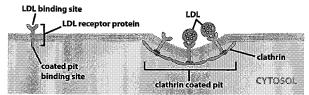
#### 7. Skin Healing

- 0-3 hours - Hemorrhage and clotting
- 12-24 hours - Acute inflammation (PMN)
- Macrophage infiltration and epithelial cell migration 2-4 days 3-5 days
- Granulation tissue (esp. at wound edges) months - Collagen production (type III then type I)

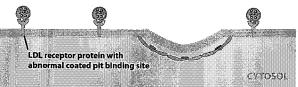
# Clathrin



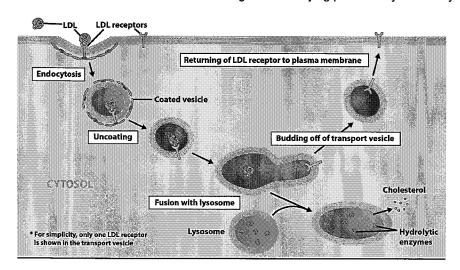
# A) Normal LDL Receptor

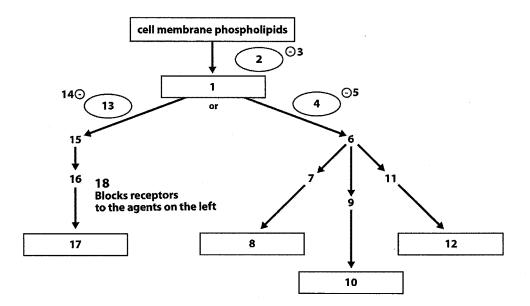


# B) Mutant LDL Receptor



A mutant LDL receptor lacks the coated-pit binding site but retains a functioning LDL-binding site. As a result, cells with mutant receptors are able to bind LDL normally but are unable to ingest it. Individuals with this mutation have a higher risk of dying prematurely from a myocardial infarction.





# 8. Mechanisms of Apoptosis (FA p220)

(Robbins and Cotran Pathologic Basis of Disease, 7<sup>th</sup> ed, p28-31)

- Apoptosis is initiated when: (1) cells are deprived of important cell signals such as growth factors, (2) cell stress is present, (3) DNA damage is present and the DNA repair process fails → p53 triggers apoptosis, (4) cytokines such as TNF trigger apoptosis, or (5) cytotoxic T cells insert granzyme B into cells → activation of caspases
  - If p53 is mutated or absent, it cannot induce apoptosis in the presence of severe DNA damage
- <u>Caspase</u> proteases execute apoptosis and have <u>Cysteine</u> protease that cleaves after <u>aspartic</u> acid residues
- Extrinsic Pathway (Death Receptor Mediated) via activation of cell surface death receptor
  - Type I TNF receptor 1 (TNFR1)
  - <u>Fas (CD95):</u> Fas ligand binds Fas → grouping of 3 or more Fas molecules to form a binding site for FADD → Fas-associated death domain (<u>FADD</u>) binds inactive <u>caspase-8</u> (caspase-10 in humans) → cleavage and activation of caspase-8 → cleaving and activation of other procaspases → apoptotic proteolytic cascade (pathway used in selection of T cells)
  - FLIP protein may bind to and inhibit cleavage of pro-caspase-8 thereby inhibiting apoptosis
- Intrinsic Pathway (Mitochondrial)
  - Increased mitochondrial permeability → release of pro-apoptotic molecules into the cytoplasm
  - Bcl-2 proteins regulate apoptosis.
  - Bcl-2 and Bcl-x prevent apoptosis (Bcl-2 is homologous to Ced-9)
  - Bak, Bax, and Bim are pro-apoptotic
  - Cells undergo stress or are deprived of important cell signals → <u>Bcl-2 and Bcl-x</u> are lost from mitochondrial membranes and are replaced with <u>Bak, Bax, and Bim</u> → mitochondrial membrane permeability increases → caspase activating proteins (i.e., <u>cytochrome c</u>) and <u>AIF</u> (apoptosis inducing factor) leak out
  - Cytochrome c binds cytosolic <u>Apaf-1</u> (apoptosis activating factor-1 which is homologous to Ced-4) → this complex activates caspase-9
  - Apaf-1 may be directly inhibited by Bcl-2 and Bcl-x
  - <u>AIF</u> (apoptosis inducing factor) binds to and neutralize various inhibitors of apoptosis → apoptosis is no longer inhibited
- During apoptosis, substances that recruit phagocytes are secreted and marker molecules are placed on the cell surface so that phagocytosis can take place prior to necrosis and inflammation. CD31 is expressed by healthy cells to prevent phagocytosis.

# End Session Quiz: Biochem - Cell Biology

1.	What drugs act on microtubules? (FA p78)
2.	What findings are a/w Ehlers-Danlos syndrome? (FA p80)
3.	Which arachidonic acid product causes the following effect? (FA p391)  Increased bronchial tone  Decreased platelet aggregation  Decreased platelet aggregation  Increased uterine tone  Decreased vascular tone  Decreased vascular tone
4.	What are the two most abundant substances in plasma membranes? (FA p78)
5.	What provides the structural framework for DNA and the nuclear envelope? (Biochem – Part 3,p1: Q5)
6.	What drugs act on the arachidonic acid product pathway? What enzymes do they affect? (FA p391)
7.	HYQ: In trying to determine the genomic location of genes x, y, and z, you cut multiple copies of the gene with a variety of different endonucleases. $\rightarrow$ The following proteins are expressed x, xz, y, and z. $\rightarrow$ What are the most likely relative locations of genes x, y and z?
8.	Describe the process of leukocyte extravasation. (FA p222)
9.	How are molecules transported into the nucleus?
10.	What histologic features are seen in apoptotic liver cells? (FA p220)
11.	What are the signaling pathway effects of activating Gq? What are the effects of activating Gs? (FA p236)

<u>vv</u>	iter Soluble Vitamins (FA	.p90-94)			
1.	What vitamins have the formal thiamine Retinol, retinal Pantothenic acid Pyridoxine α-tocopherol Folic acid Niacin Riboflavin Ascorbic acid Cobalamin	ollowing names:  B <sub>1</sub> A B <sub>5</sub> B <sub>6</sub> E B <sub>9</sub> B <sub>3</sub> B <sub>2</sub> C B <sub>12</sub>	ŀ		ver <u>Pa</u> n <u>Py</u> rite <u>F</u> illed <u>C</u> reeks. 3 B <sub>5</sub> B <sub>6</sub> B <sub>9</sub> B <sub>12</sub>
2.	What is the most commor deficiency		ncy in the US	3?	
3.	True or false? Water solutrue	ble vitamins hav	/e minimal o	verdose effects.	
	amin B1 (thiamine) What is the functionally ac	ctive form of thia	mine (B₁)?		
-	In what reactions does thi  Pyruvate → acetyl Co  α-ketoglutarate → suc  Ribose 5-P ←→ glyce	A ccinyl CoA (TCA)	· F	a role? Pyruvate dehydro L-ketoglutarate de Transketolase	<del>-</del>
-	How is thiamine deficiency by an increase in eryt		olase activity	/ observed upon	addition of thiamine
5.	What two syndromes are seen?  Beriberi (dry and wet)				what populations are these usually major component of the diet
-	<ul> <li>Wernicke-Korsakoff s</li> <li>What characterizes dry be</li> <li>Nonspecific periphera</li> <li>Toe-drop, wrist-drop,</li> <li>Muscle weakness, hy</li> </ul>	yndrome eriberi? Iand foot-drop	Chronic a	alcoholism relin degeneratio	(hint: Ber1Ber1)
-	<ul><li>What characterizes wet be</li><li>Peripheral vasodilatio</li><li>Cardiomegaly</li></ul>			→ perip	oheral edema
~	<ul> <li>What are the clinical chara</li> <li>Ocular disturbances a</li> <li>Gait ataxia</li> <li>Mental dysfunction (construction of the construction)</li> <li>Korsakoff psychosis</li> </ul>	ind nystagmus onfusion, apathy	, listlessnes	s, and disorienta	
-	What exactly is confabula the invention of fictitio past events)		supposed pa	st events (often	to disguise an inability to remember

<u>Vita</u>	<u>amins B2, B3, B5, and B6</u>
6.	What are the two biologically active forms of riboflavin (B <sub>2</sub> )? What is the role of these molecules?  •
	Both are cofactors for oxidation-reduction reactions.
-	What are some of the symptoms associated with riboflavin deficiency?  • dermatitis  • cheilosis / angular stomatitis  • glossitis (smooth, purple tongue)
-	What is cheilosis? What is angular stomatitis? Cheilosis- Angular stomatitis- inflammation of the corners of the mouth
-	In what patient population is angular stomatitis particularly common? denture wearers
7.	What nutrient deficiencies are a/w cheilosis, glossitis, and stomatitis? iron, riboflavin, niacin, folate, and B <sub>12</sub>
8.	<ul> <li>What are the biologically active forms of niacin (B<sub>3</sub>)? What is the role of these molecules?</li> <li>Nicotinamide adenine dinucleotide (NAD+)</li> <li>Nicotinamide adenine dinucleotide phosphate (NADP+)</li> <li>Both are cofactors for oxidation-reduction reactions.</li> </ul>
-	Which amino acid required for the generation of niacin?
9.	What disease is caused by niacin deficiency? What are the symptoms of this disease?  • •
	hint: niacin (B <sub>3</sub> ); NADH yields 3 ATP; 3 D's
-	Why might pellagra be seen in a population that eats primarily corn?  can be metabolized to form niacin, and corn is lacking in tryptophan.
10.	How is niacin (at a dose of 100x the RDA) affective in treating type IIb hyperlipoproteinemia? inhibits lipolysis in adipose tissue → less circulating free fatty acids → less fatty acids to liver → less VLDL made → and less LDL produced
-	What is the main side effect of high dose niacin treatment of dyslipidemia? How can it be prevented? The peripheral vasodilation (flushing) of high-dose niacin can be lessened by taking aspirin with niacin.
11.	What is the role of pantothenic acid ( $B_5$ ) in metabolism? It is a component of coenzyme A (CoA) which functions in the transfer of acyl groups.
-	True or false? There is no deficiency disease for pantothenic acid ( $B_5$ ). True
12.	What is the biologically active form of $B_6$ (pyridoxine)? pyridoxal phosphate
-	What is the metabolic function of pyridoxal phosphate?  coenzyme for numerous enzymes including those of metabolism (transaminations and deaminations)
-	What drug can lead to a deficiency in B <sub>6</sub> as well as B <sub>3</sub> ?  (used for tuberculosis)

-	What are the clinical findings of B <sub>6</sub> deficiency? same as riboflavin deficiency +, hyperirritability, and peripheral neuropathy
Fo	late (B9) and B12 (FA p92)
	In what metabolic reaction(s) is folic acid (B <sub>9</sub> ) involved? Synthesis of purines (A, G) and thymine (T)
-	What is the biologically active form of folic acid?
-	What is the intracellular storage form of folic acid (folate)? N-methyl folate
14	. What are the characteristics of folic acid deficiency?
	Growth failure     Megaloblastic anemia
-	What is megaloblastic anemia? A type of macrocytic (large RBC) anemia characterized by an elevated number of megaloblasts in the marrow
-	Deficiency in which two vitamins may cause megaloblastic anemia? Folate and $B_{12}$
-	How can you determine if a megaloblastic anemia is caused by folate or $B_{12}$ deficiency? $B_{12}$ deficiency - decreased serum $B_{12}$ folate deficiency- decreased serum folate (both may have decreased RBC-folate) (note that megaloblastic anemia can be caused by a deficiency in both at the same time)
15.	. How much folate should a sexually active woman of childbearing age take in order to prevent neural tube defects?
	0.4 mg of folic acid a day (4 grams if at high-risk for neural tube defects)
16.	. What results from an excess of folate? Why?  B <sub>12</sub> deficiency results because this vitamin is used in making tetrahydrofolate.
-	True or false? $B_{12}$ deficiency can cause a deficiency in folate. True
~	What percentage of people in the US is estimated to have low serum folate levels? 15-20%
17.	What is found in the center of the corrin ring of cobalamin (vitamin B <sub>12</sub> )?  Cobalt
-	<ul> <li>In what metabolic reactions is vitamin B<sub>12</sub> involved?</li> <li>homocysteine &amp; methyl-THF → methionine &amp; THF (required for SAM to function, FA p92)</li> <li>methylmalonyl CoA (coenzyme A) → succinyl CoA</li> </ul>

18.	<ul> <li>What are the steps involved in the intake and absorption of B<sub>12</sub>?</li> <li>Pepsin in the stomach releases B<sub>12</sub> from its protein bound form</li> <li>Still in the stomach, B<sub>12</sub> binds to salivary vitamin B<sub>12</sub> binding proteins (called cobalophilins or R-binders)</li> <li>R-B<sub>12</sub> complex is broken down in duodenum by pancreatic proteases</li> <li>Still in the duodenum, unbound B<sub>12</sub> binds to (secreted by the cells in the stomach)</li> <li>IF-B<sub>12</sub> complex binds to IF-specific receptors on cells of the</li> <li>B<sub>12</sub> tranverses the plasma membranes of the mucosal cell and is picked-up by a plasma protein called transcobalamin II</li> </ul>
-	What specific organs are involved in the absorption of vitamin $B_{12}$ ? Salivary glands, stomach, pancreas, distal ileum
19.	<ul> <li>What is a Schilling test?</li> <li>1. Radiolabeled cyanocobalamin given orally to determine if it was absorbed by the ileum</li> <li>2. Measurement of urinary excretion of radiolabeled B<sub>12</sub> over a 24 hours period</li> <li>normal = &gt;8% of the oral dose recovered in the urine</li> </ul>
-	<ol> <li>What are the three stages of the Schilling test?</li> <li>Administration of radiolabeled B<sub>12</sub> without intrinsic factor (to determine if there is a problem absorbing B<sub>12</sub>)</li> <li>Administration of radiolabeled B<sub>12</sub> with intrinsic factor (to determine if a lack of intrinsic factor is the cause of the problem)</li> <li>Administration of radiolabeld B<sub>12</sub> with pancreatic supplements (to determine if a lack of enzymatic degradation of R protein is the problem)</li> <li>Administration of radiolabeled B<sub>12</sub> after administration of antibiotics (tetracycline) or anti-inflammatory drugs (prednisone) (to determine other causes of B<sub>12</sub> malabsorption such as bacterial overgrowth)</li> </ol>
20.	<ul> <li>What is seen in B<sub>12</sub> deficiency (most often due to a failure to absorb this vitamin rather than its absence from the diet)?</li> <li>Pernicious anemia:</li> <li>Megaloblastic anemia</li> <li>CNS symptoms (myelin degeneration in the dorsal and lateral tracts of the spinal cord) → sensory problems (i.e. pins-and-needles)</li> <li>Atrophy of stomach fundic glands (→ achlorhydria) and replacement of the gastric epithelium with mucus-secreting goblet cells that resemble those lining the large intestine (intestinalization)</li> <li>Homocystinuria and methylmalonic acid in urine</li> </ul>
-	What is another name for B <sub>12</sub> neuropathy? Subacute combined degeneration
<b>-</b>	What is usually the cause of malabsorption of $B_{12}$ ?  Autoimmune destruction of gastric cells responsible for the synthesis of intrinsic factor (which is necessary for the absorption of $B_{12}$ )
-	Where is B <sub>12</sub> absorbed in the GI tract?  Distal ileum
-	Name two malabsorption problems of the distal ileum that cause B <sub>12</sub> deficiency.  Crohn's disease and celiac sprue
21.	What is the treatment for B <sub>12</sub> deficiency?  IM injection of cyanocobalamin
	tin (FA p93) What is the metabolic role of biotin? Apoenzyme in carboxylation reactions (hint: buy-a-tin of CO <sub>2</sub> )

23. W Hy  W  Tat Sc  1. W  2. W  Vitami 4. W	<ul> <li>The glycoprotein avidin which is found in egg whites prevents absorption of biotin (with a normal 20 egg whites per day are required to induce a deficiency).</li> <li>antibiotic use (gut bacteria make biotin for us)</li> </ul>
23. W Hy  W  Tat Sc  1. W  2. W  Vitami 4. W	in C (FA p93)
Fat Sc 1. W 3. W Vitami 4. W	/hat is the main metabolic reaction that vitamin C is involved in? ydroxylation of and residues of collagen
Fat Sc 1. W 2. W 3. W Vitami 4. W	hat are the major signs of vitamin C deficiency- scurvy?
Fat Sc 1. W 2. W 3. W Vitami 4. W	Sore, spongy gums
Fat Sc 1. W 2. W 3. W Vitami 4. W	Loose teeth
Fat So 1. W 2. W 3. W Vitami 4. W	Fragile blood vessels → hemorrhages
• Fat So 1. W 2. W 3. W <u>Vitami</u> 4. W	Swollen joints (bleeding into joint spaces) Impaired wound healing
1. W 2. W 3. W <u>Vitami</u> 4. W	Anemia
2. W 3. W <u>Vitami</u> 4. W	oluble Vitamins (A, D, E, K)
3. W <u>Vitami</u> 4. W	/hich of the fat soluble vitamins has a coenzyme function? vitamin K (hint: Koenzyme)
<u>Vitami</u> 4. W	hich fat soluble vitamin is synthesized in the skin with sun exposure? vitamin D
<u>Vitami</u> 4. W	Vicarriiri D
4. W	/hat vitamins are known as antioxidants (anti- oxygen free radicals)? C, E, and beta-carotene (A) (The mineral selenium is also an antioxidant.)
4. W	in A (FA p90)
	/hat are the different forms of vitamin A?
	Retinol, retinal (both used by the body)
	<ul> <li>β-carotene (cleaved in intestine to yield 2 molecules of retinal)</li> <li>Retinoic acid (cannot be reduced, unusable by the body)</li> </ul>
	etinol esters are stored on the liver until needed by the body. How are they transported in the body weeded?
	Via plasma retinol-binding protein (RBP)
- In	what broad metabolic functions is vitamin A necessary?  • Vision
	Growth
	<ul> <li>Reproduction (♂ spermatogenesis, ♀ prevent fetal resorption)</li> </ul>
	Maintenance of epithelial cells (especially mucous secreting cells)
- Fo	or what disorder(s) is topical retinoic acid useful?  Acne and psoriasis
- W	/hat retinoid derivative can be taken orally for the treatment of acne? Isotretinoin (Accutane)
5. W	/hat are the signs of vitamin A deficiency?
•	Night blindness  Varanhthalmia (nathologia dryness of the conjunctive and cornea) - corneal ylegration and blindness
•	Xerophthalmia (pathologic dryness of the conjunctiva and cornea) → corneal ulceration and blindne (wrinkling, clouding of cornea)
•	(dry, silver-gray plaques on the bulbar conjunctiva)
. W	/hat are the signs of hypervitaminosis A (vitamin A toxicity)?

- Headache, nausea/vomiting, stupor Skin – dry and pruritic Liver – enlarged (and possibly cirrhotic) Bone and joint pain Increase in intracranial pressure True or false? Lack of vitamin A in pregnant women has the potential for causing congenital malformations. False, excessive vitamin A in pregnant women has the potential for causing congenital malformations including 7. In which patient populations is vitamin A supplementation a particularly bad idea? Pregnancy → increased risk of teratogenic damage Smokers → increased risk of lung cancer Vitamin D (FA p93) How does the biological form of vitamin D exert its actions? It interacts directly with target cell DNA to selectively stimulate or repress gene expression. True or false? Vitamin D is obtained by the body from both sun exposure and diet. True, up to 80% of required vitamin D can be derived from sunlight (at least 15 minutes daily), and the remaining amount must be ingested. 9. How does vitamin D help maintain adequate plasma levels of calcium? Increases calcium uptake in the intestine (via increased expression of calcium binding protein) Stimulates PTH-dependent reabsorption of calcium in the distal tubules Stimulates bone resorption when necessary (along with PTH) 10. What are the steps in the metabolism of vitamin D? Gut absorption (D<sub>2</sub>) or skin synthesis (D<sub>3</sub>) Binding to plasma α1-globulin (D-binding protein) and transport to liver Conversion to 25-hydroxyvitamin D (AKA 25-hydroxycholecalciferol) by 25-hydroxylase in liver Conversion of 25-hydroxycholecalciferol to 1,25-dihydroxycholecalciferol by α1-hydroxylase in the kidnev What is the precursor of vitamin D<sub>3</sub> in the skin? 7-dehydrocholesterol What other names have been given to D2, D3, and 1,25-dihydroxycholecalciferol? - ergocalciferol (ingested form derived from plants) - cholecalciferol (formed in sun-exposed skin)  $D_3$ 1,25(OH)<sub>2</sub>D - calcitriol (the active form of vitamin D) When prescribing vitamin D replacement, which form is preferred? Over the counter D<sub>3</sub> (cholecalciferol)

11.	What are the names t	r vitamin D deficiency in adults and in children?
	adults-	children-

- Explain how vitamin D deficiency brings about the clinical symptoms seen in osteomalacia and rickets? Lack of vitamin D → hypocalcemia → increased levels of PTH →
  - Mobilization of calcium from bone
  - Decreased renal calcium excretion
  - Increased renal excretion of phosphate → hypophosphatemia → impairment of bone mineralization
- What is the basic derangement in both rickets and osteomalacia? excess in unmineralized bone matrix
- What are some of the common clinical manifestations of rickets?

