BI 121 Lecture 1

I. Announcements: Please check & sign attendance roster. Not on list? See Pat during a break or after class. *Lab 1 Histology* tomorrow in 130 HUE: 12 n & 1 pm sections.

II. Introduction: Staff, office hr, required sources, course overview, grading, expectations & success. Q?

III. Human Physiology LS ch 1, DC Module 1,

A. What? cf: Anatomy LS p 1
B. Where? Body Levels of Organization LS pp1-6, DC pp1-5
C. How? Different Study Approaches LS p 1

IV. Homeostasis LS ch 1, DC Module 1

A. What? Maintenance of ECF LS p 8
B. Where? ECF = Plasma + Interstitium LS fig 1-4 p 8
C. How? Simplified Homeostatic Model cf: LS fig 1-7 p 14 Balances LS p 9, DC pp 5-6
D. Why? Cell survival! LS fig 1-5 p 9, DC p 5

*Welcome to Human Physiology – what makes us tick!*
BI 121 Required Texts
http://literaryduck/uoduckstore.com

Human Body Systems
Structure, Function, and Environment
Second Edition
Daniel D. Chiras

Introduction to Human Physiology
Department of Biology, BI 121
Laboratory Manual
University of Oregon
Eugene, OR 97403
Summer 2014

DC
New (2013 ed) $26.00 Used $19.50

LM
Lab Notebook ~$ 9.75
BL 121 Optional Source @ Amazon.com or Smith Family Bookstore?

Publisher's Price. Gold nuggets?

LS 2012

Text $212.48 New or $127.99 Kindle Edition or $20.75 Rent
Dr. Evonuk’s 6 Balances

- **H₂O**
- **pH**
- **ToC**
- **ION+/−**
- **O₂/CO₂**
- **Metabolic**
  - ANA-
  - CATA-
Mitochondria: Energy Organelles

- Intermembrane space
- Cristae
- Proteins of electron transport system
- Inner mitochondrial membrane
- Matrix
- Outer mitochondrial membrane
- Cristae

fig 2-8 LS 2012
What does DNA look like? Double-helix!!

LS fig C-2
What are DNA’s major functions?
Heredity + Day-to-Day Cell Function
Dietary Analyses Thanks to Michelle Obama!
Dietary Composition & Physical Endurance

- High-fat diet (e.g., Atkins!)
- Normal mixed diet
- High-carbohydrate diet

Maximum endurance time:
- 57 min
- 114 min
- 167 min

~ 1/3 endurance!
Digestion Steps

1. Ingestion
2. Mechanical Digestion
3. Chemical Digestion
4. Peristalsis
5. Absorption
6. Storage
7. Defecation

Cardiovascular System
Figure-8 Loop

Pulmonary System

Systemic System
Atherosclerosis developing within vessel walls!
CABG ≡ Coronary Artery Bypass Graft
Cigarette Smoking: #1 Preventable Cause of Premature Death in the US

Cardiovascular Mortality (average annual incidence per 1,000):
- None: 7
- Less than 20: 8.4
- More than 20: 12.4
- Quit One Year: 7

Cigarettes smoked per day: None, Less than 20, More than 20, Quit One Year.
How much aerobic?

Continuous exercise
> 50% muscle mass
> Conversational pace
20-60 min/session
3-5 days/wk
Healthy Oils to Minimize Atherosclerosis

HAPOC?
(a) Pressure-recording device

(b) Pressure (mm Hg)

(c) When blood pressure is 120/80:

- Cuff pressure is greater than 120 mm Hg.
- No blood flows through vessel.
- No sound is heard.

- Cuff pressure is between 120 and 80 mm Hg.
- Blood flow through vessel is turbulent whenever blood pressure exceeds cuff pressure.
- Intermittent sounds are heard as blood pressure fluctuates throughout cardiac cycle.

- Cuff pressure is less than 80 mm Hg.
- Blood flows through vessel in smooth, laminar fashion.
- No sound is heard.
What's in Blood? Plasma & Blood Cells

Plasma (55% of whole blood)

Buffy coat: platelets and leukocytes (<1% of whole blood)

Erythrocytes (45% of whole blood)

Platelets

Leukocytes (white blood cells)

Erythrocytes (red blood cells)
A & B Antigens
(Agglutinogens)
Glucose: Sugar in Blood

Normal: 70-99
Pre-Diabetes: 100-125
Diabetes: ≥ 126 mg/dL
Times of Plenty!!

