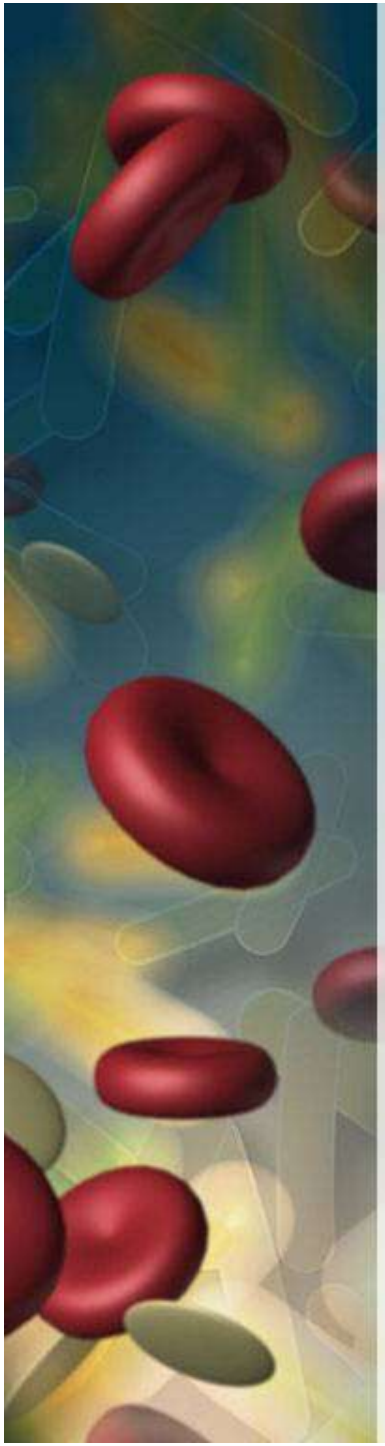
Practical Hematology
Leukopenia

Wendy Blount, DVM



Practical Hematology

1. Anemia 101
2. Blood Loss Anemia
3. Hemolysis
4. Non-Regenerative Anemia
5. Transfusion Medicine
6. Polycythemia
7. Bone Marrow Disease
8. Coagulopathy
9. Central IV Lines
10. Leukophilia
11. Leukopenia
12. Splenic Disease

James Bielfeldt

Gladewater **TX**

Nikki

4 year old neutered male poodle – 15 lbs

CC: fever & not feeling well, low white count

Responds temporarily to antibiotics, then relapses – 30 day duration

- Referred for further evaluation

Exam: T 101.9^{o}F, RR pant, P 154 bpm

- Hyperdynamic pulses, injected mucous membranes

GlobalFAST® ultrasound

- *VetBLUE®* dry lungs all 4 points
- *TFAST®* no pleural effusion, no pneumothorax, normal echo views
- *AFAST®* normal GB, normal cava, AFS=0

Nikki

CBC: HCT 32%, WBC 800/ul

Panel: SAP 282 U/L

UA: no abnormalities, USG 1.035

Occult HW: negative – current

Fecal flotation & direct smear: negative

Thoracic & Abdominal Radiographs: normal

Complete Abdominal ultrasound: normal

Urine culture: negative

Bone Marrow Cytology: M:E ratio 1:5

- Myeloblasts, promyelocytes and myelocytes in normal pyramid of maturation
- Very few metamyelocytes, bands or segs
- Increased iron stores

Nikki

Bone Marrow Histopath: no neoplasia

DDx:

Granulocytic maturation arrest

- Immune mediated neutropenia

Dx: mild anemia of chronic inflammatory dz

Tx:

- Neupogen® - filgastrim, GCSF 35 ug SC daily
- Amoxicillin 150 mg PO BID, Enrofloxacin 34 mg PO SID
- Doxycycline 25 mg PO BID x 3 weeks

Recheck 7 days: Exam normal, doing well

- **CBC:** HCT 32%, segs 750/ul
- **Bone Marrow Cytology:** no change
- **Blood culture with ARD:** negative

Nikki

Tx:

Prednisone 20 mg PO SID

Amoxicillin 150 mg PO BID

- Enrofloxacin 34 mg PO SID

Recheck 7 days: Exam normal, doing well

- **CBC:** HCT 32%, segs 22,550/ul

Tx:

- Prednisone 15 mg PO SID x 2 weeks

Recheck 7 days: Exam normal, doing well

- **CBC**: normal

Dx:

- Immune mediated neutropenia

Nikki

Tx:

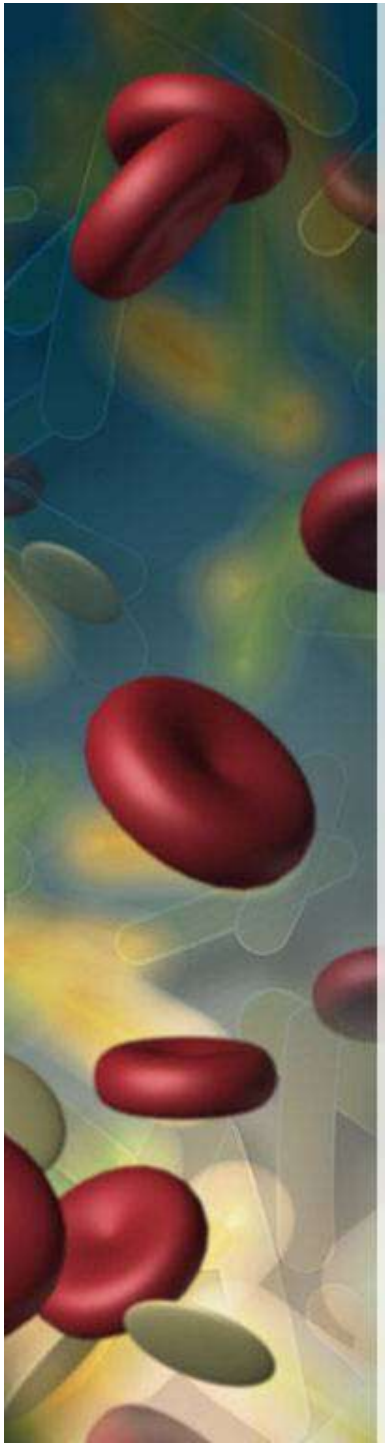
Prednisone 10 mg PO SID x 30 days

Prednisone 7.5 mg PO SID x 30 days

- Prednisone 5 mg PO SID x 30 days
- Prednisone 2.5 mg PO SID x 30 days

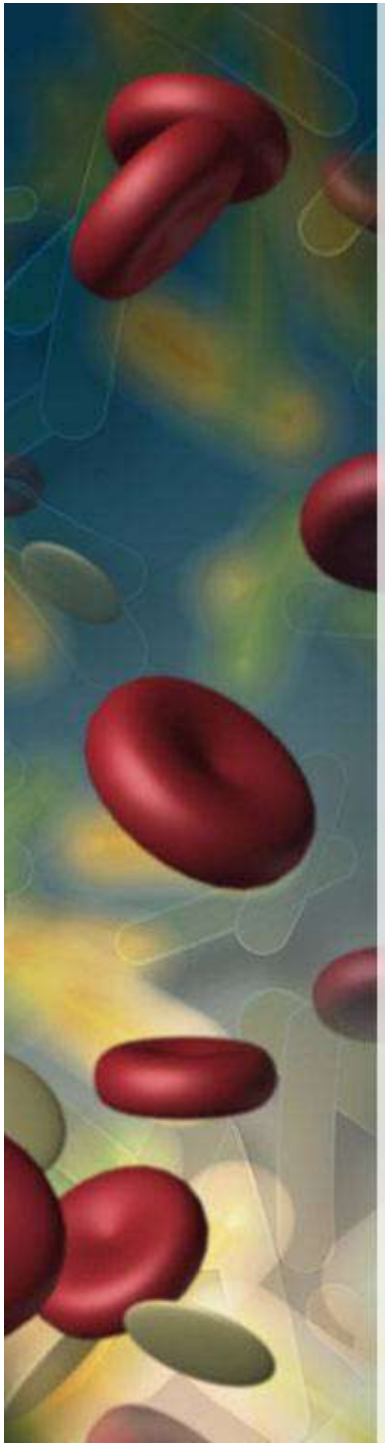
Recheck CBC 1 and 3 weeks after each medication reduction