)

)

) )

)

)

)

	Bow-legged
	<ul> <li>Lumbar lordosis</li> <li>Pectus carinatum (pigeon chest) – protrusion of the sterum and ribs</li> <li>Rachitic rosary- overgrowth of cartilage or osteoid tissue at the costochondrial junction</li> </ul>
12.	What problem is encountered with a vitamin D intake 10-100 times the US RDA? hypercalcemia
13.	In what disease does vitamin D toxicity result from excess macrophage generation of 25-hydroxy-vitamin D? sarcoidosis
<u>Vita</u>	amin K (FA p94)
14.	What is the principle role of vitamin K?
	modification of various where it serves as a coenzyme in the carboxylation of certain glutamic acid residues present in these proteins
-	For what protein synthesis is vitamin K dependent upon? proteins C & S, prothrombin, and clotting factors II, VII, IX, and X (2, 7, 9, and 10)
15.	What characterizes vitamin K deficiency in adults and children? hemorrhagic disease
-	Why are newborns particularly prone to vitamin K deficiency? What prophylactic measures can be taken to
	<ul> <li>reduce the incidence of this problem?</li> <li>Newborns do not have microbes in the gut to produce vitamin K, and the mother's milk only provides 1/5</li> </ul>
	of their need.  • It is recommended that newborns receive a single IM dose (1mg) of vitamin K at birth.
-	What pharmacologic agents can cause vitamin K deficiency with long-term use?
	<ul> <li>Coumadin</li> <li>Anticonvulsants</li> </ul>
	<ul> <li>Antibiotics (→ loss of gut bacteria)</li> </ul>
16.	What characterizes vitamin K toxicity? hemolytic anemia and jaundice in an infant
\ /:L_	
	amin E (FA p93)  What is the primary function of vitamin E?  antioxidant- prevention of the nonenzymatic oxidation of cell components (especially on red blood cells) by molecular oxygen free radicals
-	What is another name for vitamin E?
18.	What is associated with vitamin E deficiency?  • Spinocerebellar degeneration → ataxia
	Peripheral neuropathy and proximal muscle weakness
-	Mutations in what gene results in the autosomal recessive hereditary vitamin E deficiency? alpha-tocopherol transfer gene protein
19.	True or false? Vitamin E supplementation can help prevent the development of Alzheimer's disease? False, studies have not yet shown that vitamin E supplementation can reduce the risk of Alzheimer's disease; however, studies have shown that vitamin E supplementation at doses of < 1,100 IU daily do increase one's risk of "all-cause" mortality. (Ann Internal Med 2005; 142:37-46).

# **End Session Quiz: Biochem – Vitamins**

- HYQ: A patient presents with convulsions and irritability. → What vitamin deficiency is causing these symptoms in this patient? →
- 2. HYQ: Which vitamin deficiency results in gum bleeding, bruising, anemia, and poor wound healing? →
- 3. HYQ: Vitamin C is necessary for the hydroxylation of which amino acids in collagen synthesis? →
- HYQ: What vitamin in excess can cause hypercalcemia? →
- 5. HYQ: What vitamins have a function similar to reduced glutathione? →
- 6. HYQ: An alcoholic develops a rash, diarrhea, and altered mental status. → What is the vitamin deficiency? →
- 7. Which vitamin deficiency matches the following description?
  - Increased RBC fragility
  - Dermatitis, cheilosis, glossitis
  - · Peripheral neuropathy, angular cheilosis, glossitis
  - Hemorrhagic disease
  - Neural tube defects
  - Dermatitis, diarrhea, dementia
  - · Megaloblastic anemia
  - · Pernicious anemia
  - Bitot's spots, keratomalacia, xerophthalmia
  - Osteomalacia
  - Rickets
- 8. Which vitamin matches the following statement?
  - Can be used to treat acne and psoriasis
  - Used in oxidation/reduction reactions
  - Used in carboxylation reactions
  - Involved in the hydroxylation of prolyl residues
  - Requires intrinsic factor for absorption
  - Deficiency may result from kidney disease
  - Used by pyruvate dehydrogenase and α-ketoglutarate dehydrogenase
  - Given prophylactically to newborns
  - Can be used to elevate HDL and lower LDL
  - Deficiency can be caused by isoniazid use
  - Cobalt is found within this vitamin
  - Critical for DNA synthesis
- 9. What are the symptoms of zinc deficiency? (FA p94)
- 10. What enzyme is inhibited by the drug fomepizole? (FA p94)
- 11. What is the difference between kwashiorkor and marasmus? (FA p94)
- 12. What vitamins should vegetarians supplement in their diet? (FA p92)
- 13. What are the symptoms of vitamin A toxicity? (FA p90)

)

)

)

)

)

)

)

)

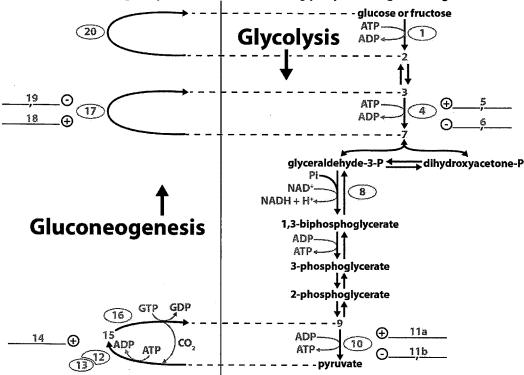
)

)

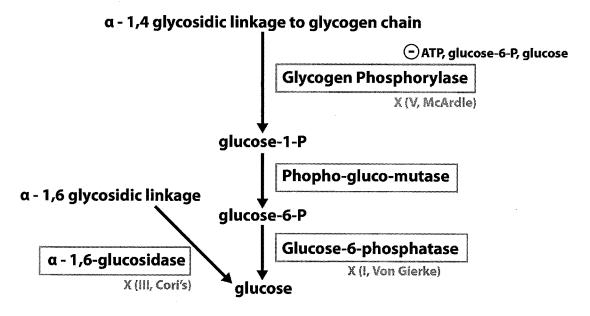
)

# Biochemistry - Part 5: Sugar & Energy Basics (FA p95): ATP, Activated Carriers (FA p97), SAM (FA p92) Glycolysis GLUT receptors (FA p109) Hexokinase v. glucokinase (FA p97) Glycolysis: pathway diagram on handout and discussion of rate limiters, (FA p98) Regulation by F2,6BP (FA p98) Glycolytic enzyme deficiencies (FA p98) Gluconeogenesis (FA p101) Glycogenesis and Glycogenolysis (FA p110) Glycogen storage diseases (FA p110) Pyruvate Metabolism (FA p99) Fates of pyruvate (FA p99) Cori cycle Alanine cycle Pyruvate DH & PDH def. (FA p99) TCA Cycle (FA p100) Electron Transport Chain (FA p100) NADH and NADPH NAD/NADPH (Universal Electron Acceptors) (FA p97) Oxygen-dependent resp. burst (FA p102) Pentose phosphate pathway (FA p101) G6PD def (FA p102) Metabolism of other sugars Fructose (FA p103) Galactose (FA p103) Lactase defic. (FA p104) Ethanol (FA p94) and EtOH hypoglycemia (FA p94) Gibbs Free Energy Feeding & Fasting (FA p113) Ketone Bodies (FA p112)

1. Label the following enzymes and substrates of glycolysis and gluconeogenesis.



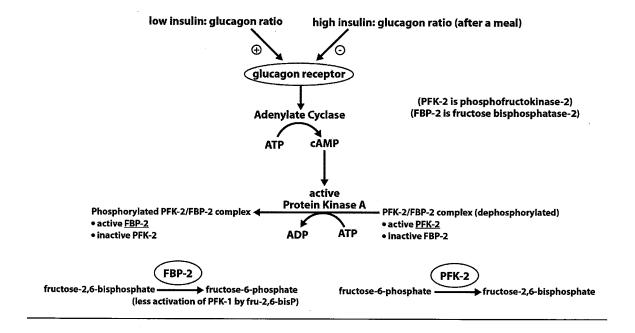
2. Glycogen Breakdown (Glycogenolysis)



- 3. Which glycogen storage disease matches the following phrase?
  - Glycogen phosphorylase deficiency
  - Glucose-6-phosphatase deficiency
  - Lactic acidosis, hyperlipidemia, hyperuricemia (gout)
  - α-1,6-glucosidase deficiency
  - α-1,4-glucosidase deficiency
  - Cardiomegaly
  - Diaphragm weakness → respiratory failure
  - · Increased glycogen in liver, severe fasting hypoglycemia
  - Hepatomegaly, hypoglycemia, hyperlipidemia (normal kidneys, lactate, and uric acid)
  - Painful muscle cramps, myoglobinuria with strenuous exercise
  - Severe hepatosplenomegaly, enlarged kidneys

#### PFK-1 and FBP-2

- 4. A muscle biopsy on a pt of yours reveals elevated glycogen levels, elevated fructose 6-phosphate, and decreased pyruvate. What enzyme deficiency do you suspect most? deficiency in PFK-1
- What enzymes are responsible for increasing and decreasing the intracellular levels of fru-2,6-bisP?
   Phosphofructokinase-2 (PFK-2) increases levels of fru-2,6-bisP.
   Fructose bisphosphatase-2 (FBP-2) decreases levels of fru-2,6-bisP.
- Describe the process by which low levels of insulin and high levels of glucagon (fasting/starvation) result in less activation of PFK-1 by fructose-2,6-bisphosphate (which results in less glycolysis and more conservation of energy).



#### In short:

- High glucagon → more active PKA → active FBP-2 → less fru-2,6-bisP → less active PFK-1 → less glycolysis
- Low glucagon (high insulin) → less active PKA → active PFK-2 → more fru-2,6-bisP → active PFK-1 → more glycolysis
- True or false? In the liver, high levels of glucagon result in elevated cAMP levels.
   True
- True or false? Having an excess of fructose-2,6-bisphosphate results in more fructose-1,6-bisphosphate.
   True, by way of allosteric activation of PFK-1.
- 6. How will levels of fructose-2,6-bisphosphate change in the liver and in the muscle during a sympathetic fight or flight response?

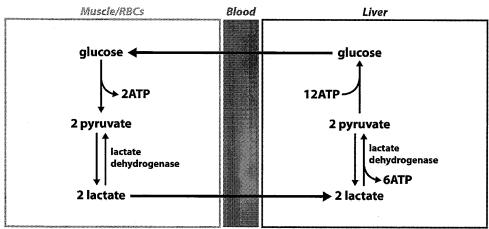
fru-2,6-bisP levels will decrease in the liver (→ less activation of PFK-1 → less glycolysis) fru-2,6-bisP levels will increase in the muscle (→ activation of PFK-1, sugar where you need it)

#### Glycolytic enzyme deficiency

Clinical presentation: hemolytic anemia, due to inability to maintain Na<sup>+</sup>-K<sup>+</sup> ATPase→ RBC swelling/lysis Common cause: pyruvate kinase deficiency, phosphoglucose isomerase deficiency

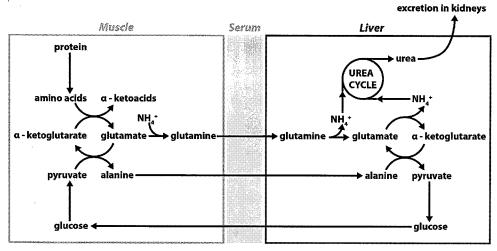


#### **GLUCONEOGENESIS**



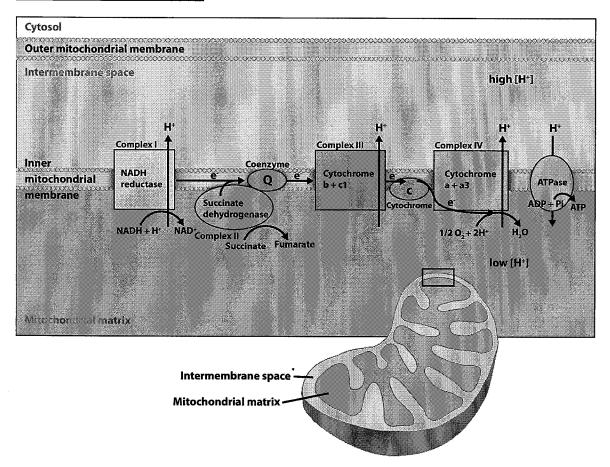
## Alanine Cycle

7. Outline the basic processes of transamination and oxidative deamination involved in the interorgan transport of nitrogen.



- 8. Why are alanine and glutamine found in such high concentrations in the blood? They are the two major carriers of nitrogen from tissues.
- 9. What is generally involved in transamination?
  - Transfer of the amino group of an amino acid to α-ketoglutarate to form glutamate
  - The remaining deaminated amino acid is a keto-acid (such as pyruvate) that is used in energy metabolism
  - What enzyme catalyses the above reaction? aminotransferase
  - How are aminotransferases named?
     by donor of the amino group (alanine aminotransferase converts alanine to pyruvate and forms glutamate)
  - In addition to substrates, what is required by all aminotransferases? pyridoxal phosphate (a derivative of vitamin )
- 10. What are the two most important aminotransferase enzymes? What reaction do they catalyze?
  - alanine + α-ketoglutarate ←→ glutamate + pyruvate
  - glutamate + oxaloacetate → α-ketoglutarate + aspartate

# **Electron Transport Chain (ETC)**



Gibbs Free Energy

# Fuel Usage in Feeding vs. Fasting States (FA p113)

1.	What fuels are produced and used in the post-absorptive period?  Produced - • •
	Muscles, brain, and other tissues use predominantly
2.	When does gluconeogenesis begin in the post-absorptive period? When does it become fully active?  • Begins hours after the last meal  • Fully active when glycogen stores are depleted (hours after last meal)
3.	How does the pattern of fuel production and usage change in early starvation (24 hours after the last meal)?  Produced - • •
	Brain uses predominantly     Muscles and other tissues use somebut predominantly
4.	In intermediate starvation (48 hours after the last meal), how does the pattern of fuel production and consumption change?  Produced - •  • •
	Brain uses predominantly but also some      Muscles and other tissue use predominantly but also some
5.	What metabolic scenario favors the synthesis of ketone bodies?
-	True or false? Ketone bodies can be used by all body tissues including the brain.
6.	What is the pattern of fuel utilization and production in prolonged starvation (5 days after last meal)?  Produced -  •  •
	Brain uses predominantly     Muscles and other tissues uses predominantly but also some
7.	Comparing an overnight fast to a 3 day fast, what percentage of energy comes from glucose and from ketone bodies?
	Overnight% from glucose (2/3 from glycogen breakdown, 1/3 from gluconeogenesis)% from ketone bodies
	3 day% from ketone bodies ( ½ are betahydroxybutarate, ½ acetoacetate)% from glucose (most from gluconeogenesis)

<u>En</u>	d Session Quiz: Biochem –Sugar & Energy
1.	What are the major regulatory enzymes of citric acid cycle? (FA p96)
2.	What is the rate-limiting enzyme for the following metabolic pathway?  Glycolysis  Gluconeogenesis  Citric acid cycle  Glycogenesis  Glycogenolysis
3.	What is the functional role of S-adenosyl-methionine? (FA p92)
4.	What is the activated carrier for the following molecule?  CO2 Glucose Electrons One-carbon units Acyl
5.	How many ATP are generated during aerobic metabolism? During anaerobic metabolism? (FA p97)
6.	What are the possible products of pyruvate? (FA p 99)
7.	What irreversible enzymes are involved in gluconeogenesis? (FA p101)
8.	HYQ: What is the primary energy source in a pt that has not eaten in two days? (FA p113) →
9.	HYQ: What is the equation for Gibbs free energy? →
10.	HYQ: Arrange the following molecules from most exergonic with loss of phosphate to least exergonic with loss of phosphate: adenosine monophosphate, adenosine triphosphate, phosphoenolpyruvate →
11.	HYQ: A stressed physician comes home from work, consumes 7 or 8 shots of tequila in rapid succession before dinner, and becomes hypoglycemic. → Why did she become hypoglycemic? →
12.	HYQ: A woman commonly develops intense muscle cramps and darkening of her urine after exercise. → What is her diagnosis? →

## **Biochemistry - Part 6: Protein and Fats**

Protein/AA/Nitrogen metabolism

- Amino Acids (FA p104)
- Amino Acid Derivatives (FA p106)
- Ammonium transport (FA p105)
- Urea cycle (FA p105)
- Diseases of AA metabolism (FA p108)

Fatty acid metabolism (FA p112)

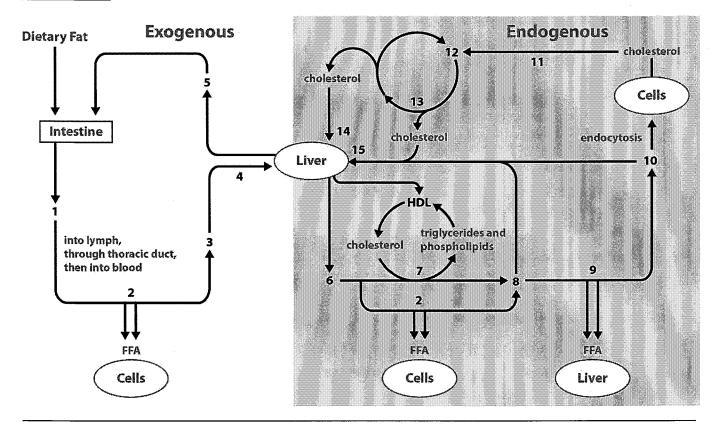
Cholesterol and Lipoproteins (FA p113)

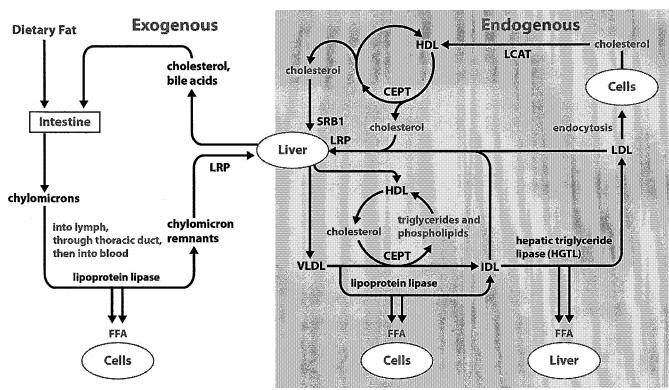
Metabolism overview (FA p96)

- Summary of pathways (FA p96)
- Sites of metabolism (FA p95) and Rate-determining Enzymes (FA p95)

1

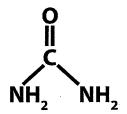
# Lipid Transport





- 1. What is the name of the genetic syndrome that fits the following description?
  - 1000-fold risk of developing skin CA
  - Alcoholics → B1 defic. → neurologic defects
  - Abnormal collagen type I synthesis
  - Absence of HGPRTase
  - · Deficiency of aldolase B
  - Defective excision repair → thymidine dimer formation
  - · Deficiency of cystathionine synthase
  - Heinz bodies
  - Musty/mousy odor, albinism, MR, eczema
  - Galactose-1-P uridyl transferase deficiency → MR, HSM, cataracts
  - Rx- no NutraSweet, increased dietary tyrosine
  - Deficiency of tyrosinase
  - Hyperextensible skin, loose joints, bleeding tendency
  - Decreased NADPH due to lack of HMP enzyme
  - Inherited defect in tubular amino acid transporter
  - Rx- decreased dietary methionine, increased cystine + B6
  - Deficiency in homogentisic acid oxidase
  - Hypoglycemia + jaundice + cirrhosis
  - · Self-mutilation, gout, aggression, choreoathetosis
  - Blocked degradation of branched chain amino acids
  - · Bloating, cramps, osmotic diarrhea
  - Rx- acetazolamide to alkalinize urine
  - Deficiency results in a combined B and T cell deficiency
  - Rx- decreased fructose and sucrose intake
  - Rx- increased intake of ketogenic nutrients (fats)
  - Dark brown urine, organs, and connective tissue; benign disease
  - Multiple fractures + blue sclera
  - Rx- exclude galactose and lactose from diet
- 2. Which amino acids have the following structure?

