**I. Lab 5 Review: Safety & Techniques**

**Q?**

**II. Introduction to Endocrinology** LS ch 17, DC Module 13, SI Fox+  
A. Endocrine vignette: Cushing's syndrome LS fig17-20 p 521-2  
B. Endocrine system DC p 103 fig 13-1, LS fig 17-1, tab 17-1  
C. What’s an endocrine? + classes ~ LS pp 495 – 6  
D. Hypothalamus (Master) – Pituitary (subcontroller)  
DC pp 104-6 + LS pp 499-506  
E. Posterior pituitary + hormones DC p 108, LS fig 17-4 p 502  
F. Anterior pituitary + hormones DC pp 105-7, LS pp 502-6  
H. Peripheral endocrine organs DC pp 109-13, LS pp 513-36  
   1. Pancreas (insulin, glucagon, diabetes) 2. Thyroid 3. Adrenals

**III. Nervous System & Excitable Cell Connections** LS ch 5, 4, 7  
A. How is the nervous system organized? fig 5-1 p 108  
B. Neurons? What kind? fig 5-2 p 109  
C. Brain structure & function fig 5-7, 5-8 pp 116 - 7  
D. **Protect your head with a helmet!** Bicycle head injury statistics, *NHTSA & BHSI*
No food, drink or gum in lab today! Thanks sincerely!

...Healthy, tasty & fresh, but not in lab!!
PREPARATION

1. WASH & DRY

2. ALCOHOL
OBTAIN μSAMPLE

BLOOD GLUCOSE

BLOOD TYPING
Glucose: Sugar in Blood

Normal: 70-99
Pre-Diabetes: 100-125
Diabetes: ≥ 126 mg/dL
ADD ANTISERA

MIX W/TOOTHPICKS

READ & RECORD!!
CLEAN-UP!

1. FOLD DIAPER

2. BLOOD PRODUCTS

3. REWASH!!
Blood Chem Lab Q?
Cushing’s Syndrome = Hypersecretion of Cortisol: Hypothalamic (CRH), Pituitary (ACTH), or Adrenal (Cortisol)
ANP = Atrial Natriuretic Polypeptide
Hormone/Endocrine Classifications

Exogenous

Endogenous
Hypothalamus & Pituitary: Intimate Relationship

Anterior lobe of pituitary

Posterior lobe of pituitary

Bone

Optic chiasm

Connecting stalk

Anterior pituitary

Posterior pituitary

Hypothalamus
Hypothalamus
< 1% of Brain Mass
Hormone Master Controller
+100s of Functions!

Good Things Come in Small Packages!

Commissure
Lateral Hypothalamic Area
Lateral Preoptic Nucleus
Medial Preoptic Nucleus
Anterior Hypothalamic Area
Supraoptic Nucleus
Optic Chiasm
Dorsomedial Nucleus
Ventromedial Nucleus
Medial Mamillary Nucleus
Lateral Mamillary Nucleus

Kreiger & Hughes 1980
**Hypothalamus-Anterior Pituitary Vascular Connection!**

- Neurosecretory neuron
- Hypothalamic-hypophyseal portal system
- Anterior pituitary
- Posterior pituitary

Systemic arterial inflow → Vascular Connection!! → Systemic venous outflow

- • = Hypophysiotropic hormones
- • = Anterior pituitary hormone

LS 2007
Pituitary Nourishing or Growth Hormones

Hypophysis = Pituitary

**RH + or RIH -**

Releasing or Release-Inhibiting Hormones

- = Hypophysiotropic hormones
- = Anterior pituitary hormone

**Neurosecretory neuron**

**Systemic arterial inflow**

**Hypothalamic-hypophyseal portal system**

**Systemic venous outflow**
fig 17-10
Progression & Development of Acromegaly
Growth Hormone = Somatotrophic Hormone
Body Builder’s Dream?
GH/STH Effects: Insulin Resistance/Type II Diabetes?

↑ Amino Acid uptake & Protein synthesis
↑ Lipolysis & Fatty Acid mobilization
↓ Glucose uptake
   (skeletal muscle & adipocytes)
↑ Glucose production
   (liver glycogenolysis)
↑ Insulin secretion
Increase GH naturally with exercise & sleep!!

