Benign Leukocytoses

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1. Neutrophilia
   - Neutrophils fight infection, participate in inflammatory responses
   - Bone marrow
     - Most neutrophils live here
     - All stages of maturation
   - Blood
     - Only 5% of all neutrophils are here
     - Normally only segmented neutrophils
     - Half are margination

2. Lymphocytosis
   - Bone marrow
   - Most lymphocytes live here

3. Basophilia
   - Bone marrow
   - Most basophils live here

4. Monocytosis
   - Bone marrow
   - Most monocytes live here

5. Eosinophilia
   - Bone marrow
   - Most eosinophils live here

6. Mature neutrophilia
   - Bone marrow
   - Many mature segmented neutrophils

7. Immature neutrophilia
   - Bone marrow
   - Many immature neutrophils
**Causes of Mature Neutrophilia**

- Infection (bacterial)
- Inflammation
- Physiologic things
  - Stress
  - Hormones

**Toxic Changes**

- Seen only in infection!
- Toxic granulation, Döhle bodies, cytoplasmic vacuolization
- Scariest: cytoplasmic vacuolization

*Normal neutrophil (top left) Neutrophil with toxic granulation*  

*Promyelocyte*  

*Döhle bodies*  

*Cytoplasmic vacuolization*
Causes of Immature Neutrophilia

- Infection (bacterial)
- Inflammation
- Severe anemia
- Something filling up the marrow

Three Forms of Immature Neutrophilia

- Left shift

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- Left shift
- Leukemoid reaction
- Leukoerythroblastotic reaction
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Three Forms of Immature Neutrophilia

- Left shift
- Leukemoid reaction
- Leukoerythroblastotic reaction
  - Due to something malignant
  - Due to something benign

Lymphocytosis

- Lymphocytes fight infection, participate in immunologic responses
- Normal lymphocyte count
  - Varies a lot with age!
  - Bigger normal range in infants
- Normal immunophenotype in blood
  - T cells: 80%
  - B cells: 15%
  - NK cells: 5%

Types of Lymphocytosis

- Mature (lots of mature lymphocytes)
- Reactive (lots of funny-looking lymphocytes)

Mature lymphocytosis

Reactive lymphocytosis
Causes of Mature Lymphocytosis

- Infectious lymphocytosis
- Bordetella pertussis
- Transient stress

Causes of Reactive Lymphocytosis

- Infectious mononucleosis
- Pediatric viral infections
- Viral hepatitis
- Immune disorders

Other Benign Leukocytoses

- Basophilia
- CML
- Eosinophilia
- Drugs
- Asthma
- Skin diseases
- Parasites
Other Benign Leukocytoses

- Basophilia
- Eosinophilia
- Monocytosis
  - Infection
  - Autoimmune disease
  - Malignancy

- Eosinophilia

- Monocytosis