BI 121 Lecture 10

I. **Announcements** Remember to read Lab 5 before Thursday. Thanks for helping us be well-prepared. Q from last time? Calculating grade from estimated final. Keys to success? Q? Notebooks returned at the end of lecture today.

II. **CVDs Risk Reduction Connections** LS ch 9-10, DC Module 4
Minimizing risk of CVDs: U of O Smoke-Free! Exercise!! Can food choices make a difference? What’s HAPOC?

III. **Blood Form & Function** LS ch 11 pp 296-304, 309-12
DC Module 5 + SI Fox + *National Geographic* Lennart Nilsson
A. Formed vs. nonformed/cells vs. plasma fig+tab 11-1
B. **Red blood cells/erythrocytes:** O$_2$-carrying sickle cells, ABO blood typing, Rh factor pp 299-304.
C. **White blood cells/leukocytes:** Defense/immunity differential + general functions pp 309-12
D. **Platelets/thrombocytes:** Initial clotting p 304

IV. **Blood Glucose & Diabetes Mellitus** LS ch 17, DC Module 13

...Fun lab week with much personal data!
Q? What do I need on the final, if I want to get…?

A? You can actually calculate given assumptions…

e.g., 62 for midterm & desire ≥ B- (assume ≥ 80)

Assume 100% for lecture (20% of grade)
+ lab attendance & participation (20% of grade!)

Hope for? MT Lecture Lab

\[ X = [80 - ((0.3 \times 62) + (0.2 \times 100) + (0.2 \times 100))] / 0.3 \]

\[ X = [80 - [(18.6) + (20) + (20)]] / 0.3 \]

\[ X = [21.4] / 0.3 = 71.3 \]

Need this on final for B- for course!

…Fortunately, lecture & lab attendance buffer the grade!
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.

Cigarettes smoked/day & cardiovascular mortality!

CIGARETTES SMOKED PER DAY

CARDIOVASCULAR MORTALITY (average annual incidence per 1,000)

- None: 7
- Less than 20: 8.4
- More than 20: 12.4
- Quit one year: 7
Tobacco-free Campus

For better health, smoking and use of tobacco products are prohibited everywhere on our property.

UO's Josh Buehler  U.S. Surgeon General Regina Benjamin
An LDL to HDL ratio *greater than* 5 to 1 in men or 4.5 to 1 in women.

*Increased risk of heart disease*
Apple type of obesity predisposed to CVD!

Pear type of fat pattern...

implies lower disease risk!

Eat more apples...

to help prevent the apple type of obesity!
HEALTH-RELATED FITNESS

Cardiorespiratory Endurance

Muscular Strength/Endurance

Flexibility

Neuromuscular Relaxation
Pick an abundance of whole grains, legumes, nuts, vegetables & fruits!
Essential Fatty Acids: Ω-6 Linoleic & Ω-3 Linolenic Acids

Linoleic → Arachadonic Acid → Inflammatory Cascade

Linolenic → EPA, DHA → Anti-inflammatory
Fish Oil Intakes & Cardiovascular Death Rates

![Bar graph showing cardiovascular deaths per 100,000 population in Ireland, USA, France, and Japan. The graph indicates that Ireland has the highest rate at 0.09%, followed by the USA at 0.13%, France at 0.14%, and Japan at 0.37%.](S&W 2011 fig 5-12 p 167)
Deep cold water fish are fabulous sources of Ω-3 fatty acids!
Healthy Oils to Minimize Atherosclerosis

HAPOC?
Olive Oil Loves Olive Oil & has some heartfelt advise for Popeye!!
Yes for the spinach! — but get rid of the pipe!!
An LDL to HDL ratio of *less than* 5 to 1 in men or 4.5 to 1 in women

Reduced risk of heart disease
Break for discussion/questions!
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)

Packed cell volume, or hematocrit

LS 2012 fig 11-1
A Antigens
(Agglutinogens)
B Antigens
(Agglutinogens)
A & B Antigens
(Agglutinogens)
No Antigens
(Agglutinogens)
A Antibodies
(Agglutinins)
Clumping with anti-A serum
No Clumping with anti-A serum
Blood Type Distribution, General Population

- Type O+: 38%
- Type A+: 34%
- Type B+: 9%
- Type A-: 6%
- Type B-: 2%
- Type AB+: 3%
- Type AB-: 1%
- Type O-: 7%
Erythroblastosis Fetalis?

eg, Rh- mom Rh+ baby

Hemoglobin Structure
What a difference one amino acid can make!

Amino acid sequence of normal hemoglobin:
Val → His → Leu → Thr → Pro → Glu → Glu

Amino acid sequence of sickle-cell hemoglobin:
Val → His → Leu → Thr → Pro → Val → Glu
Megakaryocyte

Clusters of platelets about to shed off

Developing leukocyte

Cluster of developing erythrocytes

LS 2012 fig 11-6
Formation of the Platelet Plug

1. Platelets adhere to and are activated by exposed collagen at the site of vessel injury.
2. Activated platelets release ADP.
3. ADP activates other platelets passing by.
4. Newly activated platelets aggregate onto growing platelet plug and release even more platelet-attracting chemicals.
5. Normal (uninjured) endothelium releases prostacyclin and nitric oxide, which inhibit platelet aggregation, so platelet plug is confined to site of injury.
Diabetic & Normal Response to Glucose Load

![Graph showing blood glucose level over time for diabetic and normal responses.](image)
Glucose: Sugar in Blood

Normal: 70-99
Pre-Diabetes: 100-125
Diabetes: ≥ 126 mg/dL
Fig. 10-4. Amino acid sequence of a mammalian proinsulin molecule. Note how the insulin molecule can be formed by cleaving this polypeptide chain at two locations to liberate the C peptide.
**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
Times of Plenty!!

NB: Diabetics have problems either here or here.

Fox 1987

Store!
Times of Need!

Blood

Glucose

↓

Islets

A cells

Glucagon

↑

B cells

Insulin

↓

Cellular uptake of glucose

↓

Glycogenolysis

↓

Glucose

↑

Mobilize!!

Fox 1987
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!