What is the following compound?



1.	What are the essential amino acids? (FA p104)
2.	What is the mechanism of action of lactulose? (FA p105)
3.	What amino acid is a precursor to the following molecule? (FA p106)  • Histamine
	<ul><li>Porphyrin, heme</li><li>NO</li></ul>
	GABA (a neurotransmitter)
	<ul><li>S-adenosyl-methionine (SAM)</li><li>Creatine</li></ul>
4.	Compare carbamoyl phosphate I to carbamoyl phosphate II? (FA p105)
5.	What is the rate-limiting enzyme for the following metabolic pathway?
	Urea cycle
	<ul><li>Hexose monophosphate pathway</li><li>Fatty acid synthesis</li></ul>
	<ul> <li>β-oxidation of fatty acids</li> <li>Ketone body synthesis</li> </ul>
	Cholesterol synthesis
	<ul><li>Bile acid synthesis</li><li>Heme synthesis</li></ul>
6.	HYQ: What deficiency causes familial hypercholesterolemia? →
7.	HYQ: A patient with PKU should have diet low in phenylalanine. → What other dietary modifications should a patient with PKU make? →
8.	HYQ: A full-term neonate becomes mentally retarded and hyperactive and has a musty odor. → What is the diagnosis? →
9.	HYQ: A 2-year-old girl has an increase in abdominal girth, failure to thrive, and skin/hair depigmentation. → What is her diagnosis? →
10.	. HYQ: A middle-aged man has dark spots on his sclera and has noted that his urine turns black when left sitting for a period of time. → What is the diagnosis? →
11.	. HYQ: A patient has a genetic disease in which the treatment includes protein restriction to prevent mental retardation, ketoacidosis, and death. → What is the diagnosis? →
12.	. HYQ: An 18-year-old female has moderate generalized abdominal pain, normal WBC, and no fever. She ha paresthesias in her lower extremities. → What is her diagnosis? →
13.	. HYQ: A 45-year-old male alcoholic gets blistering lesions in sun-exposed areas especially the dorsum of the hands. He also has hypertrichosis of the face. → What is the diagnosis? →
14.	. HYQ: What is the treatment for homocystinuria? →

# Female Anatomy & Physiology

Female Anatomy (FA p478)

Estrogen & Progesterone (FA p482 - FA p483)

Menstrual Cycle/Ovulation/Meiosis (FA p483)

βhCG, Menopause (FA p485)

Estrogens, Progestins, SERMs (FA p498)

Mifepristone, OCPs, HRT (FA p498)

1. Outline the general hormone sequence of the female reproductive cycle. (FA p483)

FSH  $\rightarrow$  follicle maturation  $\rightarrow$  production of estradiol  $\rightarrow$  production of LH surge  $\rightarrow$  ovulation and production of progesterone (along with estradiol)  $\rightarrow$  inhibition of FSH and LH production  $\rightarrow$  decline of corpus luteum  $\rightarrow$  no production of estradiol and progesterone  $\rightarrow$  loss of FSH inhibition  $\rightarrow$  increase in FSH (repeat step 1)

- 2. Which hypothalamic nucleus is involved in ovulation?
- 3. What are the layers of the endometrium? Which layers are shed during menstruation?
- 4. When does the basal body temperature increase occur in relation to ovulation?
- 5. Corpus Luteum
  - Formed after ovulation, produces progesterone and estrogen in the luteal phase
  - Lifespan 13-14 days (luteal phase)
  - If βhCG from the placenta is present, the lifespan will extend to 6-7 weeks until the placenta is able to produce its own progesterone.
- 6. What cells of the corpus luteum secrete progesterone and estrogen?
  - Granulosa lutein cells (formerly called granulosa cells prior to ovulation)
  - Theca lutein cells (formerly called theca interna cells prior to ovulation)
    [granulosa lutein cells and theca lutein cells are collectively called luteal (lutein) cells]
- 7. Menopausal Hot Flashes
  - Occur in 75% of menopausal women
  - Presentation: starts in face/chest then generalizes, lasts 2-4min, a/w diaphoresis and palpitations, followed by chills and shivering
  - May cause sleep disturbances
  - Rx: Estrogen replacement > SSRI or SNRI (venlafaxine) > clonidine or gabapentin
  - Herbal Rx: soy isoflavones\*, red clover\*, black cohosh\*, vitamin E
     (\*potential estrogenic effect on the breast, much like estrogen replacement)
- 8. Intrauterine Device (IUD)
  - Copper (Paragard) → 10 year
  - Progesterone (Mirena) → 5 year, prevents menstruation, used as Rx for menorrhagia
  - · Small risk of uterine rupture when placing
  - Contraindicated if high risk of STD
- 9. Medroxyprogesterone (Depo-Provera)
  - IM injection dosed g3m
  - Associated with bone mineral density loss especially if long-term, therefore not ideal for >2yr of use
  - Good choice of contraception for patients with MR

## Female Cervical, Uterine, and Ovarian Pathology (FA p488 - FA p492)

- 10. Vulvar Intraepithelial Neoplasia (VIN)
  - Very similar to CIN except vulvar location
  - Grades I, II, III
  - Associated with HPV (esp. 16, 18, and 31)
  - Koilocytosis: squamous cell w/ perinuclear cytoplasmic clearing
  - Precursor to vaginal carcinoma (FA p492)
- 11. What uterine pathology matches the following description? (FA p488)
  - Excess unopposed estrogen is the main risk factor
  - Menorrhagia with an enlarged uterus and no pelvic pain
  - Pelvic pain that is present only during menstruation
  - Diagnosed by endometrial biopsy in clinic
  - Definitive diagnosis and treatment is by laproscopy
  - Menstruating tissue within the myometrium
  - Malignant tumor of the uterine smooth muscle
  - Most common gynecologic malignancy
- 12. What are the 4 main categories of ovarian tumors? (FA p491 FA p492)
  - Epithelial (65% of ovarian tumors, 90% of ovarian cancers)
  - Germ cell
  - Stromal
  - Metastatic (GI, breast, endometrium)
- What are the main types of epithelial cell ovarian tumors (which account for 65% of ovarian tumors and 90% of ovarian cancers)?

**serous, mucinous, endometrioid**, clear cell, Brenner, mixed (hint: My Med Students Consistently Beat Exams.)

- What are the main types of germ cell ovarian tumors?

teratoma, dysgerminoma, endodermal sinus, choriocarcinoma

- What are the main types of stromal/sex cord ovarian tumors?
   granulosa-theca cell, Sertoli-Leydig cell, fibroma
- 13. What ovarian tumor matches the following statement? (FA p491 FA p492)
  - Produces AFP
  - Estrogen secreting → precocious puberty
  - Intraperitoneal accumulation of mucinous material
  - Testosterone secreting → virilization
  - Psammoma bodies
  - Multiple different tissue types
  - Lined with fallopian tube-like epithelium
  - Ovarian tumor + ascites + pleural effusions
  - Call-Exner bodies
  - Resembles bladder epithelium
  - Elevated βhCG
- 14. HYQ: An obese woman presents with amenorrhea and increased levels of serum testosterone. → What is the most likely diagnosis? →
- 15. HYQ: A patent with polycystic ovarian disease is most at risk for developing which type of cancer? →
- 16. HYQ: Why is progesterone used in combination with estrogen during estrogen replacement? →
- 17. HYQ: Under what circumstances would you expect to see an elevated LH? →
- 18. What are the risk factors for ovarian cancer?

)

)

)

)

)

)

)

)

	what are some of the normal physiologic changes that take place during pregnancy?  Cardiac output increases 30-50%  Plasma volume increases 50%, RBC volume increases 30%  BP decreases in early pregnancy → nadir at 16-20wks → return to pre-pregnancy levels by term  Increased minute ventilation → decreased PACO₂ and PaCO₂, mild respiratory alkalosis → CO₂ transferred more easily from fetus to mother  Increased procoagulation factors → hypercoagulable state  Increased GFR → decreased BUN and Cr  Normal TSH and free T4  Increased peripheral resistance to insulin (due to human placental lactogen) that worsens throughout pregnancy → hyperinsulinemia, hyperglycemia, hyperlipidemia
2.	What is the difference between placental previa, abruptio, and accreta? (FA p488)
3.	HYQ: A pregnant woman with previous c-section is at increased risk for what? →
4.	HYQ: A pregnant woman at 16 weeks of gestation presents with an atypically large abdomen and hypertension. → What abnormality might be seen on blood test, and what is the disorder? →
5.	HYQ: What substance is present in high levels in cases of hydatidiform moles? →
6.	HYQ: A 15 year-old female patient of yours that normally comes with her parents presents alone this time. She states that she is sexually active but that she knows she is not pregnant because she has never menstruated. → What would be the appropriate next step in managing this patient? →
7.	HYQ: A 23 year-old female who is on rifampin for TB prophylaxis and on birth control (estrogen) gets pregnant. → Why? →

8. HYQ: What is the best option for birth control in a mentally retarded patient? →

## Breast Pathology (FA p492 - FA p494)

<ol><li>Benign Epithelial Lesions (FA p492, FA p</li></ol>	)494)
--	-------

Nonproliferative Breast Changes (Fibrocystic Changes)	
- Cysts	
- Fibrosis	
- Adenosis: fibroadenoma (FA p492)	
Proliferative Breast Disease without Atypia	
- Sclerosing Adenosis	
- Epithelial Hyperplasia	
- Complex Sclerosing Lesion (Radial Scar)	
- Papillomas (FA p492)	

10. In Situ Breast Carcinoma (15-30%)

Ductal Carcinoma in Situ (DCIS, Intraductal Carcinoma) (FA p493)	
- Comedocarcinoma (FA p493)	
- Solid	
- Cribriform	
- Papillary	
- Micropapillary	
- (Paget Disease) (FA p493)	
Lobular Carcinoma in Situ (LCIS)	

11. Invasive Carcinoma (70-85%)

(Inflammatory Carcinoma) (FA p493)	
Invasive Ductal (70-80%) (FA p493)	
Invasive Lobular Carcinoma (10%) (FA p493)	
Tubular/Cribriform Carcinoma (6%)	
Mucinous Carcinoma	
Medullary Carcinoma (FA p493)	
Papillary Carcinoma	
Metaplastic Carcinoma	

- 12. What breast pathology fits the following description? (FA p492 FA p494)
  - Most common breast tumor in women under 25
  - Most common breast mass in postmenopausal women
  - Most common breast mass in premenopausal women
  - Most common form of breast cancer
  - Small, mobile, firm mass with sharp edges in 24-yr-old woman
  - Histological "leaf-like projections"
  - Signet ring cells
  - Loss of e-cadherin cell adhesion gene on chrom 16
  - Always ER(+) and PR(+)
  - Commonly presents with nipple discharge
  - Eczematous patches on nipple
  - Multiple bilateral fluid-filled lesions with diffuse breast pain
  - Firm, fibrous mass in a 55-yr-old woman
- 13. HYQ: A 58-year-old postmenopausal woman is on Tamoxifen → What is she at increased risk of acquiring?

Fe	male Reproduction Quiz
1.	What is the two-cell theory of estradiol production? (FA p482)
2.	What are the target cells of LH? What cells respond to FSH? (FA p481)
3.	What are the pros and cons of oral contraceptive pill use? (FA p499)
4.	State whether the following statement describes estrogen or progesterone (FA p482 - FA p483)  Production of thick mucus that inhibits entry of sperm into the uterus  Induces LH surge  Uterine smooth muscle relaxation  Follicle growth  Maintenance of pregnancy  Hepatic synthesis of transport proteins  Withdrawal leads to menstruation
5.	What drug would you give to inhibit prolactin secretion? (FA p290)
6.	When does βhCG appear in the urine during pregnancy? (FA p483)
7.	What hormonal changes are seen during menopause? (FA p485)
8.	What is the underlying cause of PCOS? (FA p490) What are the clinical manifestations? What is the treatment?
9.	What ovarian tumor matches the following statement? (FA p490 – FA p492)  • Produces AFP  • Estrogen secreting → precocious puberty  • Intraperitoneal accumulation of mucinous material  • Testosterone secreting → virilization  • Psammoma bodies  • Multiple different tissue types  • Lined with fallopian tube-like epithelium  • Ovarian tumor + ascites + hydrothorax  • Call-Exner bodies  • Resembles bladder epithelium  • Elevated βhCG
10.	What are the risk factors for endometrial carcinoma? For ovarian cancer? For cervical cancer?

#### Male Reproduction

Male Anatomy & Physiology (FA p479 – FA p482) Androgens (FA p482) Testosterone (FA p497) Antiandrogens and Sildenafil (FA p497), (FA p499) Prostate Path (FA p494 - FA p495) Testicular Path (FA p496) Penile Path (FA p496)

 HYQ: Which cells are responsible for maintaining a high testosterone concentration in the seminiferous tubules? →

#### BPH - Benign Prostatic Hyperplasia

- Present in 80% of men over age 80 y/o
- Diagnosis based on the following symptoms: sensation of incomplete voiding, increased urinary frequency (less than q2hrs), straining to void, intermittent or weak urine stream, urgency, nocturia (at least 2-3 times a night)
- Palpable prostate size may not correlate with degree of obstruction or symptom severity

Alternative Medicine- Isoflavones, saw palmetto

#### Medical Intervention

- Nonselective α-blockers: Doxazosin, Prazosin, and Terazosin
- Decrease prostate smooth muscle tone → immediate improvement in urine flow
- SE: dizziness, postural hypotension, fatigue, asthenia. To reduce SE, dose qHS and titrate dose upward slowly over time (weekly)
- Tamsulosin (Flomax)(selective α-1A—blocker) fewer SE than non-selectives, has no antihypertensive effects
- 5α-reductase inhibitors: Finasteride, Dutasteride
  - slowly reduces dihydrotestosterone levels → 20% decrease in prostate volume over 3-6m
  - SE: decreased libido, ejaculatory disorder, impotence

#### Surgical Intervention

# 2. Testicular Torsion vs. Epididymitis

## <u>Torsion</u>

- Twisting of the spermatic cord → ischemia
- Dx: support of testis → no relief; US
- Rx: Surgical detorsion with bilateral orchiopexy within 6hrs

# **Epididymitis**

- Inflammation of epididymis
- Dx: support of testes → some relief
- Rx <35 = GC/Ch
  - → ceftriaxone IM then doxycyline x10d
- Rx >35 or h/o anal intercourse = Enterobacteriaceae
   → fluoroquinolone x10-14d
- 3. What testicular tumor is described by the following statement?
  - Composed of cytotrophoblasts and syncytiotrophoblasts
  - May present initially with gynecomastia
  - Elevated AFP
  - Elevated βhCG
  - Most common testicular tumor
  - Most common testicular tumor in infants and children up to 3yrs of age
  - Most common testicular tumor in men over age 60
  - Histologic appearance similar to kiolocytes (cytoplasmic clearing)
  - Histologically may have alveolar or tubular appearance sometimes with papillary convolutions
  - Composed of multiple tissue types
  - Histologic endodermal sinus structures (Schiller-Duval bodies)
  - 25% have cytoplasmic rod-shaped crystalloids of Reinke
  - Androgen producing and associated with precocious puberty
- 4. HYQ: A 55 year-old man undergoing treatment for BPH has increased testosterone and decreased DHT as well as gynecomastia and edema. → What is his medication? →

)

)

)

)

)

)

)

)

)

)

)

)

)

)

1.	How does flutamide differ from finasteride in relation to mechanism of action and clinical use? (FA p498
2.	What is the clinical use of clomiphene? How does this drug work? (FA p498)
3.	<ul> <li>What breast pathology fits the following description? (FA p492 – FA p494)</li> <li>Most common breast mass in postmenopausal women</li> <li>Most common form of breast cancer</li> <li>Small, mobile, firm mass with sharp edges in 24 yr old woman</li> <li>Multiple bilateral fluid-filled lesions with diffuse breast pain</li> <li>Firm, fibrous mass in a 55 yr old woman</li> </ul>
4.	What are the side effects of sildenafil? (FA p499)
5.	What is the role of Sertoli cells and Leydig cells in male spermatogenesis? (FA p481)
6.	What is the difference between androgen insensitivity and 5-alpha-reductase deficiency? (FA p486)
7.	What is the most common: (FA p528)  Cause of DIC  Heart murmur  Coronary artery involved in thrombosis  Cause of death in lupus patients  Congenital heart anomaly
8.	How many carbon molecules are found on testosterone and on androstenedicne? (FA p291)
9.	What structures develop from the mesonephric duct system? (FA p132)
10	<ul> <li>What is the male homologue to the following female structure? (FA p134)</li> <li>Vestibular bulbs</li> <li>Labia minora</li> <li>Bartholin glands</li> <li>Urethral and paraurethral glands (of Skene)</li> </ul>
11	. HYQ: To where does testicular cancer first metastasize? →

					)
					)
					· · · · · · · · · · · · · · · · · · ·
					)
					\
					)
					)
					<i>)</i>
					)
					)
					· /
					).
					<u> </u>
		•			)
					)
					)
					,
					)
					)
					· )
					· · · · · · · · · · · · · · · · · · ·
				,	)
					1
				,	).
					. )
					)
					. )
					. 7
					)
					)
					,
					.)
					)
					. )
					)
					)
					)
					)
	•				-/
					)
					``
					)
			•		)
					<i>)</i>
					)
					)
					· · · · · · · · · · · · · · · · · · ·
					)
					)
					<del>-</del> ^

# Basic Neuro Anatomy & Physiology (FA p396 - FA p399)

#### Sensory Receptors (FA p397)

1. Compare Merkel receptors, Meissner's corpuscles, Ruffini endings, and Pacinian corpuscles based on location in the skin tissue and on whether they are slowly or rapidly adapting.

Slowly adapting

Rapidly adapting

Superficial layers Deep layers (dermis)

- What is the difference between a slowly adapting receptor and a rapidly adapting receptor?

Slowly adapting-

sends a continuous electrical signal throughout a continuous stimulus

Rapidly adapting-

sends an electrical signal only at the beginning and end of a continuous stimulus

- 2. What sensory receptor communicates with the following information? (FA p397, FA p414)
  - Pricking pain (fast, myelinated)
  - Burning or dull pain and itch (slow, unmyelinated)
  - Receptor for cold sensation
  - Receptor for warm sensation
  - Vibration and pressure
  - Dynamic/changing light, discriminatory touch
  - Static/unchanging light touch
  - Proprioception information muscle length monitoring
  - Proprioception information muscle tension monitoring
- 3. What sensory receptor matches the following description?
  - Resembles an onion in cross section
  - Robust spindle-shaped structures found particularly on the soles of the feet
  - Found only in areas of skin without hair (fingertips, lips, eyelids, etc.)
  - Simplest sensory receptor thought to be pain receptor or thermoreceptors
  - Touch receptor that is tough to distinguish from melanocytes
- 4. Which nervous system cell matches the following description? (FA p396 FA p397)
  - Look like fried eggs under histologic staining
  - Form multinucleated giant cells in the CNS when infected with HIV
  - Myelinates multiple CNS axons
  - Myelinates one PNS axon
  - Damaged in Guillain-Barre syndrome
  - Damaged in multiple sclerosis
  - Macrophages of the CNS
  - Cells of the blood brain barrier

# Neurotransmitters (FA p397)

5. What are the 4 major dopaminergic pathways, and what is the result of blocking these pathways?

Mesocortical pathway	Ventral tegmental of midbrain → cortex	Increase in negative symptoms of psychosis (i.e., social withdrawal and depression)
Mesolimbic pathway	Ventral tegmental of midbrain → limbic system	Relief of psychosis (positive symptoms)
Nigrostriatal pathway	Substantia nigra (pars compacta) → striatum (caudate + putamen)	Parkinson's symptoms (stimulation would result in extrapyramidal side effects)
Tuberoinfundibular pathway	Arcuate nucleus of hypothalamus → pituitary (to inhibit prolactin secretion)	Increase in release of prolactin from pituitary  → amenorrhea, gynecomastia, galactorrhea (FA p286)

- 6. What disorder is thought to arise from reduced norepinephrine activity? Increased norepinephrine activity?
- 7. What disease is associated with the degeneration of the basal nucleus of Meynert and less CNS acetylcholine?