Neutropenia resolved and did not recur



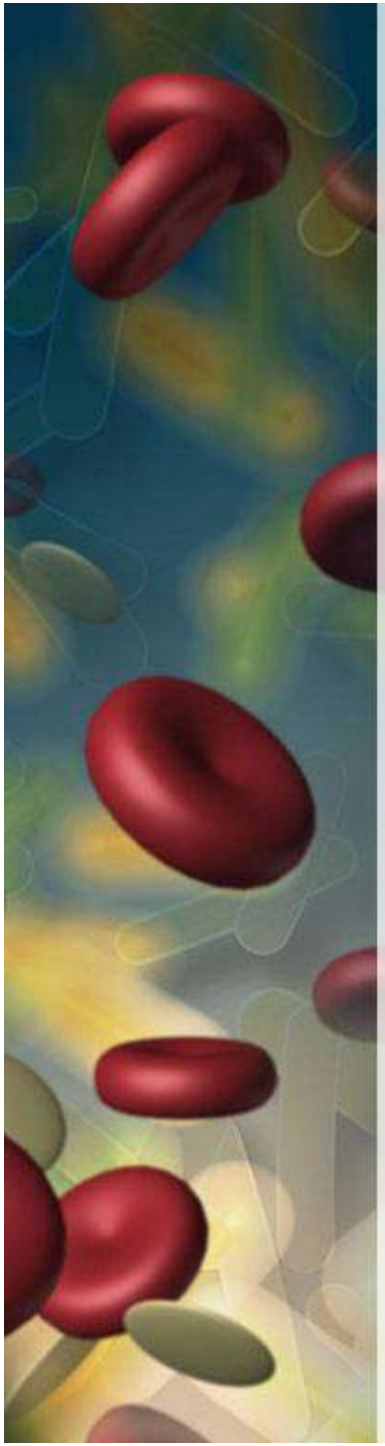
Neutropenia

- **DDx:**
  - Excessive peripheral consumption
    - Infection
    - Necrosis
    - IM neutropenia
  - Bone marrow disease
    - See non-regenerative anemia
  - Test for parvovirus
    - Diarrhea
    - < 2 years of age or immunosuppressed
    - Swab tonsils then rectum - CITE



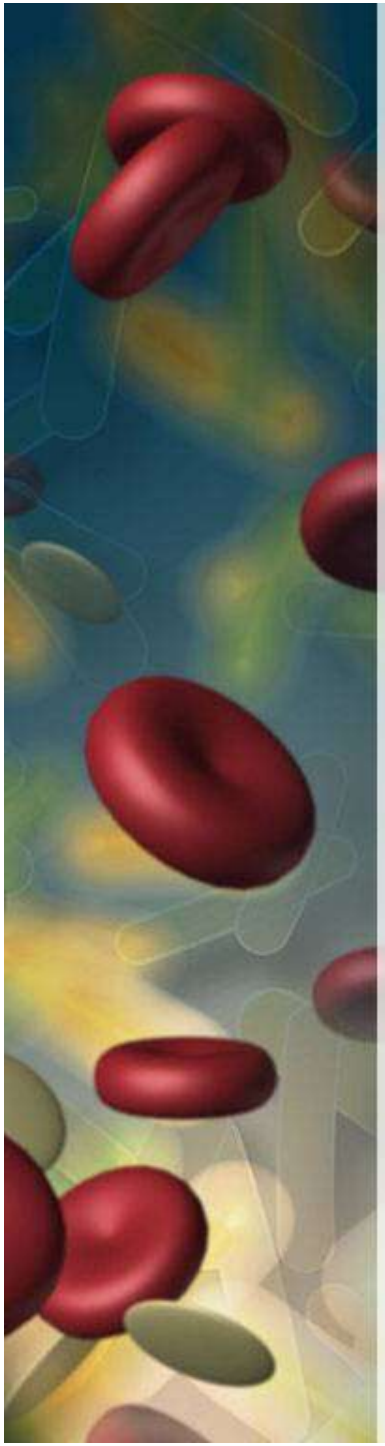
Neutropenia

- **Treatment**
  - Treat obvious causes of infection, necrosis or inflammation
  - If no obvious causes, work up for occult infection
  - Discontinue myelosuppressive drugs
  - Prophylactic antibiotics
    - 1500-2000/ul - amoxicillin
    - <1500/ul – amoxicillin and quinolone
      - Clindamycin and quinolone
      - Metronidazole and quinolone
    - If septic, IV antibiotics



