Interpreting Blood Counts

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Interpreting Blood Counts

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Interpreting Blood Counts

The machine will measure:
1. Amount of hemoglobin per unit volume (Hb g/L)
2. Number of red blood cells per unit volume (RBC x 10^12/L)
3. Size of the red blood cells (MCV fL)
4. Number of white blood cells per unit volume (WBC x 10^9/L)
5. Number of platelets per unit volume (platelets x 10^9/L)
6. Differential WBC if no abnormal cells are present (absolute numbers of the various white blood cells)
7. Reticulocyte count (x 10^9/L – the number of young [<48 h] red cells)

Interpreting Blood Counts

The blood film

Microscopic examination of the blood film gives information about the appearance of the blood cells, and a differential WBC even in the presence of abnormal white cells

Interpreting Blood Counts

How to look at the blood count

1. Concentrate on the Hb, MCV, WBC, and Platelets. If all four are normal, then significant blood disease is unlikely to be present
2. If the Hb is low LOOK AT THE MCV and the reticulocyte count
3. Examine the differential
4. Read the report on the blood film
Normal Hemoglobin Values compared with normal adult females

<table>
<thead>
<tr>
<th>Group</th>
<th>Hemoglobin</th>
<th>MCV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonates</td>
<td>High: falls over 3-6 months</td>
<td>High: falls over 3-6 months</td>
</tr>
<tr>
<td>Children and younger teens</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Adult males</td>
<td>Higher by about 20 (testosterone)</td>
<td>Normal</td>
</tr>
<tr>
<td>Elderly both sexes</td>
<td>Often lower without obvious illness</td>
<td>Normal</td>
</tr>
</tbody>
</table>

Microcytic (low MCV) Anemia
3 important causes

- Iron deficiency
- Hemoglobinopathy
- Anemia of Chronic Disease (some cases)

Macrocytic Anemia

- Megaloblastic
  - B₁₂ or folate deficiency
- Non-megaloblastic
  - eg liver disease, myelodysplasia, ethanol

Normocytic Anemia

- Underproduction of erythrocytes
  - Anemia of Chronic Disease
  - Marrow Failure
  - Renal failure
- Loss or destruction of erythrocytes
  - Hemolysis
  - Blood loss (acute only)

9. Recognizing hemolysis

a. raised reticulocyte count
b. decreased serum haptoglobin concentration
c. raised Lactate Dehydrogenase (LDH)
d. blood film may show specific abnormality (e.g. spherocytes or fragments)
Hypochromic microcytic red cells

Macrocytic red cells

Dual red cell population ('dimorphic')

Reticulocyte

Spherocytes

Sickle Cell
**10. Leukocytes and platelets**

<table>
<thead>
<tr>
<th>Problem</th>
<th>1st Marrow Disorder</th>
<th>Additional findings</th>
<th>Reactive or Destructive</th>
<th>Additional findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>High WBC</td>
<td>Leukemia etc</td>
<td>Abnormal WBC (e.g. blasts)</td>
<td>Infection, neoplasia, inflammation</td>
<td>↑Neutrophils toxic and 'left-shifted'</td>
</tr>
<tr>
<td>Low WBC</td>
<td>Marrow failure (e.g. MDS)</td>
<td>Pancytopenia is usual</td>
<td>Infection, hypersplenism</td>
<td>Often none</td>
</tr>
<tr>
<td>Increased Platelets</td>
<td>Myeloproliferative disorder e.g. P vera</td>
<td>Giant and abnormal platelets</td>
<td>Infection, bleeding, neoplasia, inflammation</td>
<td>May be neutrophilia and left shift</td>
</tr>
<tr>
<td>Decreased platelets</td>
<td>Marrow failure e.g. MDS</td>
<td>Pancytopenia is usual</td>
<td>Immune (ITP)</td>
<td>None</td>
</tr>
</tbody>
</table>

- **Bite Cells**
- **Red cell fragments**
- **Neutrophilia**
- **Döhle bodies in cytoplasm**
- **Band cell with toxic granulation and vacuoles**
Lymphocytosis
Thrombocytosis
Thrombocytopenia
Glossary
Blast Cell
Howell-Jolly Bodies
Case 1

A 55 year old woman has developed severe alcoholic liver cirrhosis

She is pale and deeply jaundiced. She has spider nevi, red palms and ascites. Her spleen can be felt 8 cm below the left costal margin, and her liver is enlarged and firm, 7 cm below the right costal margin.
Case 1

WBC x 10⁹/L 3.0 [4-11]
Hb g/L 50 [120-160]
MCV fl 96 [79-98]
Platelets x 10⁹/L 58 [150-450]
Reticulocytes x 10⁹/L 300 [20-80]
Neuts x 10⁹/L 1.3 [2-7.5]
Lymphs x 10⁹/L 1.5 [1.5-4]
Monos x 10⁹/L 0.2 [0.2-0.8]
Nucleated RBC x 10⁹/L 0.1 [0]

Film Comment: Numerous acanthocytes - ?spur cell hemolytic anemia

Haptoglobin < 0.1 g/L (normal)
LDH 850 u/L (normal 94-178)

Case 2

A black female walks in to the ER complaining of fatigue. She has recently immigrated from Tropical Africa.

She has pale mucous membranes, tachycardia, a dynamic apex beat, and a systolic ejection murmur at the apex of the heart.

WBC x 10⁹/L 5.0 [4-11]
Hb g/L 43 [120-160]
MCV fl 56 [79-98]
Platelets x 10⁹/L 750 [150-450]
Reticulocytes x 10⁹/L 10 [20-80]
Neuts x 10⁹/L 2.0 [2-7.5]
Lymphs x 10⁹/L 1.5 [1.5-4]
Monos x 10⁹/L 0.2 [0.2-0.8]
Eos x 10⁹/L 1.3 [0-0.7]
Basos x 10⁹/L - [0-0.1]

Film Comment: severe microcytic anemia
Case 2

Ferritin 2 (normal 20-400)