#### Hypothalamus (FA p398) and Thalamus (FA p399)

- 8. Which nucleus of the hypothalamus fits the following description? (FA p399)
  - Considered the "master clock" for most of our circadian rhythms
  - Regulates the parasympathetic NS
  - Destruction results in hyperthermia
  - Regulates the sympathetic NS
  - Produces antidiuretic hormone (ADH) to regulate water balance
  - Mediates oxytocin production
  - Receives input from the retina
  - Savage behavior and obesity result from stimulation
  - Savage behavior and obesity result from destruction
  - Stimulation → eating destruction → starvation
  - Regulates the release of gonadotropic hormones (i.e,. LH and FSH)
  - Responsible for sweating and cutaneous vasodilation in hot temperatures
  - · Responsible for shivering and decreased cutaneous blood flow in the cold
  - · Destruction results in neurogenic diabetes insipidus
  - Destruction results in inability to stay warm
  - Releases hormones affecting the anterior pituitary
- 9. What portion of the thalamus relays the following information? (FA p399)
  - Somatosensory from body (via medial lemniscus and spinothalamic)
  - Communications with prefrontal cortex; memory loss results if destroyed
  - Cerebellum (dentate nucleus) and basal ganglia → motor cortex
  - Trigeminothalamic and taste pathways to somatosensory cortex
  - Retina → occipital lobe
  - Basal ganglia → prefrontal, premotor, and orbital cortices
  - Mamillothalamic tract → cingulate gyrus (part of Papez circuit)
  - Integration of visual, auditory, and somesthetic input
  - Dentate nucleus and basal ganglia → supplementary motor cortex
  - (Auditory info) brachium of inferior colliculus → primary auditory cortex

# Cerebellum (FA p399)

- 10. What are the longitudinal zones of the cerebellum starting with the most medial?
  - Vermis
  - Intermediate (paravermal) zones (right and left)
  - Lateral hemispheres (right and left)
- 11. Describe the general flow of information through the cerebellum.

Inputs (mossy and climbing fibers) → cerebellar cortex → Purkinje fiber → deep nuclei of cerebellum → output targets

What structure provides the major output pathway from the cerebellum?

Brachium conjunctivum (AKA superior cerebellar peduncle) → contralateral VL of thalamus

12. Based on the primary source of information brought into the cerebellar cortex, which cerebellar regions are referred to as the vestibulocerebellum, spinocerebellum, and cerebrocerebellum? (To which deep nuclei do these regions project?)

Vestibulocerebellum

- Flocculonodular lobe and vermis

(→ fastigial)

Spinocerebellum

- Vermis and paravermal regions

(→ fastigial and interposed)

Cerebrocerebellum

- Lateral hemispheres

(→ dentate)

13. Motor control on which side of the body would be affected with a lesion on one side of the cerebellar hemisphere?

Motor control ipsilateral to the side of the lesion would be affected (because the cerebellum  $\rightarrow$  contralateral thalamus  $\rightarrow$  cortex  $\rightarrow$  corticospinal tract  $\rightarrow$  body contralateral to cortex).

14. What neurological abnormalities can be attributed to damage of the spinocerebellum (vermis and paravermis)?

)

)

)

)

)

)

)

)

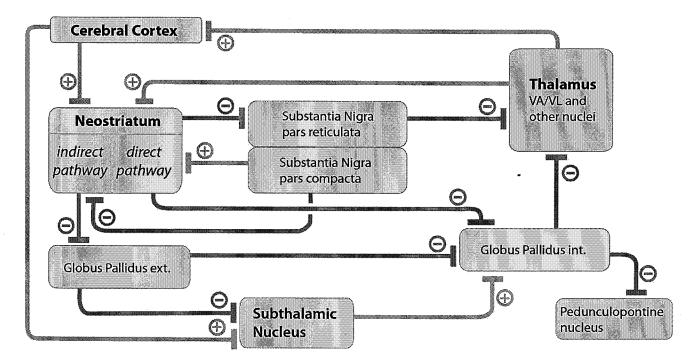
)

- Postural instability
- · Slurred/slowing of speech
- Hypotonia
- Pendular knee jerk reflexes
- What symptoms are seen in anterior lobe (anterior vermis) syndrome? What is the most common cause of anterior lobe syndrome?

The most anterior portion of the vermis belongs to the legs.

- Ataxia/dystaxia of legs (even when the trunk is supported) → broad-based, staggering gait
- Chronic alcohol abuse → thiamine deficiency → degeneration of cerebellar cortex (starting at the anterior lobe)
- 15. What neurological deficits can be attributed to damage of the cerebrocerebellum (lateral hemisphere)?
  - Lack of coordination of voluntary movements (with respect to both the timing and rate of the movement)
  - Delays in initiating movements and trouble stopping movements
  - Dysmetria (impaired ability to control the distance, speed, and power of a movement)
  - Intention tremor
- What is the difference between essential tremor, resting tremor, and intention tremor? (FA p402)
  - Essential tremor- family history of tremor, occurs with movement and at rest
  - · Resting tremor- a/w Parkinson's disease, disappears with voluntary movement
  - · Intention tremor- a/w cerebellar damage, appears only with voluntary movements
- What are the features of essential (AKA familial) tremor?
  - Rapid fine tremor of head, hands, arms, and/or voice (think Katharine Hepburn)
  - 50% of pts have a family history of tremor
  - Occurs with movement and at rest
  - Treated with beta-blocker (propranolol), primidone (an anticonvulsant), clonazepam, or alcohol (pts often self medicate)
- 16. What neurological deficits can be attributed to damage of the vestibulocerebellum (vermis and flocculonodular)?
  - Disequilibrium: difficulty in maintaining balance
  - Abnormal eye movements (such as cerebellar nystagmus that is more pronounced when pt looks to the side of the lesion)
- What is the most common cause of damage to the flocculonodular lobe?
   Medulloblastoma in childhood

Huntington's (FA p401) and Wilson's (FA p333)



## Brain Lesions (FA p403)

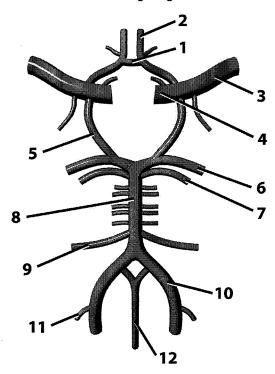
- 17. A lesion to which area of the brain is responsible for the following clinical scenario?
  - · Contralateral hemiballismus
  - · Eyes look toward the side of the lesion
  - Eyes look away from the side of the lesion
  - Paralysis of upward gaze
  - Hemispatial neglect syndrome
  - Coma
  - Poor repetition
  - Poor comprehension
  - · Poor vocal expression
  - Resting tremor
  - Intention tremor
  - Hyperorality, hypersexuality, disinhibited behavior
  - Personality changes
  - Dysarthria
  - · Agraphia and acalculia
- 18. HYQ: A patient with a cortical lesion is unaware of his neurologic deficiency. → Where is the lesion? →

## Aphasia (FA p404)

- 19. Nondominant Aphasia
  - Nondominant Broca's (Expressive Dysprosody) inability to express emotion or inflection in speech
  - Nondominant Wernicke's (Receptive Dysprosody) inability to comprehend emotion or inflection in speech

# Circle of Willis (FA p405) and Brainstem Occlusion Syndromes

- 20. What artery is damaged (via hemorrhagic stroke or ischemic stroke) with the following presentation?
  - Aneurysm causes the eye to look down and out
  - Aneurysm may cause bilateral loss of lateral visual fields
  - Broca's or Wernicke's aphasia
  - Unilateral lower extremity sensory and/or motor loss
  - Unilateral facial and arm sensory and/or motor loss
- 21. Label the following diagram of the Circle of Willis:



#### **Brainstem Occlusion Syndromes**

22. What is the hallmark sign of a general brainstem lesion?

Alternating syndromes: with long tract symptoms on one side (i.e., hemiparalysis) and cranial nerve Symptoms on the other

23. What causes and what are the symptoms of Weber's syndrome?

Midbrain infarction resulting from occlusion of the paramedian branches of the posterior cerebral artery:

- Cerebral peduncle lesion → contralateral spastic paralysis (AKA contralateral hemiparesis)
- Oculomotor nerve (CN III) palsy → ipsilateral ptosis, pupillary dilation, and lateral strabismus (eye looks down and out)
- 24. What causes and what are the symptoms of <u>medial medullary syndrome</u>? Damage to which areas cause these symptoms?

Caused by occlusion of a paramedian branch of anterior spinal artery (from vertebral artery) → unilateral infarct of medial portion of rostral medulla (AKA anterior spinal artery syndrome)

- Contralateral spastic hemiparesis (pyramid/corticospinal tract damage)
- Contralateral tactile and kinesthetic defects (medial lemniscus damage)
- Tongue deviates toward side of the lesion (hypoglossal nucleus/nerve damage)
- (Note that pain and temperature sensation are preserved)

25. What causes and what are the symptoms of <u>lateral medullary syndrome</u> (AKA <u>Wallenberg's syndrome</u>)? Damage to which areas cause these symptoms?

Caused by occlusion of one of the <u>posterior inferior cerebellar arteries (PICA)</u> → unilateral infarct of lateral portion of rostral medulla (AKA posterior inferior cerebellar artery syndrome)

- Loss of pain and temp. over contralateral body (spinothalamic tract damage)
- Loss of pain and temp. over ipsilateral face (trigeminothalamic tract damage)
- Hoarseness, difficulty swallowing, loss of gag reflex (nucleus ambiguus: glossopharyngeal and vagus damage)
- Ipsilateral Horner's syndrome (descending sympathetic tract)
- Vertigo, nystagmus, nausea/vomiting (vestibular nuclei damage)
- Ipsilateral cerebellar deficits (i.e., ataxia, past pointing) (inferior cerebellar peduncle damage)
- 26. What is the cause of <u>medial inferior pontine syndrome</u>? What are the symptoms? Damage to which areas cause these symptoms?

Caused by occlusion of a paramedian branch of the basilar artery → unilateral infarct of medial aspect of inferior pons

- Contralateral spastic hemiparesis (corticospinal tract damage)
- Contralateral loss of light touch/vibratory/kinesthetic sensation (medial lemniscus damage)
- Paralysis of gaze to side of lesion (damage to pontine gaze center: PPRF and abducens nucleus)
- Ipsilateral paralysis of lateral rectus muscle (damage to abducens nerve fibers)
- (Note that pain and temperature sensation are preserved)
- 27. What is the cause of <u>lateral inferior pontine syndrome</u>? What are the symptoms? Damage to which areas cause these symptoms?

Caused by occlusion of one of the <u>anterior inferior cerebellar arteries (AICA)</u> → unilateral infarct of lateral aspect of inferior pons (AKA anterior inferior cerebellar artery syndrome)

- <u>Ipsilateral</u> facial nerve paralysis (facial nucleus and nerve fiber damage)
- Ipsilateral loss of taste from anterior 2/3 of tongue (solitary nucleus and nerve fibers)
- Ipsilateral deafness and tinnitus (cochlear nucleus and nerve fiber damage)
- Nystagmus, vertigo, nausea/vomiting (vestibular nucleus and nerve fiber damage)
- Ipsilateral limb and gait ataxia (damage to middle and inferior cerebellar peduncles)
- Ipsilateral loss of pain and temperature sensation from the face (spinal trigeminal nucleus and nerve fiber damage)
- Contralateral loss of pain and temperature sensation (damage to spinothalamic tract)
- Ipsilateral Horner's syndrome (damage to descending sympathetic tract)
- (No contralateral body paralysis or loss of light touch/vibratory/kinesthetic sensation)
- An occlusion of one of <u>AICA arteries</u> in the <u>superior/rostral pons</u> causes a <u>lateral superior pontine syndrome</u>. What are the symptoms of this syndrome? Damage to which areas cause these symptoms?
  - Ipsilateral loss of taste from anterior 2/3 of tongue (solitary nucleus and nerve fibers)
  - Ipsilateral limb and gait ataxia (damage to middle and inferior cerebellar peduncles)
  - Ipsilateral loss of pain and temperature sensation from the face (spinal trigeminal nucleus and nerve fiber damage)
  - Ipsilateral loss of light touch and vibration sensation from face (main sensory trigeminal nucleus and nerve fiber damage)
  - Ipsilateral jaw weakness and deviation of jaw toward side of lesion (trigeminal motor nucleus and nerve fiber damage)
  - Contralateral loss of pain and temperature sensation from body (damage to spinothalamic tract)
  - Ipsilateral Horner's syndrome (damage to descending sympathetic tract)

# Intracranial Hemorrhage (FA p406)

- 28. Intraventricular Hemorrhage in the Newborn
  - Hemorrhage into the ventricular system
  - Most common in premature/very low birth weight infants (< 32 wks, <1500g) within the first 72 hours of life
  - Originates from the germinal matrix in the subependymal, subventricular zone that gives rise to neurons and glia during development
  - All infants born at younger than 30-32 wks gestational age should receive a screening US to detect

)

)

)

)

)

)

)

)

)

)

)

)

)

)

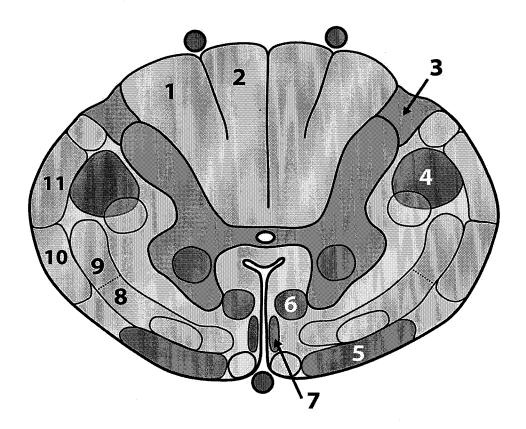
)

# Pseudotumor Cerebri (AKA Benign Intracranial Hypertension)

- 29. What are the characteristic features of pseudotumor cerebri?
  - Young, obese female
  - Headaches daily (worse in the morning) pulsatile, possible nausea/vomiting, possible retroocular pain worsened by eye movement
  - Papilledema
  - Most worrisome sequelae is vision loss
  - CT scan: Absence of ventricular dilation, no tumor or mass
  - CSF pressure elevated (>200mmHg in nonobese, >250mmHg in obese patient)
- 30. What treatment options are available for managing pseudotumor cerebri?
  - Confirm absence of other pathology with CT and MRI of the head (r/o central venous thrombosis)
  - Discontinue any inciting agents (e.g. vitamin A, tetracyclines, corticosteroid withdrawal)
  - Weight loss in obese patients
  - <u>Acetazolamide</u> first line (start 250mg qid or 500mg bid → increase to 500mg qid to 1000mg qid) Invasive Treatment Options
  - Serial lumbar punctures
  - Optic nerve sheath decompression
  - <u>Lumboperitoneal shunting (CSF shunt)</u>

#### Spinal Cord (FA p409 - FA p410)

- 31. Which spinal tract conveys the following information? (FA p409)
  - Touch, vibration, and pressure sensation
  - Voluntary motor command from motor cortex to body
  - Voluntary motor command from motor cortex to head/neck
  - Alternate routes for the mediation of voluntary movement
  - · Pain and temperature sensation
  - Important for postural adjustments and head movements
  - Proprioceptive information for the cerebellum



## Spinal Cord Lesions, Polio, ALS (FA p411)

- 32. Selected Hereditary Ataxias:
  - Friedreich's ataxia (FA p412)
  - · Hereditary vitamin E deficiency (mutations in the alpha-tocopherol transfer gene protein)
  - Ataxia-telangiectasia (FA p213 Immunodeficiencies)
  - Metachromatic leukodystrophy (FA p111 Lysosomal storage diseases, and FA p426)
  - Wilson's disease (FA p333)

)

<u>Les</u> 1.	sions of the Basal Ganglia, Brainstem, Cortex, and Spinal Cord Quiz (FA p400 – FA p412) HYQ: What are the findings of Brown-Séquard syndrome? (FA p412)
2.	What is the most common site of a berry aneurysm? What diseases are often a/w berry aneurysms?
3.	Where does each of the following spinal tracts decussate/cross over? (FA p410)  • Dorsal columns  • Lateral corticospinal  • Spinothalamic tract
4.	What is the classic presentation of a syringomyelia? What malformation is associated with syringomyelia? (FA p127, FA p411)
5.	What are the cardinal features of Parkinson's disease? (FA p401)
6.	What are classic signs of an upper motor neuron lesion? Of a lower motor neuron lesion? (FA p410)
7.	HYQ: A man in his 40s begins to develop early dementia and uncontrollable movements of his upper extremities. → In what portion of the brain do you expect to see atrophy? →
8.	HYQ: A male patient presents with involuntary flailing of one arm. → Where is the lesion? →
9.	HYQ: 28 year-old chemist presents with MPTP exposure. → What neurotransmitter is depleted? →
10.	HYQ: A patient cannot abduct her left eye on lateral gaze and convergence is normal. She is also having difficulty smiling. $\rightarrow$ In what part of the CNS is there a lesion? $\rightarrow$
11.	A lesion of what artery can cause a locked-in syndrome? →
12.	When performing a lumbar puncture for anesthesia, where is the anesthesia dosed? Where is CSF found?
13.	HYQ: A 28 year-old woman is involved in a motor vehicle accident (MVA). She initially feels fine, but minutes later she loses consciousness. CT scan reveals an intracranial hemorrhage that does not cross suture lines. → Which bone and vessel were injured in the crash? →
14.	HYQ: A 40 year-old man with a history of Marfan's syndrome and hypertension presents with a severe headache. A head CT is normal at presentation and examination of the CSF reveals numerous red blood cells. → What is the cause of the man's headache? →
15.	HYQ: An 85 year-old man with Alzheimer's disease falls at home and presents 3 days later with severe headache and vomiting. → What is the most likely diagnosis and structures were damaged? →
16.	What is the most common cause of the following? (FA p529)  • Hypoparathyroidism  • Metastatic disease to brain  • Lysosomal storage disease  • Myocarditis

Neuro

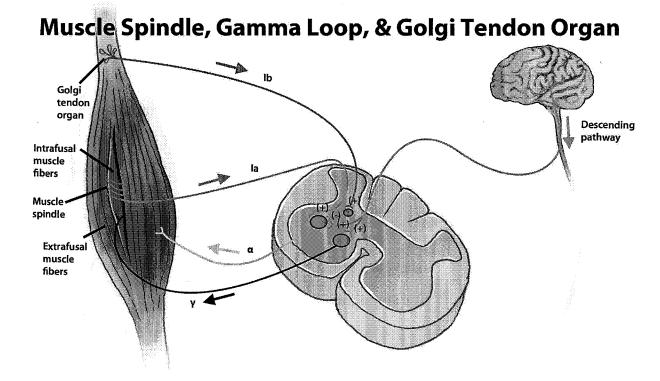
#### Muscle Spindle Control

Muscle spindle: monitors muscle length

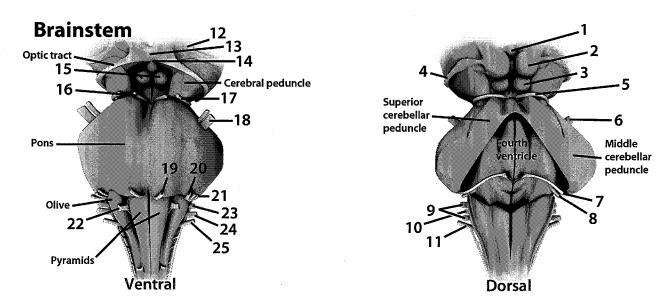
- · Extrafusal muscle fibers: functional unit of muscle
- · Intrafusal muscle fibers: regulate length
  - Muscle stretch results in intrafusal stretch which stimulates 1a afferent→ DH→ alpha motor neuron, causing reflex muscle contraction
    - Hint: help you pick up a heavy suitcase
- Golgi tendons: monitor tension rather than length (perpendicular to intrafusal muscle fibers)
  - Provide inhibitory 1b afferent feedback
    - Hint: cue you to drop a heavy suitcase

Gamma loop: regulates sensitivity of reflex arc

CNS → the γ motor neuron→ contracts intrafusal fiber (central part of spindle), increasing the sensitivity
of the reflex arc



Cranial Nerves (FA p418 - FA p419)



#### Cranial Nerve Lesions (FA p418 – FA p419)

- 33. If the right vagus nerve or nuclei is damaged, then to which side will the uvula deviate?

