I. Announcements
   No lab today! Break for exam week!
   Next R Blood Chemistry. Thanks sincerely for helping us
   optimize safety by reading ≥ 2x Lab 5, LM pp 5-1 thru 5-6.

II. Blood Form & Function
   LS ch 11, DC Module 5 pp 35-9
   A. Formed vs Nonformed/cells vs plasma LS fig + tab 11-1
      Cell origin - bone marrow. What’s in plasma? LS p 297
   B. Red blood cells/erythrocytes: O₂ carrying LS p 299
      Normal flexible vs fragile sickle cell LS p 301
   C. White blood cells/leukocytes: defense/immunity
      differential + general functions LS pp 298, 309-12
   D. Platelets/thrombocytes: clotting LS pp 304-6 fig 11-6+7

III. Blood Chemistry Lab: Basics
   LM + LS ch 11 & 17
   A. What’s blood typing? ABo System LS pp 302-4
      Rhesus factor? Erythroblastosis fetalis? LS p 303-4
   B. What’s blood glucose? Clinically healthy range?
   C. Diabetes + Treatment LS ch 17 pp 532-5

IV. Exam Comments & Return
   We survived the exam! Happy Halloween!!
   Remember nutrient ρ & have safe fun!
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)
Hemoglobin Structure

L Sherwood 2011 fig 11-2
What a difference one amino acid can make!

Amino acid sequence of normal hemoglobin:
Val-His-Leu-Thr-Pro-\textcolor{red}{\textbf{Glu}}-\textcolor{red}{\textbf{Glu}}

Amino acid sequence of sickle-cell hemoglobin:
Val-His-Leu-Thr-Pro-\textcolor{red}{\textbf{Val}}-Glu
Megakaryocyte

Clusters of platelets about to shed off

Developing leukocyte

Cluster of developing erythrocytes
**Platelet Plug Formation**

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.
Break for discussion/questions!
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

Erythroblastosis Fetalis or Hemolytic Disease of the Unborn/Newborn

(a) First pregnancy

Placenta

First Rh⁺ fetus

Rh⁺ antigens

Rh⁻ mother

(c) Second pregnancy

Second Rh⁺ fetus

Throw Blanket Over This Step!
Inject Mom with RhoGam ≤ 48-72 hr > each Rh+ Pregnancy

The Blanket is RhoGam → Masks the Mom’s Immune System!
Diabetic & Normal Response to Glucose Load

Blood glucose level (mg/100 ml)

Hours

Diabetes
Normal

Guyton & Hall 2000
Glucose: Sugar in Blood

Normal: 70-99
Pre-Diabetes: 100-125
Diabetes: ≥ 126 mg/dL
**Proinsulin with C-Connecting Peptide**

**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.

DO Norris 1980
NB: Diabetics have problems either here or here.

Cellular uptake and utilization of glucose

Fox 1987
1994 Diabetes Prevalence in the US by State

Source: Centers for Disease Control, Division of Diabetes Translation, [http://www.cdc.gov/diabetes/statistics](http://www.cdc.gov/diabetes/statistics), S&W 2014 fig 4-15 p139A.
2010 Diabetes Prevalence in the US by State

Key:
- Yellow: <4.5%
- Medium Blue: 4.5%–5.9%
- Light Blue: 6.0%–7.4%
- Deep Blue: 7.5%–8.9%
- Green: ≥9%

<table>
<thead>
<tr>
<th></th>
<th>Type 1</th>
<th>Type 2</th>
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<tbody>
<tr>
<td>Percentage of cases</td>
<td>5–10%</td>
<td>90–95%</td>
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<tr>
<td>Age of onset</td>
<td>&lt;30 years</td>
<td>&gt;40 years&lt;sup&gt;a&lt;/sup&gt;</td>
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<td>Associated characteristics</td>
<td>Autoimmune diseases, viral infections, inherited factors</td>
<td>Obesity, aging, inherited factors</td>
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<tr>
<td>Primary problems</td>
<td>Destruction of pancreatic beta cells; insulin deficiency</td>
<td>Insulin resistance, insulin deficiency (relative to needs)</td>
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<tr>
<td>Insulin secretion</td>
<td>Little or none</td>
<td>Varies; may be normal, increased, or decreased</td>
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<tr>
<td>Requires insulin</td>
<td>Always</td>
<td>Sometimes</td>
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<tr>
<td>Older names</td>
<td>Juvenile-onset diabetes</td>
<td>Adult-onset diabetes</td>
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<tr>
<td></td>
<td>Insulin-dependent diabetes mellitus (IDDM)</td>
<td>Noninsulin-dependent diabetes mellitus (NIDDM)</td>
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</table>

<sup>a</sup> overweight
### Table 4–9

**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!
Exercise is a must based on its insulin-like effect!
Class Frequency Distribution Report for BI 121 Exam I F18, Multiple Choice, Part II

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<td>0.00 - 23.99</td>
<td>35</td>
<td>20.00</td>
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</tbody>
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Mean Score: 69.76%
WOW!  SUPER 😊
~ TOP 5-10

EXCELLENT!!
~ TOP 15

GREAT EFFORT
~ TOP 20-25