I. Lab 5 Review: Safety & Techniques

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!!
1. WASH & DRY

2. ALCOHOL

3.
OBTAIN μSAMPLE

BLOOD GLUCOSE

BLOOD TYPING
Glucose: Sugar in Blood

Normal: 70-99
Pre-Diabetes: 100-125
Diabetes: ≥ 126 mg/dL
BLOOD TYPING

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)

$T = 0$, near normal

$T = 4$ months later
ANP = Atrial Natriuretic Polypeptide
Hormone/Endocrine Classifications

Exogenous

Endogenous
Hypothalamus & Pituitary: Intimate Relationship
Hypothalamus
< 1% of Brain Mass
Hormone Master Controller
+100s of Functions!

Kreiger & Hughes 1980
Nervous Connection!!

- Neurosecretory neurons
- Hypothalamic-posterior pituitary stalk
- Anterior pituitary
- Posterior pituitary
- Nervous Connection!!

- Vasopressin
- Oxytocin

Systemic arterial inflow
Systemic venous outflow

LS 2007
Hypothalamus-Anterior Pituitary Vascular Connection!

- Neurosecretory neuron
- Systemic arterial inflow
- Hypothalamic-hypophyseal portal system
- Anterior pituitary
- Systemic venous outflow

• = Hypophysiotropic hormones
• = Anterior pituitary hormone

LS 2007
Pituitary Nourishing or Growth Hormones

RH + or RIH -

Hypothalamus

Neurosecretory neuron

Systemic arterial inflow

Hypothalamic-hypophyseal portal system

Pituitary Nourishing or Growth Hormones

Releasing or Release-Inhibiting Hormones

Systemic venous outflow

• • = Hypophysiotropic hormones

• = Anterior pituitary hormone

Hypophysis = Pituitary

LS 2007
Capillary-Venule-Capillary Intimate Circulation

Krieger & Hughes 1980
Discussion &/or Break?
Progression & Development of Acromegaly

Age 13

Age 21

Age 35
Growth Hormone = Somatotropic 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!!

Growth hormone (ng/ml plasma) vs. Time of day

Sleep

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

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

Islets

A cells

Glucagon

B cells

Insulin

Cellular uptake of glucose

Glycogenolysis

Glucose

Mobilize!!

Fox 1987
FIGURE 13-12
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%

**Figure 77-1**

Secretion of adrenocortical hormones by the different zones of the adrenal cortex.
Nervous System

CNS

PNS

input

output
~99% of all neurons in humans!
CNS ~100 billion interneurons!!
M. Supplementary motor area (on inner surface—not visible; programming of complex movements)

M. Premotor cortex (coordination of complex movements)

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

M. Broca’s area (speech formation)

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)

M. Primary motor cortex (voluntary movement)

S. Primary sensory cortex (sensation)

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

A. Wernicke’s area (speech understanding)

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

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

Key

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

LS 2006, cf: LS 2012 fig 5-8a
~540,000 bicyclists/yr visit emergency rooms
67,000 head injuries, 1 in 8 brain injuries
716 cyclists died in 2008 ≡ 2% of all traffic fatalities
½ of deaths children < 15 yr
53,000 cyclists have died since 1932
that's more than the population of
Springfield, OR  52,864
Bend, OR      52,029
Corvallis, OR  49,322
Bicycle crashes & injuries are under reported,
since majority not serious enough for ER visits.
Helmets may prevent 45-88% of brain injuries!
~$81 million/yr = direct 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 not wearing a helmet riding on a major road between intersections in an urban area on a summer evening when hit by a car. Please wear a helmet – it can make the difference between life and death.