  Since the muscles of the <u>left</u> soft palate are working to <u>raise</u> the palate and the muscles on the <u>right</u> are <u>not</u>, the uvula will deviate to the left (opposite the side of the lesion).
- If the portion of the right motor cortex (or right corticobulbar tract) that innervates the soft palate is damaged, to which side will the uvula deviate?

Since the soft palate fibers from the right motor cortex (or right corticobulbar tract) travel to the left nucleus ambiguus, the uvula will deviate to the right (toward the side of the lesion).

A pt comes to your office and before you notice any other symptoms, you see that the pt's uvula deviates to the left when she says "Ah." What neurological areas might be damaged in order for this abnormality to be seen?

(Work backward to figure these problems out) left deviation of uvula means that the muscles of the left palate are raising the palate and the muscles of the right palate are not. What innervates the right soft palate?

- Right vagal nerve (CN X)
- Right nucleus ambiguus
- Left corticobulbar tract
- Soft palate portion of left motor cortex
- 34. If the right hypoglossal nerve or nuclei is damaged, then to which side will the tongue deviate when sticking-

Since the tongue is "pushed" out, the muscles on the functional side (in this case the left side) will "push" the tongue to the nonfunctional side (in this case the right side) (toward the side of the lesion).

• If the portion of the right motor cortex (or right corticobulbar tract) that innervates the tongue is damaged, to which side will the tongue deviate?

Since tongue fibers from the right motor cortex travel to the left hypoglossal nucleus, the tongue will deviate to the left (away from the side of the lesion).

A pt comes to your office and before you notice any other symptoms, you see that the pt's tongue deviates to
the left when he sticks out his tongue. What neurological areas might be damaged in order for this
abnormality to be seen?

(Work backward to figure these problems out) left deviation of the tongue means that the muscles of the right tongue are pushing the tongue out unopposed by the muscles of the left tongue. What innervates the left tongue?

- Left hypoglossal nerve (CN XII)
- Left hypoglossal nucleus (anterior spinal artery ← vertebral artery)
- Right corticobulbar tract
- Tongue portion of the right motor cortex
- 35. How do the symptoms of a lesion to the cortical motor region of the face differ from a lesion of the facial nerve or nucleus? (FA p401)

Lesion in cortical motor face region-

Paralysis of contralateral side of lower face

Lesion of facial nerve or nucleus-

Paralysis of ipsalateral side of entire face

Explain the above answer.

The facial motor nucleus receives motor fibers for the lower face from the opposite motor cortex and motor fibers for the upper face from both motor cortices. Therefore, if a lesion occurs in the facial region of the left motor cortex, there is still sufficient innervation for the right upper face from the right motor cortex. However, since the left motor cortex is the only cortex to innervate the right lower face, there will be paralysis in the right lower face.

- 36. What name is given to a collection of symptoms indicative of a lesion of the facial nerve or nucleus? Bell's palsy
- What diseases might have Bell's palsy as a complication? (FA p402)
  - <u>L</u>yme Disease
- Herpes zoster
- AIDS

- Sarcoidosis
- <u>Tumors</u>
- <u>D</u>iabetes

(hint: My Lovely Beila Had An STD)

- How can a stroke of the facial motor cortex be distinguished from Bell's palsy?
   A stroke to the facial motor cortex will spare the upper face because the facial nuclei are each innervated from both motor cortices. A pt with Bell's palsy will not be able to wrinkle the forehead on one side.
- What should you immediately think about in a pt with "bilateral Bell's palsy"?
   Guillain-Barré Syndrome

#### Cranial Nerve Quiz (FA p415 – FA p419)

- 37. Which cranial nerves have their nuclei located in the medulla? (FA p416)
- 38. Which cranial nerves have their nuclei in the pons? (FA p416)
- 39. Which cranial nerves have their nuclei in the midbrain? (FA p416)
- 40. Which cranial nerve is responsible for the following actions? (FA p416)
  - Eyelid opening
  - Taste from anterior 2/3 of tongue
  - Head turning
  - Tongue movement
  - · Muscles of mastication
  - Ralance
  - · Monitoring carotid body and sinus chemo- and baroreceptors
- 41. What information is communicated at the nucleus solitarius? Nucleus ambiguus? Dorsal motor nucleus?
- 42. HYQ: A woman involved in an accident cannot turn head to the left and has a right shoulder droop → What structure is damaged? →
- 43. HYQ: A 19 year-old pt presents with a furuncle on his philtrum, and the cavernous sinus becomes infected. → What neurological deficits might you see in this pt? →
- 44. HYQ: A patient has leftward deviation of the tongue on protrusion and has a right sided spastic paralysis. → Where is the lesion? →
- 45. HYQ: A patient cannot blink his right eye or seal his lips. → What is the diagnosis and which nerve is affected? →
- 46. What are the muscles of mastication? (FA p419)

 $\frac{1}{2}$ 

)

)

)

)

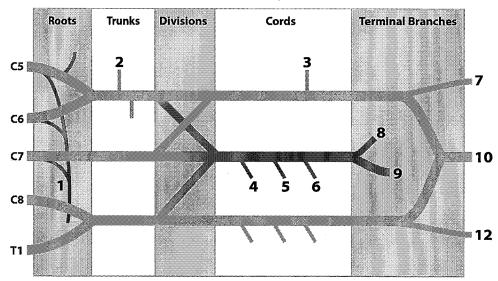
)

)

)

#### Peripheral Nerves (FA p372 - FA p376)

47. Label the following diagram of the brachial plexus:



#### Brachial Plexus and Upper Extremity Nerves (FA p372 – FA p376)

- 48. What nerve is damaged when a patient presents with the following symptom (upper extremity)?
  - Claw hand
  - Ape hand
  - Wrist drop
  - Scapular winging
  - Unable to wipe bottom
  - Loss of forearm pronation
  - Cannot ab- or adduct fingers
  - · Loss of arm abduction
  - Weak lateral rotation of arm
  - Loss of arm and forearm flexion
  - · Loss of forearm extension
  - Trouble initiating arm abduction
  - Unable to abduct arm beyond 10 degrees
  - Unable to raise arm above horizontal

#### 49. What nerves run with the following arteries?

- Dorsal scapular artery
- Lateral thoracic artery
- Posterior circumflex artery
- · Suprascapular artery
- Thoracodorsal artery
- Deep brachial artery
- Ulnar artery
- Brachial artery
- Anterior interosseous artery
- Posterior interosseous artery

#### 50. What nerve is most at risk of injury with the following types of fractures/injury?

- Shaft of the humerus
- Surgical neck of the humerus
- Supracondyle of the humerus
- Medial epicondyle
- Anterior shoulder dislocation
- Injury to the carpal tunnel

#### LE Nerves (FA p376)

Femoral nerve
Psoas and iliacus
Pectineus
Sartorius

Rectus femoris

Vastus - lateralis

- intermedius
- medialis

#### Obturator nerve

Adductor - magnus

- longus
- brevis

Gracilis (Pectineus)

Deep peroneal nerve

Peroneus tertius

Tibialis anterior

Extensor hallicus longus Extensor digitorum longus

Superficial peroneal nerve

Peroneus longus Peroneus brevis Superior gluteal nerve

Tensor fasciae latae Gluteus medius Gluteus minimus

Inferior gluteal nerve

Gluteus maximus

Sciatic nerve (tibial branch)

Biceps femoris Semitendinosus Semimembranosus Adductor magnus

Sacral plexus

Gemillus superior and inferior

**Piriformis** 

Quadratus femoris

Tibial nerve

Gastrocnemius

Soleus Plantaris Popliteus

Flexor hallicus longus Flexor digitorum longus

Tibialis posterior

#### Peripheral Nerves Quiz (FA p372 – FA p376)

- 51. HYQ: A patient falls off a motorcycle and lands on his right shoulder. → On physical exam you notice his shoulder has an abnormal configuration. → X-rays indicate an anterior dislocation of his shoulder. → What artery and nerve is most at risk of being damaged? →
- 52. HYQ: A patient fractures her humerus mid-shaft. → What nerve and artery are most likely damaged? What muscular actions are affected? →
- 53. HYQ: A patient presents with decreased pain and temperature sensation over the lateral aspects of both arms. → Where is the lesion? →
- 54. HYQ: Exam of a patient reveals decreased prick sensation on the lateral aspect of her foot and leg. → What muscular defect would you also expect to be present? →
- 55. HYQ: A patient falls while rollerblading and hurts his elbow. He can't feel the median part of his palm. → Which nerve has been damaged, and how was it damaged? →
- 56. HYQ: An elderly woman complains of pain, numbness, and a tingling sensation over the lateral digits of her right hand. Exam reveals wasting of the thenar eminence. → What is the diagnosis and what nerve is the source of her symptoms? →
- 57. HYQ: A 20 year-old dancer reports decreased plantar flexion and decreased sensation over the back of her thigh, calf, and lateral half of her foot. → What spinal nerve is involved? →
- 58. HYQ: A patient fractures her fibula neck. → What nerve is most at risk of being damaged? →

)

)

)

)

)

)

)

) )

)

) )

) )

#### Eyes & Ears (FA p420 - FA p424)

**Weber Test** 

Normal → Midline

Conductive hearing loss → lateralizes to the side of the affected ear

Sensorineural hearing loss → lateralizes to the side opposite the affected ear

#### Rinne Test

Normal → Air conduction > Bone conduction (AC>BC)

Conductive hearing loss → BC > AC

	Weber	Rinne (left)	Rinne (right)	Diagnosis	
Patient A	Midline	AC>BC	AC>BC		
Patient B	Right	AC>BC	BC>AC		***
Patient C	Left	AC>BC	AC>BC		
Patient D	Midline	BC>AC	BC>AC		

## Pupillary Light Reflex (FA p422)

59. Outline the pupillary light reflex pathway.

Cells of retina → optic tract → optic tract/nerve → pretectal nucleus → bilateral Edinger-Westphal nuclei → preganglionic parasympathetic fibers in oculomotor nerve → ciliary ganglion → postganglionic parasympathetic fibers → pupillary sphincter of iris → pupillary constriction (miosis)

- 60. Describe what light reflexes will be seen in both eyes if the right optic nerve is damaged prior to the pretectal nucleus (AKA afferent defect).
  - No constriction of either the left or right eye when light is shined in the right eye
  - Both pupils constrict if the light is shined in the left eye
- Describe what light reflexes will be seen in both eyes if the right oculomotor nerve is damaged (AKA efferent defect).
  - Right eye will not respond to light shone in either the right or left eye
  - Left eye will constrict when a light is shined in either eye
- 61. HYQ: MS and internuclear ophthalmoplegia (FA p424). What eye abnormality is seen? →
- 62. HYQ: A patient cannot adduct her left eye on lateral gaze but convergence is normal → What structure is damaged? →
- 63. HYQ: Light stimulus in patient's right eye produces bilateral pupillary constriction. When the light is shown in the left eye, there is a paradoxical bilateral pupillary dilatation. → What is the defect? →

#### **Neuro Pathology**

#### Dementia (FA p425) and Dementia Treatment (FA p436)

64. What are the usual components of a "dementia work-up"?

## Neurodegenerative Diseases (FA p401, FA p411, FA p425)

- 65. Which neurodegenerative disease matches the following statement?
  - Lou Gehrig's disease
  - Senile plaques, neurofibrillary tangles
  - Presents at birth as "floppy baby"
  - Lewy bodies
  - Dementia often a/w frequent falls and/or syncope
  - Atrophy of caudate nucleus → chorea
  - Depigmentation of substantia nigra
  - Both upper and lower motor neuron signs (spasticity and weakness)
  - Dementia + visual hallucinations
  - Dementia + personality changes and/or aphasia
- 66. Identify the neuronal pigment / inclusion that matches the following statement:
  - Intranuclear inclusions seen in herpes simplex encephalitis
  - Cytoplasmic inclusions pathognomonic of rabies
  - Neuronal inclusions characteristic of Parkinson's disease
  - Cytoplasmic inclusion bodies associated with aging
  - Dark cytoplasmic pigment in neurons of the substantia nigra and locus coeruleus, not seen in pts with Parkinson's
  - Eosinophilic, rodlike inclusions in hippocampus of Alzheimer's pts
  - Diagnostic of Alzheimer's disease
  - Filamentous inclusions that stain with silver, do not survive neuronal death
  - Filamentous inclusions that stain with PAS and ubiquitin
- 67. What diseases are associated with Lewy bodies?

#### Anti-Seizure Meds (FA p431)

- 68. Drug of choice for partial (simple and complex) and tonic-clonic seizures
- 4 other drugs useful in partial and tonic-clonic seizures
- 69. Drug of choice for absence seizures?
- 70. Used to treat status epilepticus and eclampsia
- 71. Common side-effects of epilepsy drugs
- 72. Additional SE of phenytoin
- 73. Which antiepileptics are teratogens?
- 74. What drugs cause Stevens-Johnson syndrome?
- 75. What drugs are known to cause agranulocytosis?
- Hepatotoxic antiepileptics
- 77. What drugs induce the P450 system?

)

)

)

)

)

)

)

)

- 78. Which antiepileptics block Na+ channels?
- 79. Which antiepileptics work by potentiating the effects of GABA inhibition?

#### Trigeminal Neuralgia

- AKA Tic Douloureux
- "Lightening-like" pain, "Electric shocks," along a division of the trigeminal (usually maxillary) triggered by light touch (wind, bed sheets.)
- Rx: carbamazepine or other anticonvulsant (phenytoin, gabapentin, topiramate)

#### Headaches (FA p427)

- 80. What is the typical presentation of a tension headache?
  - Constant, chronic pain (lasts hours/days/weeks/months)
  - Occurring in the frontal or occipital regions (most often bilateral) or as a band around the head
  - No associated symptoms such as light/loud noise sensitivity, visual changes, nausea/vomiting, or focal neurological changes
- 81. What are the main diagnostic criteria for migraine without aura?
  - At least 5 attacks
  - Headache lasting 4 -72hrs (2-48hrs in children)
  - At least 2 of the following:
    - Unilateral location
    - Pulsating quality
    - Moderate to severe intensity (inhibits or prohibits daily activities)
    - Aggravated by climbing stairs or similar activity
  - At least 1 of the following: nausea and/or vomiting; photophobia and/or phonophobia
- 82. What are the typical symptoms of a cluster headache?
  - Strictly unilateral
  - Severe aching/boring pain in the retro-orbital/periorbital region
  - (Doesn't throb like a migraine) (no aura)
  - Duration of 30 min 3 hours, occurs daily (often at the same time), and continues for an interval of 4 8
    weeks
  - May be a/w partial Horner's syndrome (ptosis and miosis), ipsilateral nasal congestion or eye redness, rhinorrhea, or tearing

#### Brain Tumors (FA p428)

- 83. What are the 3 most common primary brain tumors in adults? What are the 3 most common in children?
- 84. Which primary brain tumor fits the following description?
  - Pseudopalisading necrosis
  - Polycythemia
  - Neurofibromatosis II
  - A/w von Hipple-Lindau syndrome
  - Foamy cells, high vascularity
  - Prolactinemia → galactorrhea, amenorrhea, anovulation
  - Psammoma bodies
  - Fried-egg appearance
  - Perivascular pseudorosettes
  - Bitemporal hemianopia
  - worst prognosis of any primary brain tumor
  - child with hydrocephalus
  - Homer-Wright pseudorosettes

#### Neuro Path Quiz (FA p425 – FA p429)

- 1. Which primary brain tumor fits the following description? (FA p428)
  - Polycythemia
  - Neurofibromatosis II
  - Prolactinemia → galactorrhea, amenorrhea, anovulation
  - Psammoma bodies
  - Perivascular pseudorosettes
  - · Loss of peripheral vision
  - Worst prognosis of any primary brain tumor
- 2. In regards to seizures, what do the terms partial, simple, complex, and generalized mean? (FA p426)
- 3. What are the most common causes of seizures in children? (FA p426)
- 4. What is the classic triad of symptoms in multiple sclerosis? (FA p425)
- What features allow you to distinguish a migraine headache from a cluster headache or a tension headache?
   (FA p427)
- 6. What allele is a/w with Alzheimer's disease? Why is Alzheimer's so common in pts with Down syndrome? (FA p425)
- 7. HYQ: A woman presents with headache, visual disturbance, and amenorrhea. → What is the diagnosis? →
- 8. HYQ: A 43 year-old man presents with symptoms of dizziness and tinnitus. CT shows enlarged internal acoustic meatus. → What is the diagnosis? →
- 9. HYQ: A child exhibits proximal muscle weakness and enlarged calves. → What is the disease and how is it inherited? →
- 10. HYQ: A 25 year-old female presents with sudden uniocular vision loss and slightly slurred speech. She has a history of weakness and paresthesia that have resolved. → What is the diagnosis? →
- 11. HYQ: A 10 year-old child "spaces-out" in class (stops talking midsentence and then continues as if nothing had happened). During the spells, there is slight quivering of lips. → What is the diagnosis? →
- 12. HYQ: A patient presents with vertigo + tinnitus + hearing loss → What is the diagnosis? →

)

)

)

))))

)

)

)

)

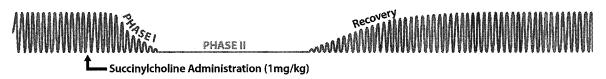
)

)

1

NODBUG	DEPOLARIZ	NONDEROLARIZING BLOCK		
NOBROG	PHASE I	PHASE II	NONDEPOLARIZING BLOCK	
Train-of-four	Constant but diminished	Fade	Fade	
Time				
Tetanus	Constant but diminished	Fade	Fade	
Time			A STATE OF THE STA	
Posttetanic potentiation	Absent	Present philde	Present physical present physical physical present physical physic	
Time				

	SUCCINYLCHOLINE		
	PHASEI	PHASEII	TUBOCURARINE
Succinylcholine Administration	Additive	Augmented	Antagonistic
Tubocurarine   Administration	Antagonistic	Augmented	Additive
Effect of neostigmine	Augmented	Antagonistic	Antagonistic
Posttetanic facilitation	No	Yes	Yes
Rate of recovery	4-8 min	; > 20 min <sup>3</sup>	/ 30-60 min <sup>3</sup>
Response to a tetanic stimulus	Sustained <sup>3</sup>	Unsustained	Unsustained
Initial excitatory effect on skeletal muscle	Fasciculations	None None	None



N 1	<b>D</b> I	•
Neuro	Pharm	(JIII7

- What are the endogenous agonists to the different opioid receptors? (FA p430)
- 2. Which medication fits the following description (FA p430)?
  - Opioid cough suppressant commonly used with the expectorant quaifenesin
  - Opioid used in the treatment of diarrhea
  - · Opioid commonly used in the treatment of acute heart failure
  - · Opioid receptor antagonist
  - Non-addictive weak opioid agonist
  - Partial opioid agonist that causes less respiratory depression
- 3. What 5 drug classes are used in the treatment of glaucoma? (FA p430)
- 4. What drugs are known for causing Steven's Johnson syndrome? (FA p245)
- 5. How is barbiturate overdose managed? How is benzo overdose managed? (FA p432 FA p433)
- 6. Which anesthetic fits the following description? (FA p433 FA p435)
  - IV, a/w hallucinations and bad dreams
  - Inhaled, SE nephrotoxic
  - IV, most common drug used for endoscopy
  - Inhaled, SE convulsions/seizures
  - Inhaled, SE hepatoxic
  - IV, used for rapid anesthesia induction & short procedures
  - Inhaled, used for rapid anesthesia
  - IV, decreases cerebral blood flow (important in brain surgery)
  - IV, does not induce histamine release like morphine
  - High triglyceride content increases risk of pancreatitis with long-term use
- 7. What agents are used in the treatment of Parkinson's disease? (FA p435-436)
- 8. What side effects are common to most all of the anti-epileptics? (FA p432) What are the toxic side effects of Phenytoin? (FA p432)
- 9. What is the mechanism of action of dantrolene? (FA p435)
- 10. What is the mechanism of action of local anesthetics? Which nerve fibers are blocked first with local anesthesia? (FA p434)
- 11. What drugs can be used to reverse neuromuscular blockade? (FA p435)
- 12. What is the mechanism of action of the drugs used in the treatment of Alzheimer's disease? (FA p436)
- 13. What is the mechanism of action of sumatriptan? For what populations is this drug contraindicated? (FA p436)

)

)

)

)

)

)

)

)

)

)

) ) )

)

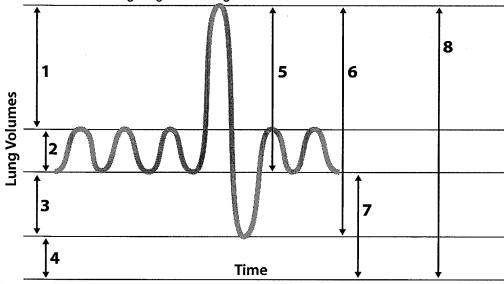
)

## Respiratory Anatomy (FA p502 – FA p504)

- 1. HYQ: What histological change takes place in the trachea of a smoker? →
- 2. HYQ: A patient in the ER is having anaphylaxis. → You make an incision beneath thyroid cartilage to establish airway → What structure was cut? →
- 3. What structures traverse the diaphragm and at what vertebral level do they pass through?
- 4. What cell type proliferates during lung damage?
- 5. What amniotic fluid measurement is indicative of fetal lung maturity?
- 6. HYQ: A young woman has infertility, recurrent URIs, and dextrocardia. → Which of her proteins is defective?

