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?

II. **CVDs Prevention & Treatment** Exercise, dietary modifications anti-inflammatory oils? PTCA, CABG,…Torstar, S&W ch 5+…

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
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 $\geq B-$ (assume $\geq 80$)

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

Hope for? MT Lecture Lab
$X = [80 - ((0.3 \times 62) + (0.2 \times 100) + (0.2 \times 100))] / 0.3$

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

$X = [21.4] / 0.3 = \boxed{71.3}$

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.

Treatment Triad

- Exercise
- Dietary Modification
- Drugs/Surgery

NB: Last blasted resort!!
**Figure 37-1** Devices for percutaneous transluminal coronary interventions. **A**, Coronary balloon. **B**, Rotational atherectomy burr (Rotablator). **C**, Coronary stent.
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UO's Josh Buehler

U.S. Surgeon General
Regina Benjamin

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September 1, 2012

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UNIVERSITY OF OREGON
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!
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!!
Fish Oil Intakes & Cardiovascular Death Rates

- **Ireland**: 0.09% Cardiovascular Deaths per 100,000 Population
- **USA**: 0.13% Cardiovascular Deaths per 100,000 Population
- **France**: 0.14% Cardiovascular Deaths per 100,000 Population
- **Japan**: 0.37% Cardiovascular Deaths per 100,000 Population

S&W 2011

fig 5-12 p 167
Essential Fatty Acids: Ω-6 Linoleic & Ω-3 Linolenic Acids

Linoleic → Arachadonic Acid → Inflammatory Cascade

Linolenic → EPA, DHA → Anti-inflammatory
Deep cold water fish are fabulous sources of \( \Omega-3 \) fatty acids!
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
Before

After
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)
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
Erythroblastosis Fetalis?

eg, Rh- mom, Rh+ baby

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
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

Blood glucose level (mg/100 ml)

Hours

Guyton & Hall 2000
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.
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.

Cellular uptake and utilization of glucose

Fox 1987
Times of Need!

Blood

↓ Glucose

Glucose

Cellular uptake of glucose

Glycogenolysis

↓ Insulin

↓ Glucagon

Islets

A cells

B cells

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!