**Graph:**
- **Y-axis:** Growth hormone (ng/ml plasma)
- **X-axis:** Time of day
- Peaks indicate growth hormone release:
  - Arrows mark stress periods (stressful exercise)
  - Higher levels during sleep

**Legend:**
- ng/ml = nanograms per milliliter
Endocrine Pancreas: Insulin (I) & Glucagon (G)
See-Saw Hormones in Regulating Blood Glucose

Hormones (insulin, glucagon)

Exocrine portion of pancreas
(Acinar and duct cells)

Duct cells secrete aqueous NaHCO₃ solution
Acinar cells secrete digestive enzymes

Blood

Endocrine portion of pancreas
(Islets of Langerhans)

The glandular portions of the pancreas are grossly exaggerated.
Times of Plenty!!

**NB:** Diabetics have problems either here or here.

Fox 1987
Times of Need!

Blood

Glucose

- Glucose

Islets

A cells

Glucagon

B cells

Insulin

Cellular uptake of glucose

Glycogenolysis

Mobilize!!

Fox 1987
### TABLE 4-7

**Warning Signs of Diabetes**

These signs appear reliably in type 1 diabetes and, often, in the later stages of type 2 diabetes.

- Excessive urination and thirst
- Glucose in the urine
- Weight loss with nausea, easy tiring, weakness, or irritability
- Cravings for food, especially for sweets
- Frequent infections of the skin, gums, vagina, or urinary tract
- Vision disturbances; blurred vision
- Pain in the legs, feet, or fingers
- Slow healing of cuts and bruises
- Itching
- Drowsiness
- Abnormally high glucose in the blood
Diabetics must constantly juggle diet, exercise & medication to control blood glucose!
Like others, diabetics benefit from whole grains, vegetables, fruits, legumes & non-/low-fat milk products!
Adrenal Gland

The adrenal glands sit atop the kidney and consist of an outer zone of cells, the adrenal cortex, which produces a variety of steroid hormones, and an inner zone, the adrenal medulla. The adrenal medulla produces adrenalin and noradrenalin.
Epinephrine 80%
Norepinephrine 20%
Central nervous system (CNS)

Brain and spinal cord

Input to CNS from periphery

Output from CNS to periphery

Peripheral nervous system (PNS)

Afferent division

Visceral stimuli

Sensory stimuli

Efferent division

Motor neurons

Somatic nervous system

Smooth muscle
Cardiac muscle
Exocrine glands
Some endocrine glands

Effector organs

Autonomic nervous system

Enteric nervous system

Stimuli in digestive tract

Digestive organs only
~99% of all neurons in humans! CNS ~100 billion interneurons!!
Motor

M. Supplementary motor area
(on inner surface—not visible; programming of complex movements)

M. Premotor cortex (coordination of complex movements)

S. Primary auditory cortex
surrounded by higher-order auditory cortex (hearing)

A. Limbic association cortex
(mostly on inner and bottom surface of temporal lobe; motivation and emotion; memory)

S. Primary visual cortex
surrounded by higher-order visual cortex (sight)

S. Primary sensory cortex
(sensation)

A. Wernicke’s area
(speech understanding)

A. Posterior parietal cortex
(integration of somato-sensory and visual input; important for complex movements)

A. Parietal-temporal-occipital association cortex
(integration of all sensory input; important in language)

A. Prefrontal association cortex
(planning for voluntary activity; decision making; personality traits)

Key
M. Motor cortex
A. Association cortex
S. Sensory cortex

LS 2006, cf: LS 2012 fig 5-8a
~ 500,000 bicyclists/yr visit emergency rooms

As of 2014, the population estimate of
State of Wyoming  584,153
Albany OR  51,980
Corvallis OR  54,953
Springfield OR  60,263

~ 26,000 traumatic brain injuries

743 of ~900 cyclist deaths, 2013 ≡ ~ 2% of all traffic fatalities
13% of deaths children ≤ 14 yr, 87% ≠
11% involved wrong-way riding!

Bicycle crashes & injuries are under reported, since majority not serious enough for ER visits.

Helmets may reduce head & brain injury risk by 85%!

~$2.3 billion/yr = indirect injury costs from not using helmets!

Helmets Cheap, Brains Expensive!!
Use Your Head, Get a Helmet!!
http://www.bhsi.org/stats.htm
The "typical" bicyclist killed on our roads is a sober male over 16 riding without a helmet. He's hit by a car on a major road between intersections in an urban area on a summer evening. Please wear a helmet – it can make the difference between life and death.
Hey, I’m alive because I wore a helmet!!
Stories, Discussion, Questions or Comments!