## Respiratory Physiology (FA p504 – FA p509)

7. Label the following diagram of lung volumes.



- 8. HYQ: The following lung volumes are obtained from an elderly smoker: FRC 5.0L, IRV 1.5L, IC 2.0L, VC 3.5L. → What is his total lung capacity? →
- 9. What substances are known for causing methemoglobinemia?
- 10. HYQ: A 42 year-old woman with fibroids is chronically tired. → What is the most likely diagnosis, and what changes have occurred in the oxygen content and saturation? →
- 11. HYQ: Patient is shown to have hypoxia and CXR reveals an enlarged heart. → What is the most likely cause of hypoxia? →
- 12. Primary Pulmonary Hypertension (FA p507)
  - AKA Idiopathic Pulmonary Arterial Hypertension
  - Associated with abnormalities in BMPR2: Bone Morphogenetic Protein Receptor type II
  - Associated with HIV and Kaposi's sarcoma (HHV-8)
  - More common in women, average age is 36

## Respiratory Pathology (FA p510 – FA p516)

- 13. Virchow's triad (FA p510)
  - Stasis: post-op, long trips, cast, pregnancy
  - Hypercoagulability: sickle cell, polycythemia, CHF, estrogen excess, smoking
  - Endothelial damage: fracture, post-op, postpartum

## 14. <u>DVT</u> (FA p510)

- Sx: swollen foot/ankle (ipsilateral), +/- pain, +/- Homan's sign (pain with ankle dorsiflexion), +/- palpable cord
- Prevent: sq heparin bid-tid, SCDs/compression stockings, long-term warfarin
- Rx: heparin until warfarin therapeutic

#### 15. Pulmonary Embolism (PE)

- Sx: pleuritic CP, SOB, cough, hemoptysis (rare), fever, tachypnea, tachycardia, AMS/confusion
- Studies: elevated d-dimer, +/- DVT on LE US, usually nI CXR, large Aa gradient on ABG, +/- EKG changes (S1Q3T3 wide S in lead I, large Q and inverted T in lead III), CT scan, V/Q scan, gold standard- pulm angiogram
- "Saddle embolus" = death
- Rx: if massive PE then consider thrombolysis, but usually just heparin/warfarin
- 16. HYQ: A patient suffers a stroke after incurring multiple long bone fractures in a skiing accident. → What caused the infarct? →
- 17. HYQ: A patient with a recent tibia fracture and no history of COPD or asthma is shown to have hypoxia. CXR is normal. → What is the cause of the hypoxia, and what disease process does it mimic? →

18. What is the differential diagnosis for eosinophilia?

D	
N	
Α	
Α	
Α	,
С	
Р	

- 19. HYQ: A patient presents with asthma attack. → What immunological reaction is taking place that is responsible for anaphylaxis in this pt →
- 20. What asthma medication fits the following statement (FA p515)
  - Inhaled treatment of choice for chronic asthma
  - Inhaled treatment of choice for acute exacerbations
  - Narrow therapeutic index, drug of last resort
  - Blocks conversion of arachidonic acid to leukotriene
  - Inhibits mast cell release of mediators, used for prophylaxis only
  - Inhaled treatment that blocks muscarinic receptors
  - Inhaled long-acting beta-2 agonist
  - Blocks leukotriene receptors
- 21. HYQ: A patient has an extended expiratory phase. → What is the disease process? →

#### 22. Antihistamine

#### •

- Cyproheptadine
- Appetite stimulant
- Promethazine
- Nausea, vomiting
- Chlorpheniramine
- OTC allergy/cold
- Hydroxyzine
- Sedation, itching
- Meclizine
- Vertigo

)

)

)))

)

23. C	Coal Workers	Pneumoconiosis (	(CWP)	)
-------	--------------	------------------	-------	---

- Anthracosis (mild) black pigment in lung
- Simple CWP small fibrotic lung nodules
- Complicated CWP progressive massive fibrosis
- 24. HYQ: H&E of lung biopsy from a plumber shows elongated structures with clubbed ends in tissue. → What is the diagnosis and what is he at increased risk for? →

#### 25. ARDS (FA p511)

Shock, infection, toxic gas inhalation, aspiration, high [O2], pancreatitis, heroin OD

Inflammatory cells / mediators and oxygen free radicals

Damage to endothelial or alveolar epithelial (type I) cells

Diffuse Alveolar Damage (DAD) and Hyaline Membrane Disease (HMD)

- 26. HYQ: A preterm infant has difficulty breathing. An x-ray reveals diffuse ground glass appearance with air bronchograms. → What is the diagnosis, and what could have prevented this condition? →
- 27. HYQ: A patient develops ARDS from an occupational inhalation of nitrogen dioxide. → What histologic change is seen in a pt recovering from ARDS →

## Lung Physical Findings (FA p512)

- 28. HYQ: CXR shows pleural effusions. → What are the clinical findings? →
- 29. HYQ: A tall, thin male teenager has abrupt onset dyspnea and left-sided chest pain. Percussion on the affected side reveals hyperresonance, and breath sounds are diminished. → What is the diagnosis? →

## Lung Cancer (FA p513)

- 30. HYQ: CXR shows collapse of middle lobe of right lung and mass in right bronchus; pt has history of recurrent pneumonias. → What is the diagnosis? →
- 31. HYQ: A patient of yours develops bronchogenic lung cancer but has never smoked. He is a coal miner. → Exposure to what substance has put him at risk for developing lung cancer? →
- 32. What complications can arise from lung cancer?

#### Pneumonia (FA p514)

- 33. Which infectious agent fits the following description?
  - Common cause of pneumonia in immunocompromised pts
  - Most common cause of atypical / walking pneumonia
  - Common causative agent for pneumonia in alcoholics
  - Can cause an interstitial pneumonia in bird handlers
  - Often the cause of pneumonia in a pt with a history of exposure to bats and bat droppings
  - Often the cause of pneumonia in a pt who has recently visited South California, New Mexico, or West Texas
  - Pneumonia associated with "currant jelly" sputum
  - Q fever
  - Associated with pneumonia acquired from air conditioners
  - Most common cause of pneumonia in children 1 year-old or younger
  - Most common cause of pneumonia in the neonate (B-28d)
  - Most common cause of pneumonia in children and young adults (including college students, military recruits, and prison inmates)
  - Common cause of pneumonia in pts with other health problems
  - Most common cause of viral pneumonia
  - Causes a wool-sorter's disease (a life-threatening pneumonia)
  - Endogenous flora in 20% of adults
  - Common bacterial cause of COPD exacerbation
  - Common pneumonia in ventilator pts and those with cystic fibrosis
  - Pontiac fever
- 34. HYQ: Examination of a lung at autopsy reveals a peripheral lesion with caseous necrosis. → What is the diagnosis? →
- 35. HYQ: A 30 year-old comatose man on ventilatory support in the ICU develops an infection and dies. Autopsy reveals a pus-filled cavity in his right lung. → What is the likely etiology? →
- 36. HYQ: A 55 year-old man who is a smoker and heavy drinker presents with a new cough and flu-like symptoms. → Gram stain shows no organisms; silver stain of sputum shows gram-negative rods. → What is the diagnosis? →
- 37. Pleural Effusions Causes

Transudate Exudate

CHF Pneumonia, Infections, TB

Cirrhosis Cancer Nephrotic syndrome Uremia

PE Connective tissue disease

Fluid overload

)

)

)

)

)

)

)

)

)

)

)

## **End Session Quiz: Respiratory** 1. What pathology is associated with the following statement? (FA p531) Most common cause of SIADH Most common testicular tumor Most common tumor of infancy Translocation 9:22 and drug used to treat 2. What is the triad of Kartagener's syndrome? What is the underlying defect? 3. What are the 3 most common locations of lung cancer mets? 4. What is the V/Q at the apex of the lung? at the base of the lung? During airway obstruction? During blood flow obstruction? 5. How does the emphysema caused by smoking differ from the emphysema caused by alpha-1-antitrypsin deficiency? 6. What is the hallmark sign of COPD? What is the hallmark sign of a restrictive lung disease? 7. Which tumors arise centrally in the lung and are linked to smoking? Which tumors arise peripherally in the lung and are less linked to smoking (if at all)? 8. How does the body compensate for hypoxia at high altitude? 9. What infectious agent is the cause of pneumonia based on the following lab test? Gram (+) cocci in clusters Gram (+) cocci in pairs Gram (-) rods in 80 year-old Gram (+) cocci in neonate Gram (-) rods in neonate 10. What are common causes of ARDS?

11. A 75 year-old pt of yours that has a 60 pack/year history comes to your office complaining of difficulty

wash his hair. What do you immediately suspect is going on with this pt?

12. What is pulsus paradoxus, and what are the causes?

standing up from his bed when he wakes up in the morning, and difficulty raising his arms in the morning to

Pulmonary

	Anatomy and Physiology Quiz Ap308 – FAp321)
1.	What enzyme catalyzes the rate-limiting step in carbohydrate digestion? (FA p320)
2.	What enzyme is responsible for the conjugation of bilirubin? (FA p321)
3.	What important secretory products are secreted from the following cells of the GI tract? (FA p317)  • G cells  • I cells  • S cells  • D cells  • Parietal cells  • Chief cells
4.	<ul> <li>What GI ligament matches the following description? (FA p309)</li> <li>Contains the portal triad and may be compressed to control bleeding</li> <li>Attaches the spleen to the posterior abdominal wall</li> <li>Attaches the spleen to the stomach</li> </ul>
5.	What drugs and endogenous hormones regulate the secretion of gastric acid? (FA p318)
6.	Which hormones stimulate pancreatic secretion? (FA p317)
7.	What structures form Hesselbach's triangle? (FA p316)
8.	Which hereditary hyperbilirubinemia matches the following statement? (FA p333)  Mildly decreased UDPGT  Completely absent UDPGT  Grossly black liver  Responds to phenobarbital  Treatment includes plasmapheresis and phototherapy  Asymptomatic unless under physical stress (alcohol, infection)
9.	Which antacid matches the following statement? (FA p338)  May cause diarrhea  May cause constipation  May cause rebound hypercalcemia  May cause hypokalemia
10.	What enzyme is inhibited by PPIs? Name two different PPIs. (FA p337)
11.	What is the artery of the foregut? Of the midgut? Of the rectum and distal 1/3 colon? (FA p311)

#### GI Pathology

#### Salivary Gland Tumors (FA p321)

- 1. What is the most common location of salivary gland tumors?
- 2. What is the most common salivary gland tumor? What is the histological appearance of this tumor?
- 3. What is the second most common benign salivary gland tumor?
- 4. What is the most common malignant salivary gland tumor (the second most common tumor overall of the salivary gland)?
- 5. What is the likelihood that a salivary gland tumor will be malignant based on the gland it is located in?

#### Esophageal and Gastric Pathology

- 6. Esophageal diverticulum are named according to their location in the esophagus:
  - Zenker's diverticulum (FA p327)
- Immediately above the upper esophageal sphincter

Traction diverticulum

- Near the midpoint of the esophagus
- Epiphrenic diverticulum
- Immediately above the lower esophageal sphincter
- 7. HYQ: A patient taking NSAIDs for the management of her gout develops anemia, has pain with eating, and is positive on occult blood test. → What drug would most directly address the mechanism behind this pt's current problem? →
- 8. HYQ: A newborn is having trouble feeding. He vomits milk when fed and has a gastric air bubble on X-ray. → What kind of fistula is present? →
- 9. HYQ: A 60 year-old man with chronic reflux presents with esophageal cancer. → What is the most likely histologic subtype? →

)

)

)

)

)

)

)
)

10. What upper GI problem is associated with the following findings/symptoms?

Specialized columnar epithelium seen in a biopsy from distal esophagus	
Biopsy of a pt with esophagitis reveals large pink intranuclear inclusions and host cell chromatin that is pushed to the edge of the nucleus	
Stomach biopsy reveals neutrophils above the basement membrane, loss of surface epithelium, and fibrin-containing purulent exudate	
An esophageal biopsy reveals a lack of ganglion cells between the inner and outer muscular layers	
Biopsy of mass in parotid gland reveals a double layer of columnar epithelial cells resting on a dense lymphoid stroma	
Small intestine biopsy reveals small lymphocytes with irregular nuclear contours and proliferation of these lymphocytes into the mucosa and epithelial glands	
Outpouching of all layers of the esophagus found just above the LES	
Basal cell hyperplasia, eosinophilia, and elongation of lamina propria papilla seen in biopsy of esophagus	:
Goblet cells seen in the distal esophagus	
Stomach biopsy reveals lymphoid aggregates in the lamina propria, columnar absorptive cells, and atrophy of glandular structures	
Protrusion of the mucosa in the upper esophagus	
Biopsy of a pt with esophagitis reveals enlarged cells, intranuclear and cytoplasmic inclusions, and a clear perinuclear halo	
Diffuse thickening of gastric folds, elevated serum gastrin levels, biopsy reveals glandular hyperplasia without foveolar hyperplasia	
Biopsy of mass in parotid gland shows both epithelial and mesenchymal differentiation	
Biopsy of mass from parotid gland reveals a carcinoma composed of mostly mucus-secreting cells but also some squamous cells, and intermediate hybrids of both	
A PAS stain on a biopsy obtained from a pt with esophagitis reveals hyphenated organisms	
Most common cause of duodenal ulcers	
Esophageal pouch found in the upper esophagus	

#### Small Bowel Pathology

- 11. Irritable Bowel Syndrome (IBS): ROME II Diagnostic Guidelines
  - At least 12wks of abdominal discomfort or pain in the preceding yr a/w one of the following:
    - Relief with defecation
    - Change in frequency of stool
    - Change in form of stool
  - Characteristic of IBS: change in stool form or frequency (>3 daily or <3 wkly), straining, urgency, or feeling of incomplete passage, bloating/distention, mucus
  - Not characteristic of IBS: anorexia, weight loss, malnutrition, progressively worsening pain, pain that prevents sleep

#### Diarrhea Predominant

- Lab work-up: serum tissue transglutaminase antibody to r/o celiac sprue
   +/- CBC, Chem 7, TSH, ESR, stool leukocyte
- Tricyclic antidepressants (desipramine) or SSRIs (if TCA's not well tolerated)
- If woman with severe disease, alosetron (Lotronex)
- Loperamide (Imodium) prn

### **Constipation Predominant**

- Fiber bulking agents
- Zelnorm (tegaserod)
  - Due to increased risk of MI, use is limited to those in critical need of the drug who have no preexisting heart conditions. Informed consent must be signed prior to use.
  - Dose only for flares up to 8 weeks at a time.
  - If no success after 1 month, then D/C.
- 12. What are the common causes of small bowel obstruction (SBO)?
  - A Adhesions from previous surgeries (about 75% of cases)
  - B Bulge / Hernia (second most common cause)
  - <u>C Cancer / Tumors</u> (most commonly metastatic colorectal cancer)
  - Other less common causes: volvulus, intussusception (FA p328), Crohn's disease, gallstone ileus, bezoar, bowel wall hematoma from trauma, inflammatory stricture, congenital malformation, radiation enteritis
- 13. HYQ: After the loss of his job, a 35 year-old man has diarrhea and hematochezia. → Intestinal biopsy shows transmural inflammation. → What is the diagnosis? →
- 14. HYQ: A weight lifter undergoes emergency surgery for a life threatening condition. → Examination of a section of his small bowel reveals focal hemorrhages. → What is the process responsible for this? →
- 15. Prokinetic Agents (FA p338 FA p339)

↑ACh, ↑5-HT (carcinoid syn), ↓D2

- Cholinergic agonists (bethanacol)
- Acetylcholine-esterase inhibitors (neostigmine)
- Metoclopramide (Reglan) (+5-HT4, -D2)
- Domperidone (-D2)
- Cisapride (+5-HT4)
- Macrolides stimulate smooth muscle motilin receptors

#### Colon Pathology

- 16. HYQ: A 40 year-old woman presents with having to defecate 4 times a day for several months along with a constant low-grade abdominal pain that is somewhat relieved by defecation. Colonoscopy is normal. → What is the most likely diagnosis? →
- 17. HYQ: 50 year-old man complains of diarrhea. On exam, his face is plethoric and a heart murmur is detected.

  → What is diagnosis? →

)

)

)

)

)

)

)

)

)

)

)

)

Hepatic Pathology	
18. Serum Albumin: Ascites Gradient (SAA)	
SAAG = [albumin]serum - [albumin]asc	ites
SAAG > 1.1 in portal hypertension	-durant TD - commence (Co. L. Warner Proposed Co. Co. Co. Co. Co. Co. Co. Co. Co. Co.
<ul> <li>SAAG &lt; 1.1 in cancer, nephrotic syr</li> </ul>	ndrome, TB, pancreatitis, biliary disease, connective tissue disease
19. Hepatic Adenoma	
Most often in females 20-44 (OCP y     Diek Factors OCP year analysis at	
	eroids, (glycogen storage disease types I and III) no symptoms because it is often an incidental finding on imaging
Malignant transformation in 10% of	
Rx: DC the OCP, serial imaging and	
Hepatic Angiosarcoma - Malignant end Risk Factors: vinyl chloride, arsenic	othelial neoplasm in liver
·	
ANA (+) Anti smooth muscle antibody (	+), Anti-liver-kidney microsomal antibody (+)
Anti-mitochondrial antibody (-)	+), Anti-liver-kidney microsomai antibody (+)
, and mitodiffication and antibody ( )	
<ol> <li>HYQ: A young man presents with ataxia periphery of his cornea. → What treatment</li> </ol>	a and tremors. He has brown pigmentation in a ring around the ent should he receive? →
	your clinic because her family is concerned about her yellowing skin. ding the palms and soles but no scleral icterus. What question could dentify the cause of yellowing? →
22. HYQ: A 20 year-old man contracts influent the most likely cause? →	enza then presents with an idiopathic hyperbilirubinemia. → What is
Gallbladder Pathology	
23. Gallbladder Pathology Terminology:	
Cholelithiasis	- Gallstones (hint: lith = stone)
<ul> <li>Cholecystitis</li> </ul>	- Inflammation/infection of the gall bladder (-itis = inflammation)
<ul> <li>Cholangitis</li> </ul>	<ul> <li>Inflammation/infection of the biliary tree</li> </ul>
Choledocholithiasis	- Gallstones in the bile ducts
24. What is the overall differential diagnosis	for hyperbilirubinemia?
Unconjugated Hyperbilirubinemias	Conjugated Hyperbilirubinemias
↑ bilirubin production	Impaired transport
•	•
•	•
•	Biliary epithelial damage
Impaired bilirubin uptake and storage	•
•	•
↓ UDP-GT activity	Intrahepatic biliary obstruction
w U L GULLTILT	IIII GII ODGGO DIIIGI V ODGG GOGO!

