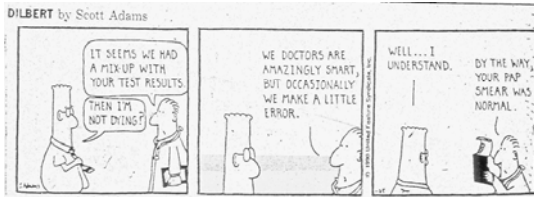


Why Basic Labs Require Advanced Interpretation

Jo Stecher PhD, RN, CCTC





Introduction

- Labs change and are affected all of the time-
 - Diseases
 - Pharmaceuticals


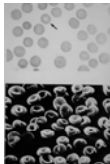


Look for a State of Balance




Red Blood Cell Count

- Males- 4.6-6.0 mill/mcL
- Females- 4.0-5.0 mill/mcL
- Life span of ~120 days
- Formed in the bone marrow
 - Involve hemoglobin transport to deliver oxygen to the tissues




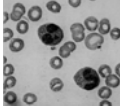
The H & H

<ul style="list-style-type: none">• Hemoglobin<ul style="list-style-type: none">– Males- 13.5-17.0 g/dL– Females- 12.0-15.0 g/dL– Oxygen carrying pigment– Made up of amino acids	<ul style="list-style-type: none">• Hematocrit<ul style="list-style-type: none">– Males- 40- 54%– Females- 38-0.47• Proportion of red cells in whole blood related to plasma
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The White Blood Cell Count

- Range- 4,500-11,000/ mm^3
- Two tests
 - Total count
 - Differential
- Detects the presence of infections or specific hematological diseases
- *Warning--* <500 / mm^3




The Differential

- Mononuclear cells (Nongranulocytes)
 - Monocytes
 - Lymphocytes
- Polymorphonuclear (Granulocytes)
 - Neutrophils
 - Eosinophils
 - Basophils




Granulocytes

- Neutrophils
 - 50-70% of total WBC
 - Segments- 50-65%
 - Bands- 0-5%
- Eosinophils
 - 1-3%
- Basophils
 - 0.4-1.0%




Nongranulocytes

- Monocytes
 - 4-6%
- Lymphocytes
 - 35-35%
 - Made up of *B* cells
 - T cells
 - Helper T
 - Cytotoxic T




What is a Shift?

- Shift to the Left-
 - Term used in connection with the white blood cells (neutrophils) that generally increase in their numbers and in their precursor more primitive forms in many disease processes
 - An increase in the number of immature neutrophils




What is a Shift?

- Shift to the Right-
 - Term used in connection with the white blood cells (neutrophils) that generally increase in their numbers
 - An increase in the number of mature neutrophils




Pharmaceuticals that Affect Hematology Lab Values

- Calcineurin Inhibitors
 - Cyclosporine
 - Prograf
- Antiproliferatives
 - Azathioprine
 - Mycophenolate mofetil




Pharmaceuticals that Affect Hematology Lab Values

- Rapamycin Inhibitors
 - Sirolimus
- Corticosteroids
 - Prednisone, Solu-medrol
- Anti-infectives
 - Bactrim or Septra




Pharmaceuticals that Affect Hematology Lab Values

- Antivirals
 - Valganciclovir
 - Ganciclovir
 - Valacyclovir
 - Cytomegalovirus immunoglobulin
- ACE Inhibitors
- Angiotensin-receptor blockers




The Basic Metabolic Panel

- **Na⁺ 135-145mmol/L**
 - May be low after renal tx due to decreased concentrating abilities of a new kidney
- **K⁺ 3.5- 5.0mmol/L**
 - May be high after renal tx due to delayed function of a new kidney, multiple blood transfusions, or diuresis
 - May be low after liver tx due to preservation solution




The Basic Metabolic Panel

- **Blood Urea Nitrogen 5-25mg/dL**
 - Breakdown product of protein
 - Nitrogen portion formed in the liver
 - Azotemia
 - May be elevated in kidney disease
 - Decreased in liver disease= high ammonia levels




The Basic Metabolic Panel

- **Creatinine 0.5-1.5 mg/dL**
 - Excreted via glomerular filtration
 - Proportional to muscle mass
- **Glucose 60-110 mg/dL**
 - Main source of cellular energy
 - Elevated in liver tx indicates liver is converting glucose to glycogen




Creatinine Clearance

- Dependent on the GFR
 - Involves measurement of blood and urine to determine the rate creatinine is cleared
 - $GFR = \frac{(140 - \text{age}) \times \text{body weight/kg}}{\text{Serum creatinine/mg/dL}} \times 72$




Liver Function Tests

- Total Bilirubin 2-21 *umol/L*
- Aspartate aminotranferase 20-48 *U/L*
- Alanine aminotranferase 10-40 *U/L*
- Alkaline phosphatase 42-136 *U/L*
- *All elevated in liver diseases*



Pharmaceuticals that Affect Chemistry Values

- Calcineurin Inhibitors
 - Cyclosporine
 - Prograf
- Corticosteroids
 - Prednisone, Solu-medrol
- Anti-infectives
 - Bactrim or Septra



Pharmaceuticals that Affect Chemistry Values

- Thiazide Diuretics
 - Diuril
- ACE Inhibitors
- Anti-fungals
 - Amphotericin B



Pharmaceuticals that Affect Renal Values

- Calcineurin Inhibitors
 - Cyclosporine
 - Prograf
- Angiotensin-receptor blockers
- Anti-fungals
 - Amphotericin B



Pharmaceuticals that Affect Liver Functions

- Calcineurin Inhibitors
 - Cyclosporine
 - Prograf
- Rapamycin Inhibitors
 - Sirolimus
- Corticosteroids
 - Prednisone, Solu-medrol
- Antiproliferatives
 - Azathioprine



Pharmaceuticals that Affect Liver Functions

- Anti-infectives
 - Dapsone
 - Atovaquone
- Anti-fungals
 - Ketoconazole
- Anti-virals
 - Acyclovir Sodium



Pharmaceuticals and Labs

- Through the looking glass and beyond