

## Hematopathology on One Piece of Paper

### Peripheral Blood

Normal counts: 5K WBC, 250K PLT, 5M RBC, 50K reticulocytes; MCV 82-98 fL in adults

Low counts –

1. Are all counts low or just one lineage?

Single Lineage	All Counts
Specific nutrient (e.g. Fe)	Nutritional (B12/folate)
Lineage specific toxin (e.g. Pb)	Meds
Autoimmune	Infection
Consumption/Splenic sequestration	Ineffective hematopoiesis (MDS)
Early MDS or marrow failure syndrome	Marrow infiltration (fibrosis, acute leukemia, lymphoma, metastatic tumor)

2. What is the reticulocyte count – is the marrow responding to anemia?
3. Are there critters in RBCs or WBCs?

Anemia specific –

4. What is the MCV?

Microcytic – Can't fill the bag with hemoglobin	Normocytic	Macrocytic
Fe deficiency	Blood loss	B12/Folate/Toxin e.g. arsenic or drug
Chronic disease (high hepcidin)	RBC destruction (autoimmune, membrane, enzyme)	MDS
Thalassemias	Renal failure	EtOH
Pb poisoning	Tumors	Hypothyroid
		Large # reticulocytes

High counts –

Cell Type	Reactive	Neoplastic
RBC	Thal Trait (low MCV) Hypoxia	Polycythemia Vera (PV, JAK-2 positive)
PLT	Fe defic., inflammation, other tumor	CML, ET, PV, PMF
Neutrophils	Infection, other tumor	CML, PV, PMF, CMML
Monocytes	TB, other infections, early recovery from BM insult	CMML, other MPDs, monocytic AML
Lymphocytes	EBV, Pertussis, other virus (young), smoking (young women)	CLL, LGL leukemia, peripheralizing lymphoma (older)
Eosinophils	Asthma, parasites, HES?	CML, other MPDs, specific PDGF-related translocations, certain AML cases (e.g. inv 16)
Basophils	None	CML, other MPDs

## Bone Marrow

Cellularity normally approximately 100-age = % cellularity

Myeloid : Erythroid ratio typically 2-3:1 with mature cells >> immature cells

Blasts = approx. 1%

Plasma cells = 1-5%

Looking at a marrow:

1. Are important cells like blasts and plasma cells increased?
2. Are the findings matched to the peripheral counts or mismatched? – Mismatches suggest ineffective hematopoiesis or peripheral destruction of cells
  - a. Low PLT, but increased megakaryocytes
  - b. Pancytopenia but hypercellular marrow
3. How is the morphology – erythroids w/ round nuclei with appropriate maturation, megakaryocytes with appropriately hyperlobulated nuclei and large size, myeloids with proper granulation and nuclear maturation (e.g. no giant bands)?
4. Is the architecture right – erythroids in little groups and myeloids maturing from the bones outward?
5. Are there cells that don't belong? Lymphocyte aggregates, mast cells, metastatic cells, granulomata
6. Ask yourself if you have answered the question that prompted the biopsy, and if not, state that rather than providing a descriptive diagnosis only.

## Lymph Nodes

1. Architecture normal or abnormal
  - a. Germinal centers and paracortical areas with vascular-rich medulla?
  - b. Germinal center – mantle zone borders crisp and regular?
  - c. Germinal centers contain morphologically variable cells and tingible body macrophages?
  - d. Mantle (and potentially marginal) zones normally sized?
  - e. Are there big weird cells?
  - f. Histiocytes, granulomata, necrosis, funny looking cells in sinuses?
2. If abnormal, what is the pattern and size of the cells present, homogenous or heterogenous?

Resources:

Hematology Outlines Free App for iPhone/iPad

An old but good flow chart of lymphoma/leukemia flow phenotypes:

<http://web2.airmail.net/uthman/cdphobia/cdphobia.html>

Image Bank of the Amer. Soc. Of Hematology: <http://imagebank.hematology.org>

ASH Education Book Archive – many nice reviews on various heme topics:

<http://asheducationbook.hematologylibrary.org>

CDC Atlas of Blood (and other) Parasites: <http://www.dpd.cdc.gov/dpdx/default.htm>