Extrahepatic biliary obstruction

- 25. HYQ: What is the fate of bilirubin after it is conjugated and secreted into the GI tract? →
- 26. HYQ: A patient presents complaining of pain in the right upper quadrant that he can point to with one finger, the area is tender to light touch, and pain is worsened when the pt is asked to raise his arms above his head. → What is most likely this pt's problem? →

## What problem is most closely associated with the following statement?

Most common cause of acute RLQ pain	
50 year-old female presents with pruritis without jaundice, lab reveals (+) AMA	
Most common cause of acute LLQ pain	
Gluten sensitivity	
A patient with GI bleeding has buccal pigmentation	
60 year-old female with rheumatoid arthritis and no alcohol history presents	
with fatigue and right abdominal pain, lab studies reveal high levels of ANA and	
ASMA, elevated serum IgG levels, and no viral serologic markers  Colonoscopy reveals very friable mucosa extending from the rectum to the	
distal transverse colon	
A small intestinal mucosa laden with distended macrophages in the lamina	
propria (that are filled with PAS(+) granules and rod-shaped bacilli seen by electron microscopy)	
Most common cause of RUQ pain	
Liver biopsy on a 23 year-old female with elevated levels of LKM-1 antibodies,	
no alcohol history, and no viral serologic markers reveals infiltration of the portal and periportal area with lymphocytes	
Diarrhea, fever, and abdominal cramps following a course of antibiotics	
Fatal disease of unconjugated bilirubin resulting from a complete lack of	
UDPGT activity	
Radiography reveals a "string-sign" in the terminal ileum	
Total or subtotal atrophy of the small bowel villi, plasma cells and lymphocyte	
infiltration into the lamina propria and epithelium, and hyperplasia/elongation of crypts	
Nonfatal disease of unconjugated bilirubin resulting from low levels of UDPGT	
activity	
Elevated levels of serum ferritin and increased transferrin saturation	
Alpha-fetoprotein levels >1000 pg/mL	
Elevated serum copper, decreased serum ceruloplasmin, and elevated 24-hr	
urinary copper	
Liver disease + lung emphysema	
ERCP reveals alternating strictures and dilation	

1. What are some of the risk factors for esophageal cancer? (FA p323)	
2. What are the risk factors for colon cancer? (FA p329)	
3. What are the signs of portal hypertension? (FA p330)	
4. What is seen in Budd-Chiari syndrome? What conditions are a/w Budd-Chiari syndrome? (FA p332)	
<ol> <li>What is the underlying problem in Wilson's disease? What are the characteristics of Wilson's disease? is the treatment for Wilson's disease? (FA p333)</li> </ol>	What
6. What is the classic triad of symptoms in hemochromatosis? What lab tests are used to diagnose hemochromatosis? What is the treatment for hemochromatosis? (FA p334)	
7. What are the possible etiologies of acute pancreatitis? (FA p335)	
8. What is the typical presentation of a pt with pancreatic insufficiency? What is the treatment for pancreat insufficiency? (FA p323)	C
9. What are the risk factors for the development of hepatocellular carcinoma? (FA p331)	
10. What is the difference between primary biliary cirrhosis and primary sclerosing cholangitis? (FA p334)	
11. What is the most common salivary gland tumor? What is the second most common salivary gland tumor What is the most common location for a salivary gland tumor? (FA p321)	?
12. What are the five 2's of Meckel's diverticulum? (FA p327)	
13. What are the tumor markers for pancreatic cancer? (FA p336)	
14. What is the typical histological neoplastic progression of colon cancer? (FA p329)	

		)
		)
		)
		· )
		) 
		)
		· · · · · · · · · · · · · · · · · · ·
		)
		)
		)
		)
		)
		)
		<u>)</u>
		)
		) (
		. <i>)</i>
		)
		)
		) ( )
		)
		) )

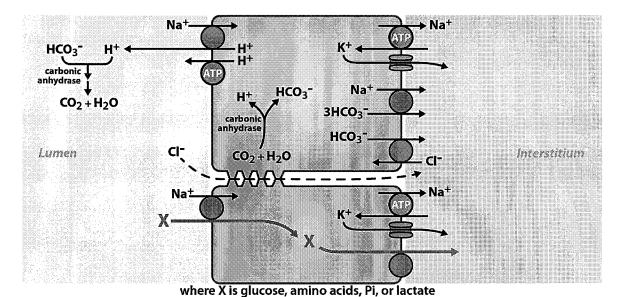
## Renal Anatomy & Physiology (FA p458 – FA p466)

1. How will the following changes affect RBF, GFR, and filtration fraction? (FA p458)

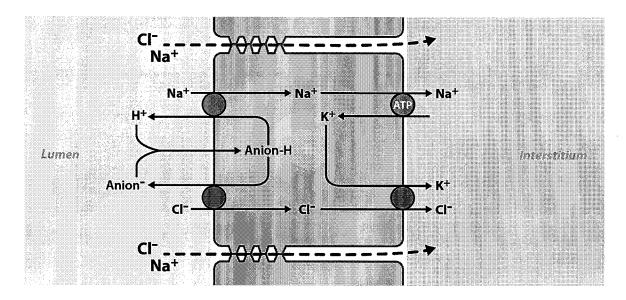
	<u>GFR</u>	RBF	FF (GFR/RBF)
Constriction of the afferent arteriole			
Constriction of the efferent arteriole			
Dilation of the afferent arteriole			
Dilation of the efferent arteriole			
Increase in serum protein			
Ureter stone obstruction		I	
ACE inhibitors			
Indomethacin, Naprosyn, ibuprofen			

- 2. Plasma osmolality = 2[Na<sup>+</sup>]<sub>plasma</sub> + [glucose]/18 + [BUN]/2.8
- 3. What segment of the renal tubule matches the following statements? (FA p461)
  - Reabsorbs 67% of the fluid and electrolytes filtered by the glomerulus
  - · Segment responsible for concentrating urine
  - · Site of secretion of organic anions and cations
  - Always impermeable to water
  - · Permeable to water only in the presence of ADH
  - Site of the Na/2Cl/K co-transporter
  - Site of isotonic fluid reabsorption
  - · Site responsible for diluting urine
  - · Only site where glucose and amino acids are reabsorbed
  - Water reabsorption in the Loop of Henle

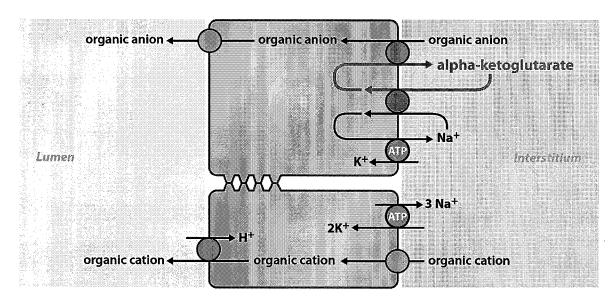
#### 4. Proximal Tubule (first half)



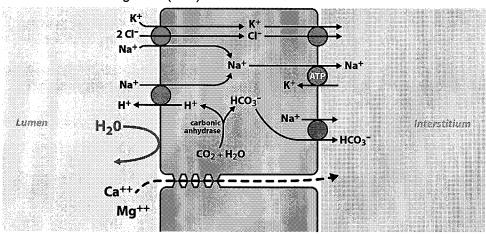
## 5. Proximal Tubule (second half)



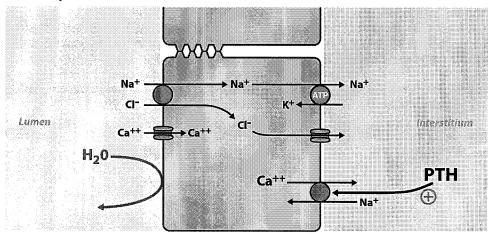
## 6. Proximal Tubule (anions and cations)



7. Thick Ascending Limb (TAL)



- 8. What class of drugs inhibits the Na/2Cl/K symporter in the thick ascending limb? (FA p473)
- 9. Early Distal Tubule



- 10. What determines how much water is reabsorbed in the distal tubules and the collecting ducts?
- 11. What two types of cells compose the collecting duct and the last segment of the distal tubule? What do they do?
  - Principle cells -
  - · Intercalated cells -
- What are the two types of intercalated cells?
  - •
- 12. What class of diuretic directly affects principle cells?
- 13. What affect does aldosterone have on the intercalated cells and principle cells of the collecting duct?
  - Intercalated cells-
  - Principle cells-
- What drug antagonizes aldosterone's action on the principle cells of the collecting duct thereby promoting Na+ excretion and inhibiting K+ excretion?

- 14. What are the critical steps involved in excreting dilute urine?
  - Dilution of fluid in the thick ascending segment (to 100 mOsm/kg H<sub>2</sub>O) as solute is reabsorbed and water remains in lumen (due to the impermeability of water in the thick ascending limb)
  - The absence of ADH renders the distal tubule and cortical collecting duct impermeable to water
  - Tubular fluid is diluted even more as solute is removed from the tubular fluid in the distal tubule and cortical collecting duct but water remains
  - Because of the low fluid osmolality in the collecting duct and the slight permeability of the medullary
    collecting duct to urea, urea enters the tubule from the medullary interstitium thereby keeping the
    osmolality of the medullary interstitium low
- 15. What are the critical steps involved in excreting concentrated urine?
  - 1. Dilution of fluid in the thick ascending segment (to 100 mOsm/kg H<sub>2</sub>O) as solute is reabsorbed and water remains in lumen (due to the impermeability of water in the thick ascending limb)
    - The reabsorption of solute without water in the thick ascending limb helps to increase the osmolality in the interstitium
  - The presence of ADH renders the distal tubule and collecting duct permeable to water
    - As water leaves the tubular fluid to an interstitium of high osmolality, the osmolality of the tubular fluid increases (and equals the osmolality of the interstitium)
  - The presence of ADH increases the permeability of the <u>last</u> portion of the medullary collecting duct to urea
    - As the tubular fluid has a high concentration of urea (due to the reabsorption of water in the <u>initial</u> segments of the collecting duct and impermeability of those segments to urea), urea enters the interstitium as it goes down its concentration gradient from the last portion of the medullary collecting duct
    - As urea leaves the last portion of the medullary collecting duct (to go into the interstitium) and
      enters the loop of Henle (from the interstitium), it becomes more and more concentrated within
      the interstitium thereby increasing the osmolality of the interstitium
    - This high osmolality serves to concentrate the urine in the collecting ducts (which are permeable to water which allows the fluid in the cortical collected duct to achieve the same osmolality as the fluid in the medullary interstitium)

#### Potassium Shifts (FA p464)

#### K+ shift out of cells → Hyperkalemia

- Low insulin
- Beta-blockers
- Acidosis
- Digoxin
- Cell lysis (i.e. leukemia)

## K+ shift into cells → Hypokalemia

- Insulin
- Beta-agonists
- Alkalosis
- Cell creation / proliferation

)

)

)

)

)

)

Normal	Gas Values		Norma	Ranges (use for the question below)
рН	7.35 - 7.45		pН	7.35-7.45
pCO2	35 – 45		pCO2	35-45 mmHg
pO2	> 90	$(45 \times 2 = 90)$	pO2	75-105 mmHg
HCO3	22	(45/2 = 22.5)	HCO3-	. 22-28 mFg/l

16. Determine what is wrong in patients with the following lab values.

рН	HCO3-	pCO2	Type of Acid-Base Disorder	
7.40	23	40		
7.50	35	42		
7.33	13	28		
7.42	32	64	·	
7.20	18	40		
7.20	24	54	·	
7.52	22	22		
7.66	36	30		
7.47	14	22		
7.46	35	53		
7.39	12	22		
7.34	31	62		To prove
7.10	15	50		

(please note that the above values only reflect high and low values and may not accurately reflect values in appropriate compensatory mechanisms)

- 17. HYQ: How does acidosis/alkalosis affect extracellular K concentrations?
- 18. HYQ: A patient with recent kidney transplant on cyclosporin for immunosuppression requires an antifungal agent for candidiasis. → What drug would result in cyclosporin toxicity? →
- 19. HYQ: A patient presents with renal insufficiency. → What alterations need to be made in his doses of digoxin and digitoxin respectively? →
- 20. HYQ: What effect will a renal stone that obstructs the ureter have on GFR and FF? →
- 21. HYQ: What is the maximal serum glucose concentration at which glucose can be absorbed in the tubules?
- 22. HYQ: What change in a basic metabolic panel might you expect in a young pt being treated for status asthmaticus? →
- 23. HYQ: MUD PILES
- 24. HYQ: A patient taking lisinopril complains of new onset, constant coughing → What medication class should this patient be switched to? →
- 25. HYQ: A patient with heart failure exacerbation needs medical diuresis but has a sulfa allergy → What diuretic can be used? →
- 26. HYQ: A patient presents with hypertension, hypokalemia, metabolic alkalosis, and low plasma renin. → What is the diagnosis, and how do you treat it? →

Re	nal Phys/Pharm Quiz (FA p458 – FA p466) (FA p473 – FA p475)
1.	What type of diuretic is the following drug? (FA p473 – FA p475)
	• Triamterene
	Acetazolamide     Albedos obligations in the second s
	Hydrochlorothiazide
	Burnetanide     Spinopalantana
	Spironolactone     Chlorothiazide
	Officialidation
	Ethacrynic acid     Mannitol
	Metolazone
	Chlorthalidone
	Furosemide (Lasix)
	Amiloride
	Torsemide
2.	What diuretic or class of diuretic would be most useful in the following situation? (FA p474 – FA p475)
	Acute pulmonary edema
	<ul> <li>Idiopathic hypercalciuria (→ calcium stones)</li> </ul>
	Glaucoma
	Mild to moderate CHF with expanded ECV
	In conjunction with loop or thiazide diuretics to retain K+
	Edema a/w nephrotic syndrome
	Increased intracranial pressure
	Mild to moderate hypertension
	Hypercalcemia
	Altitude sickness
	Hyperaldosteronism
3.	What is the equation for the renal clearance of any substance? (FA p459)
	That is the equation for the reliance of any substance. (171) for
	A 40
4.	A 40 year-old pt of yours weighs 100 kg. What is her estimated plasma volume? (FA p459)
5.	What factors/substances cause hyperkalemia? What factors/substances cause hypokalemia?
6.	What are the actions of angiotensin II? (FA p462)
•	(177 F 102)
7	AMI1 H
1.	What is the site of action of mannitol? What is the site of action of the thiazides? (FA p474)
8.	What substances can be used to estimate GFR? What substances can be used to estimate renal plasma
	flow? (FA p459)

Renal	Pathology	(FA p466	- FA p472)
ı ve Hai	rauioiouv	11 A D400	- FA D4/41

- 27. Which glomerular disease would you suspect most in a pt with the following findings? (FA p466 FA p468)
  - Most common nephrotic syndrome in children
  - IF: granular pattern of immune complex deposition; LM: diffuse capillary thickening
  - IF: granular pattern of immune complex deposition; LM: hypercellular glomeruli
  - IF: linear pattern of immune complex deposition
  - IF: deposition of IgG, IgM, IgA, and C3 in the mesangium
  - Kimmelstiel-Wilson lesions (nodular glomerulosclerosis)
  - Most common nephrotic syndrome in adults
  - EM: loss of epithelial foot processes
  - Nephrotic syndrome associated with hepatitis B
  - Nephrotic syndrome associated with HIV
  - · Anti-GBM antibodies, hematuria, hemoptysis
  - EM: subendothelial humps and tram-tack appearance
  - · Nephritis, deafness, cataracts
  - LM: crescent formation in the glomeruli
  - LM: segmental sclerosis and hyalinosis
  - Purpura on back of arms and legs, abdominal pain, IgA nephropathy
  - LM: wire-loop appearance
  - Apple-green birefringence with Congo-red stain under polarized light
  - EM: spiking of the GBM due to electron dense subepithelial deposits
- 28. Under what circumstances would you see the following type of cast? (FA p466)
  - RBC cast
  - WBC cast
  - Bacterial cast
  - Epithelial cell cast
  - Waxy cast
  - Fatty cast
  - Granular cast
- 29. HYQ: Glomerular histology reveals multiple mesangial nodules. → This lesion is indicative of what disease?
- 30. HYQ: A teenager presents with nephrotic syndrome and hearing loss. → What is the disease? →
- 31. HYQ: A 4 year-old boy presents with facial edema and proteinuria. → What is the appropriate treatment? →
- 32. HYQ: UTI caused by *Proteus vulgaris*. → What type of renal stone is this patient at risk for? →
- 33. HYQ: A patient reports a long-term history of acetaminophen use. → What is she at increased risk for? →
- 34. HYQ: What artery prevents a horseshoe kidney from ascending in the abdomen? →
- 35. Acute Interstitial Nephritis (AIN) (FA p470)
  - Results in acute renal failure (ARF)
  - Classic presentation: fever, rash, eosinophilia, and azotemia
  - Most common cause is drug-induced (NSAIDs, PCN/cephalosporins (esp. methicillin), sulfonamides (ie. TMP-SMX, furosemide), ciprofloxacin, cimetidine, allopurinol, PPIs, indinavir, mesalamine)
  - Rx: 2-wks of corticosteroids
- 36. Causes of ATN (FA p471)
  - Drugs: aminoglycosides, cephalosporins, polymyxins
  - Radiograph contrast dye (prevent with N-acetylcysteine, fluids, NaHCO3)
  - Rhabdomyolysis / Myoglobinuria
    - Due to muscle breakdown from seizure disorder, cocaine, or crush injuries
    - Findings: 4+ blood in urine, no RBC on urine cell count, renal failure, elevated CPK

#### Renal Path Quiz

- 1. What is the WAGR complex? (FA p469)
- 2. Which glomerular disease would you suspect most in a pt with the following findings? (FA p468)
  - IF: granular pattern of immune complex deposition; LM: diffuse capillary thickening
  - IF: granular pattern of immune complex deposition; LM: hypercellular glomeruli
  - IF: linear pattern of immune complex deposition
  - IF: deposition of IgG, IgM, IgA, and C3 in the mesangium
  - EM: subendothelial humps and tram-tack appearance
  - Nephritis, deafness, cataracts
  - · LM: crescent formation in the glomeruli
  - · LM: segmental sclerosis and hyalinosis
  - Purpura on back of arms and legs, abdominal pain, IgA nephropathy
  - EM: spiking of the GBM due to electron dense subepithelial deposits
- 3. Determine what is wrong in a pt with the following lab values:

problem?	pCO2	HCO3	<u>рН</u> 7.50
	42	35	7.50
	28	13	7.33
	40	18	7.20
	30	36	7.66
	22	14	7.47
	50	15	7.10

- 4. What are the risk factors for transitional cell carcinoma? (FA p470)
- 5. What are the causes of acidosis with an elevated anion gap? (FA p465)
- 6. HYQ: What changes will be seen in a basic metabolic panel in a pt with renal failure? (FA p471)
- 7. HYQ: A CT scan reveals massively enlarged kidneys bilaterally. → What is the diagnosis? →
- 8. Which electrolyte disturbance fits the following presentation? (FA p464)
  - · Correcting too rapidly may result in central pontine myelinosis
  - Peaked T waves
  - Tetany
  - Arrhythmias
  - Decreased deep tendon reflexes
  - Flattened T waves, U waves on EKG
- Renal pathology rapid review: (FA p531)
  - Most common tumor of the urinary tract system
  - Most common renal malignancy of early childhood (ages 2-4)
  - Histologic appearance of renal cell carcinoma
  - · Histological appearance of chronic pyelonephritis
  - Fever + rash + hematuria + eosinophilia
  - Cancer associated with Schistosoma haematobium
  - Treatment for cystine kidney stones

)

)

)

)

)

)))

## <u>Immunosuppressants (FA p215 – FA p216)</u>

<u>Sirolimus</u> MOA: binds FKBP-12 intracellular protein → inhibition of mTOR (mammalian target of rapamycin) → inhibition of T-cell proliferation

#### **Thalidomide**

- Uses immunosuppression (SLE, organ transplant), anti-angiogenic
- Mechanism of Action affects TNFα
- Toxicity phocomelia (prior use as a sedative during pregnancy)
- 10. Which immunosuppressant matches the following statement?
  - Precursor of 6-mercaptopurine
  - May prevent nephrotoxicity with mannitol diuresis
  - Antibody that binds to CD3 on T cells
  - Antibody that binds IL-2 receptor on activated T cells
  - Inhibits inosine monophosphate dehydrogenase
  - Inhibits calcineurin → loss of IL-2 production → blockage of T cell differentiation and activation
  - Binds FK-binding protein → loss of IL-2 production
  - Binds FKBP-12 → inhibition of mTOR → inhibition of T cell proliferation
  - Used for lupus nephritis
  - · Metabolized by xanthine oxidase, therefore allopurinol increases its toxicity