NB: Diabetics have problems either here or here.
ANP = Atrial Natriuretic Polypeptide
Homeostasis is a dynamic balance between the autonomic branches.

- **Parasympathetic**
  - Rest-and-digest: Parasympathetic activity dominates.

- **Sympathetic**
  - Fight-or-flight: Sympathetic activity dominates.
Muscular System

Body systems maintain homeostasis

Homeostasis is essential for survival of cells

Cells make up body systems

Cells
Atrophy
*decrease in size & strength*

Hypertrophy
*increase in size & strength*
NB: In vivo, Cupola or peak of each lung goes into neck > clavicle line!
Not only the Brain, but the Heart & 100s of Other Tissues and Organs are Adversely Affected!
...I ♡ U of O!

Students who succeed are usually those who:

(1) **Attend** class regularly
(2) **Ask** questions
(3) **Come** to office hours & problem-solving sessions
(4) **Study** outside class both alone & in study groups
(5) **Seek** to understand methods & overarching principles/concepts rather than specific answers
(6) **Teach** or tutor others &
(7) **Discuss** concepts informally with fellow students.

ANATOMY vs PHYSIOLOGY
STRUCTURE vs FUNCTION
WHAT? vs HOW?
WHERE? vs WHY?
Structure begets function!
Structure gives rise to function!
Structure & function are inseparable!
Knee Structure-Function?
**Preoperative Diagnoses:** R Knee
Degenerative Joint Disease (DJD) = arthritis
Varus malalignment = bow-leg

**Procedures:**
Arthroscopy & microfracture
High Tibial Osteotomy (HTO)
Packing bone graft substitute

**Blocks/Medications:**
Femoral n. block
General anesthesia
IV Morphine, Oral Oxycontin + Oxycodone,
Tylenol, Injectable Lovenox (enoxaparin Na)
R knee medial meniscus cleavage & tear
R knee lateral compartment in good shape!
1. Arthroscopy clean-up
2. Debridement complete
3. Microfracture with awl
4. Punctuate bleeding
Further bleeding to create superclot!
High-Tibial Osteotomy (HTO) to Realign the Joint

1. Oscillating saw cut
2. R plate/scaffolding insert
3. Align, stabilize w/screws & pack defect
Post-Operative Reality: 10 d injectable anti-coagulant, 3 wk oral anti-coagulant, 4 wk CPM machine, non-wt bearing 8 wk, 12 wk PT, 3-5 d/wk,...

CPM ≡ Torture Device
Break for discussion/questions!
Body Levels of Organization

1. Molecular

2. Cellular

3. Tissue

4. Organ

5. System

Entire Organism, like you & me!
Nerve conducts

Muscle contracts

Connective connects!!

Epithelial covers
Epithelial tissue gives rise to glands: (a) exocrine & (b) endocrine

(a) Exocrine gland

(b) Endocrine gland

Surface epithelium

Duct cell

Secretory exocrine gland cell

Secretory endocrine gland cell

Blood vessel

LS fig 1-3 p 4
Organs are made up $\geq 2$ tissue types

Organ:
Body structure that integrates different tissues and carries out a specific function

Epithelial tissue
- protection, secretion, absorption

Connective tissue
- structural support

Muscle tissue
- movement

Nervous tissue
- communication, coordination, control

LS fig 1-2 p 4
Which body systems?
Which body systems?
Why study human physiology?
KNOWLEDGE IS POWER!!!

Thomas Hobbes of Malmesbury
English Philosopher, 1658
Homeostasis is essential for cell survival!
Maintenance of a relative constancy in the Internal environment = ECF = fluid outside of cells

milieu interieur?

100 trillion cells working intimately

Claude Bernard

Walter B. Cannon
Where is extracellular fluid?
Where is extracellular fluid?

As long as between/outside cells, ECF everywhere?

G&H 2011
ICF = Intracellular

ECF = Extracellular

Plasma (within CV System)

Interstitium (eg, between muscle cells)
HOMEOKINESIS?
Dr. Evonuk’s 6 Balances

Metabolic

ANA- CATA-

$\text{H}_2\text{O}$

$\text{ToC}$

$\text{O}_2/\text{CO}_2$

Ion$^+/-$

$p\text{H}$