# Hematology: Anatomy and Physiology What allows RBCs to change shape as they pass through vessels?

- 2. What are some of the different causes of polycythemia?
- 3. What coagulation factor is deficient in hemophilia A?
- 4. What coagulation factor is deficient in hemophilia B?
- 5. What clotting factors require vitamin K for synthesis?
- 6. What are the treatments for overdose of heparin and warfarin?
- 7. What lab value is used to monitor the following medications: heparin, warfarin, enoxaparin?
- 8. What is the treatment for heparin-induced thrombocytopenia?
- 9. Platelet Stimulation (FA p346)
  - 1. Adhesion (endothelial damage, vWF, Gp1b)
  - 2. Activation
    - Secretion of ADP, PDGF, serotonin, fibrinogen, lysosomal enzymes, thromboxane A2, calcium, thrombin
    - thrombin: fibrinogen → fibrin
    - thromboxane A2 → vasoconstriction and platelet aggregation
  - 3. Aggregation of platelets via GpIIb/IIIa
- 10. Von Willebrand's Factor

Basics: several subunits linked by disulfide bonds, synthesized by endothelial cells and megakaryocytes Major Functions: complexes with and stabilizes factor VIII (deficiency → ↑PTT)

platelet adhesion to vessel wall & to other platelets (deficiency → ↑bleeding time)

## Hematology: Pathology

11. What pathologic form of RBC would you see in the following diseases?

(90% of normal hemoglobin)

- Lead poisoning
- G6PD deficiency
- DIC
- Abetalipoproteinemia
- Asplenia

Hb A

#### 12. <u>Iron Proteins (FA p353)</u>

<u>Ferritin</u>	<u>Transferrin</u>
<ul> <li>Iron-protein complex (Ferric acid and apoferritin)</li> </ul>	- Protein that binds ferric molecules and transports
- <u>Cellular</u> storage protein for iron	them through plasma. Synthesized in the liver.
- Acute phase reactant	- t ½ = 8 days
	- Increased in iron deficiency

13. What are the different forms of hemoglobin (Hb)?

$Hb A_2$	(2% of normal hemoglobin)	$\alpha_2 \delta_2$
Hb A1c	(Hb in poorly controlled diabetes)	$\alpha_2$ $\beta_2$ -glucose
Hb F	(fetal hemoglobin)	$\alpha_2 \gamma_2$ (gamma chains replace beta chains)
Hb Gower	(embryonic hemoglobin)	$\zeta_2  \epsilon_3$
Hb S	(sickle cell hemoglobin)	$\alpha_2 \beta_2^{\rm S}$ (glu $\rightarrow$ val in $\beta$ chain)
Hb C	(hemoglobin C disease)	$\alpha_2 \beta^{\rm C}_2$ (glu $\rightarrow$ lys in $\beta$ chain)
Hb Bart	(severe α-thalassemia)	γ <sub>4</sub> (no alpha chains)
Hb H	(severe α-thalassemia)	β <sub>4</sub> (no alpha chains)
	(oor or a manageonna)	p4 (no dipila oriality)

 $\alpha_2 \beta_2$ 

- 14. What is the cause of anemia given the following statement?
  - Microcytic anemia + swallowing difficulty + glossitis
  - Microcytic anemia + > 3.5% HbA<sub>2</sub>
  - Megaloblastic anemia not correctable by B12 or folate
  - Megaloblastic anemia along with peripheral neuropathy
  - Microcytic anemia + basophilic stippling
  - Microcytic anemia reversible with B6
  - HIV positive patient with macrocytic anemia
  - Normocytic anemia + red urine in the morning
  - Normocytic anemia and elevated creatinine

#### 15. Coomb's (+) (FA p353)

RBC agglutination with the addition of antihuman antibody because RBCs are coated with immunoglobulin or compliment proteins

#### **Direct Coomb's (DAT)**

- Prepared antibodies are added to a pt's washed RBC to detect the presence of immunoglobulins already present on the RBC (Using an antibody to detect an antibody.)
- (+) in: Hemolytic Disease of the Newborn, Drug-induced autoimmune hemolytic anemia, Hemolytic transfusion reactions

#### **Indirect Coomb's**

- Pt's serum is incubated with normal RBC to detect for the presence of antibodies
- (+) when: Antibodies present to foreign blood (used to test blood prior to transfusion, Screening for maternal antibodies to a fetus' blood

•	Antibodies against RBCs that interact more strongly at low t	emps (4°C) than at body temp
_		

- Nearly always \_\_\_\_
- Occur regularly in infections with
- Problems/disease occurs when there is circulation to a cold extremity → IgM binds RBC antigen → compliment fixation → MAC lysis (and opsonization → phagocytosis)

## 17. Warm Agglutinins (FA p353)

- Antibodies that react against RBC protein antigens at body temperature
- Nearly always \_\_\_\_\_\_
- Seen in
- 1. 2.
- 3.
- 4.
- 18. What is the rate-limiting step in heme synthesis? (FA p354)
- 19. What is the cause of ITP? (FA p355)
- 20. What is the defect in Bernard-Soulier disease? (FA p356)
- 21. What is the most common inherited bleeding disorder? (FA p356)
- 22. What are some of the hereditary syndromes of thrombosis? (FA p356)

#### 23. Hematologic tests/findings

- Ham's test
- DEB test
- Heinz bodies
- D-dimers
- Basophilic stippling
- Osmotic fragility test
- (+) ristocetin test

)

)

)

)

)

)

)

#### **Acute Leukemia**

- Rapid onset and rapidly progressive
- Over 50% myeloblasts (AML) or lymphoblasts (ALL) in the bone marrow
- Numerous blast (immature) cells (> 20% blasts)
- Often a/w pancytopenia (anemia, bleeding tendency, infection)

ALL	AML
<ul> <li>ALL</li> <li>Philadelphia chromosome may be seen (poor prognosis)</li> <li>most common in children and young adults</li> <li>males &gt; females, whites &gt; blacks</li> <li>B cell types more common that T cell</li> <li>3 morphologic variants and 5 phenotypic variants</li> <li>bone pain is common</li> <li>most have the enzyme terminal deoxynucleotide transferase (Tdt)</li> <li>very good prognosis in children (up to 90% remission)</li> <li>PAS (+)</li> </ul>	AML     Philadelphia chromosome rarely seen     characteristic Auer rods     8 different morphological classifications     most all are CD 13/33 (+)     usually nonspecific esterase (+) myeloid cells     median age of onset is 50     PAS (-)     a/w numerous risk factors
difficult to diagnose on blood smear (others can be Dx with smear)	

#### 8 types of AML

- M0 undifferentiated
- M1 minimal differentiation/maturation
- M2 with differentiation/maturation
- M3 acute promyelocytic
- M4 myelomonocytic / myelomonoblastic
- M5 pure monocytic / monoblastic
- M6 erythroleukemia
- M7 megakaryocytic

#### AML risk factors

- Radiation, benzene, or alkylating agents (such as in Hodgkin's treatment)
- Myeloproliferative disease, myelodysplastic syndrome, or aplastic anemia
- Down syndrome, Fanconi syndrome, or Bloom syndrome

ALL type by morphology	ALL types by phenotype
L1- small blasts	<ul> <li>common (= L1)</li> </ul>
L2- large blasts with prominent nucleoli	<ul><li>null (= L1)</li></ul>
<ul> <li>L3- large blasts with cytoplasmic vacuoles</li> </ul>	• T (= L2)
• • •	• B (= L3)

#### Chronic Leukemia

- Insidious onset and gradual progression (months to years)
- Mature cells (rather than blasts) (< 5% blasts)
- Can be either myeloid (CML) or lymphoid (CLL)
- A/w hepatosplenomegaly and lymphadenopathy
- · Prominent infiltration of bone marrow by leukemic cells and peripheral WBC counts may be high

CLL	CML
<ul> <li>Most common adult leukemia seen in western countries</li> </ul>	May progress to AML (80%) or ALL (20%)
Males > females, whites > blacks	Numerous basophils and PMNs are LAP (-)
Adults over age 50	Adults ages 25-60
95% have <b>B cell markers</b> (rather than T cell)	Hyperplasia of all 3 cell lines
10% progress to ALL	(granulocytic, erythroid, and megakaryocytic)
Characteristic smudge cells and	but granulocyte precursors predominate
autoimmune hemolytic anemia	Philadelphia chromosome (t 9;22) is always present
Tends to be indolent	Fatigue, abdominal pain, <u>splenomegaly</u> , bleeding tendency

## What hematology disease matches the following statement?

- Most common leukemia in children
- Most common leukemia in adults in US
- Most common lymphoma in US
- Reed-Sternberg cells
- AML a/w Down syndrome
- Leukemia with more mature cells and less than 5% blasts
- AML that are CD13 and CD33 (+)
- Particularly a/w EBV
- Characteristic Auer rods
- · A/w long term celiac disease
- · Greater than 20% blasts in marrow
- Myelodysplastic syndromes have a tendency to progress to \_\_\_\_\_
- Myeloproliferative disorders may progress to
- AML that is CD 41 and CD 61 (+)
- PAS (+) acute leukemia
- · Commonly presents with bone pain
- · Viscous blood, headache, plethora, splenomegaly, and low erythropoietin
- · Leukemia equivalent of Burkett's lymphoma
- Lymphoma equivalent of CLL
- · Numerous basophils, splenomegaly, and negative for leukocyte alkaline phosphatase (LAP)
- Most common neonatal leukemia
- Always positive for the Philadelphia chromosome (t 9;22)
- Only AML that is CD 13 and CD 33 (-)
- "Starry-sky pattern" due to phagocytosis of apoptotic tumor cells
- Always associated with the BCR-ABL genes
- · A/w Sjogren syndrome, Hashimoto's thyroiditis, and H. pylori
- · Acute leukemia positive for peroxidase
- · Solid sheets of lymphoblasts in marrow
- PAS (-) acute leukemia

- Retinoblastoma
- Rhabdomyosarcoma
- - Teratoma

Ewing's sarcoma

Osteogenic sarcoma

Lymphoma (lymphoblastic)

ALL Astrocvtoma

Neoplasms in Children

- Neuroblastoma
- Hemangioma
- Wilms' tumor
- Hepatoblastoma

Diffuse large B-cell lymphoma

Hodgkin's lymphoma

M7 AML

Chronic leukemia

M0-M6 AML

Burkitt's and Hodgkin's

Lymphomas

AML (particularly M2 and M3)

Intestinal T-cell lymphoma

Acute leukemia

**AML AML** 

M7 AML ALL

ALL

Polycythemia vera L3 or B variant ALL

Small lymphocytic lymphoma

CML

M7 AML (megakaryocytic)

CML M7 AML

Burkitt's lymphoma

Marginal cell MALToma

**AML** ALL

AML

)

)

) )

1.	Compare the age distribution of those affected by Hodgkin's lymphoma to those affected by non-Hodgkin's lymphoma. (FA p357)
2.	What is the most common type of non-Hodgkin's lymphoma in adults? In children? (FA p358)
3.	What lab findings are indicative of disseminated intravascular coagulation (DIC)? (FA p356)
4.	What is the structure of HbH? What disease results in HbH production? What is the structure of Hb Bart's? What disease results in Hb Bart's production? (FA p349)
5.	With what hematologic disease would you expect to see the following?  • (+) Ham's test  • Heinz bodies  • Basophilic stippling  • (+) osmotic fragility test  • (+) DEB test  • D-dimers  • Coomb's (+)  • Coomb's (-)  • (+) ristocetin test
6.	What are the causes of aplastic anemia? (FA p351)
7.	A pt of yours develops hypercalcemia from the most common primary tumor arising within bones in adults. What lab findings would you suspect in this pt? (FA p358)
8.	What findings are a/w hereditary spherocytosis? (FA p352)
9.	What lab findings allow you to distinguish iron deficiency anemia from a microcytic, hypochromic anemia resulting from thalassemia? (FA p349)
10.	. HYQ: A child anemic since birth has now been cured with splenectomy. → What is the disease? →
11.	. HYQ: A patient is diagnosed with a macrocytic, megaloblastic anemia. → What is the danger of giving folate alone? →
12.	HYQ: A patient with anemia, hypercalcemia, and bone pain receives a bone marrow biopsy which reveals plasma cells (large, round, off-center nucleus). → What is the diagnosis, and what may be found on urinalysis? →
13.	. HYQ: What neoplasms are associated with AIDS? (FA p174) →
Hor	Conveight @ 2011 All Bights Possered Destars In Training com 11 C

- 14. HYQ: A heart failure patient is newly diagnosed with cancer and is being evaluated for chemotherapy. → Which chemotherapeutic agent should be avoided in this pt? →
- 15. HYQ: Chromosomal analysis of a leukemia patient reveals the presence of the Philadelphia chromosome t(9;22). → What is the treatment?
- 16. HYQ: After a normal spontaneous vaginal delivery, the new mom bleeds profusely from her vagina and later from her gums → What abnormal lab values would you suspect? →
- 17. HYQ: A 11 year-old child presents with a chronic non healing ulcer on his foot and imaging shows a small calcified spleen. → What drug can improve his symptoms? →
- 18. HYQ: NSAIDs inhibit the production of which substance important in platelet aggregation? →
- 19. HYQ: Does HbF have more or less affinity for 2,3-bisphosphoglycerate →
- 20. What is the mechanism of action of the following drugs? (FA p362 FA p364)
  - Streptokinase
  - Aspirin
  - Clopidogrel
  - Abciximab
  - Tirofiban
  - Ticlopidine
  - Enoxaparin
  - Eptifibatide

)

1. Ace	etaminophen	
	icylates	
	phetamines	•
	icholinesterases, organophosphates	
5. Ant	imuscarinic, anticholinergic agents	,
6. β-b	lockers (or verapamil)	
7. Dig	italis	
8. Iror	n (FA p224)	
9. Lea	ıd .	
10. Ars	enic, mercury, gold	
11. Cop	pper, arsenic, gold	
12. Cya	anide	
13. Met	themoglobin	
14. Car	bon monoxide	
15. Met	thanol, ethylene glycol (antifreeze)	
16. Opi	oids	
17. Ber	nzodiazepines	
18. Tric	cyclic Antidepressants	
19. Hep	parin	
20. Wa	rfarin	•
21. t-P/	A, streptokinase	
22. The	eophylline	
	y Poisoning	
	cumulates in the kidney and brain odynia – peeling of the fingertips	
<ul> <li>Abo</li> </ul>	dominal pain mmon sources: shark, swordfish, old thermometers, batteries	

- Cancers lip, mouth, salivary glands, larynx, esophagus, lung, bladder, pancreas, kidney, cervix
- COPD chronic bronchitis, emphysema
- Peptic ulcer disease
- Pregnancy complications (IUGR)

## What drugs have the following potential side effects? (FA p244)

Anticholinergic SE (dryness, confusion)  Coronary vasospasm  Cutaneous flushing  Dilated cardiomyopathy  Torsades de pointes  Agranulocytosis  Aplastic anemia  Thrombocytopenia  Gray baby syndrome  Hemolysis in g6PD-deficient patients  Thrombosis  Pulmonary fibrosis  Cough  Focal to massive hepatic necrosis  Hepatitis  Pseudomembranous colitis
Cutaneous flushing  Dilated cardiomyopathy  Torsades de pointes  Agranulocytosis  Aplastic anemia  Thrombocytopenia  Gray baby syndrome  Hemolysis in g6PD-deficient patients  Thrombosis  Pulmonary fibrosis  Cough  Focal to massive hepatic necrosis  Hepatitis
Cutaneous flushing  Dilated cardiomyopathy  Torsades de pointes  Agranulocytosis  Aplastic anemia  Thrombocytopenia  Gray baby syndrome  Hemolysis in g6PD-deficient patients  Thrombosis  Pulmonary fibrosis  Cough  Focal to massive hepatic necrosis  Hepatitis
Dilated cardiomyopathy  Torsades de pointes  Agranulocytosis  Aplastic anemia  Thrombocytopenia  Gray baby syndrome  Hemolysis in g6PD-deficient patients  Thrombosis  Pulmonary fibrosis  Cough  Focal to massive hepatic necrosis  Hepatitis
Torsades de pointes  Agranulocytosis  Aplastic anemia  Thrombocytopenia  Gray baby syndrome  Hemolysis in g6PD-deficient patients  Thrombosis  Pulmonary fibrosis  Cough  Focal to massive hepatic necrosis  Hepatitis
Torsades de pointes  Agranulocytosis  Aplastic anemia  Thrombocytopenia  Gray baby syndrome  Hemolysis in g6PD-deficient patients  Thrombosis  Pulmonary fibrosis  Cough  Focal to massive hepatic necrosis  Hepatitis
Agranulocytosis  Aplastic anemia  Thrombocytopenia  Gray baby syndrome  Hemolysis in g6PD-deficient patients  Thrombosis  Pulmonary fibrosis  Cough  Focal to massive hepatic necrosis  Hepatitis
Aplastic anemia Thrombocytopenia Gray baby syndrome Hemolysis in g6PD-deficient patients Thrombosis Pulmonary fibrosis Cough Focal to massive hepatic necrosis Hepatitis
Aplastic anemia Thrombocytopenia Gray baby syndrome Hemolysis in g6PD-deficient patients Thrombosis Pulmonary fibrosis Cough Focal to massive hepatic necrosis Hepatitis
Thrombocytopenia  Gray baby syndrome  Hemolysis in g6PD-deficient patients  Thrombosis  Pulmonary fibrosis  Cough  Focal to massive hepatic necrosis  Hepatitis
Thrombocytopenia  Gray baby syndrome  Hemolysis in g6PD-deficient patients  Thrombosis  Pulmonary fibrosis  Cough  Focal to massive hepatic necrosis  Hepatitis
Gray baby syndrome  Hemolysis in g6PD-deficient patients  Thrombosis  Pulmonary fibrosis  Cough  Focal to massive hepatic necrosis  Hepatitis
Hemolysis in g6PD-deficient patients  Thrombosis  Pulmonary fibrosis  Cough  Focal to massive hepatic necrosis  Hepatitis
Hemolysis in g6PD-deficient patients  Thrombosis  Pulmonary fibrosis  Cough  Focal to massive hepatic necrosis  Hepatitis
Thrombosis  Pulmonary fibrosis  Cough  Focal to massive hepatic necrosis  Hepatitis
Thrombosis  Pulmonary fibrosis  Cough  Focal to massive hepatic necrosis  Hepatitis
Pulmonary fibrosis  Cough  Focal to massive hepatic necrosis  Hepatitis
Cough  Focal to massive hepatic necrosis  Hepatitis
Cough  Focal to massive hepatic necrosis  Hepatitis
Focal to massive hepatic necrosis  Hepatitis
Hepatitis
Hepatitis
Pseudomembranous colitic
1 3Cudomembranous contis
Adrenocortical insufficiency
Gynecomastia
Hot flashes
Hypothyroidism

## What drugs have the following potential side effects? (FA p245)

Gingival hyperplasia	
Gout	
Osteoporosis	
Photosensitivity	
Stevens-Johnson syndrome	
Drug-induced SLE	
Tendon rupture / cartilage damage	
Fanconi's syndrome	
Interstitial nephritis	
Hemorrhagic cystitis	
Dizziness, nausea, headache, vision changes, tinnitus	
Nephrogenic diabetes insipidus	
Seizures	at ex
Tardive dyskinesia	
Disulfiram-like reaction	
Nephro + neurotoxicity	
Nephro + ototoxicity	

## **Toxicology Quiz**

- 1. HYQ: What medication causes cardiotoxicity and bone marrow suppression? →
- 2. HYQ: A patient tries to commit suicide by overdosing on digitalis. → What is the most important step in the management of this pt? →
- 3. HYQ: What drugs induce the P450 system, and what effect this will have on other drugs?
- 4. HYQ: What drugs inhibit the P450 system, and what effect this will have on other drugs?
- 5. HYQ: An African-American male that goes to Africa develops anemia after taking prophylactic medicine for primary disease prevention. → What enzyme is this patient deficient in? →
- 6. HYQ: A 65 year-old male patient taking multiple medications presents with gynecomastia. → Which of the following meds is most responsible for this pt's gynecomastia? → digitalis, cimetidine, or spironolactone? →
- 7. HYQ: A patient presents with tinnitus, dizziness, headaches, and GI distress. → What drug is causing these symptoms? →
- 8. HYQ: What medications are known for causing drug-induced lupus?

)

)

)

)

)