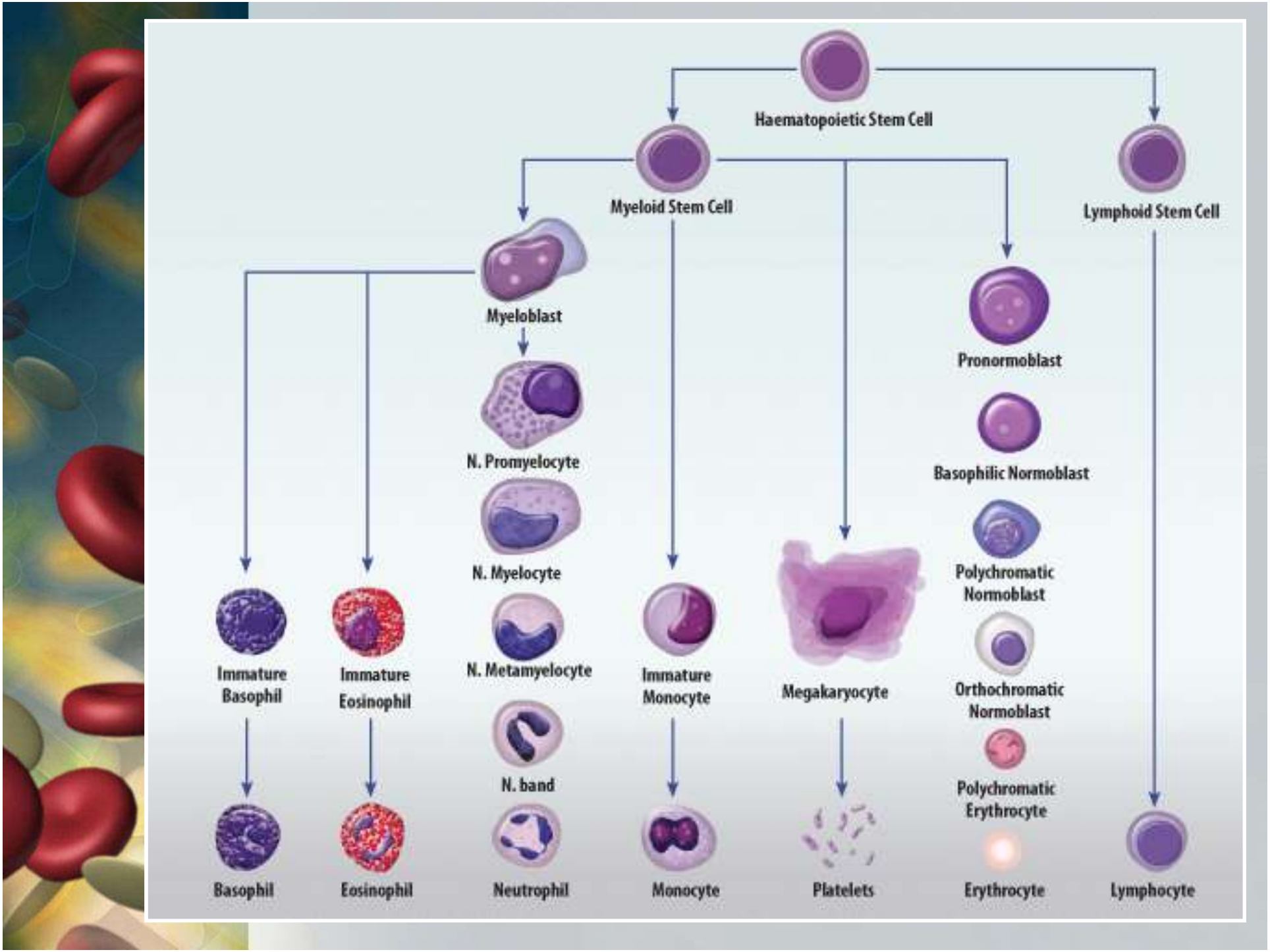
Neutropenia

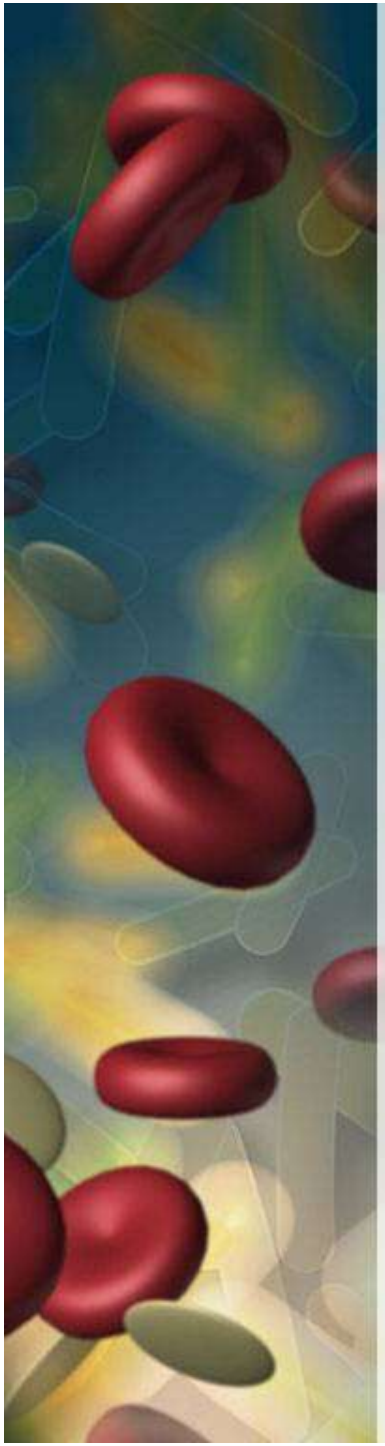
- **Treatment**
  - Recheck CBC weekly
  - Bone marrow sampling of no response
    - Sooner if bicytopenia or pancytopenia
    - FeLV IFA/PCR in cats
  - Neupogen if maturation arrest
    - GCSF - Granulocyte colony stimulation factor (filgastrim)
  - Doxycycline then Immunosuppressive therapy for IM neutropenia



Degenerative Left Shift

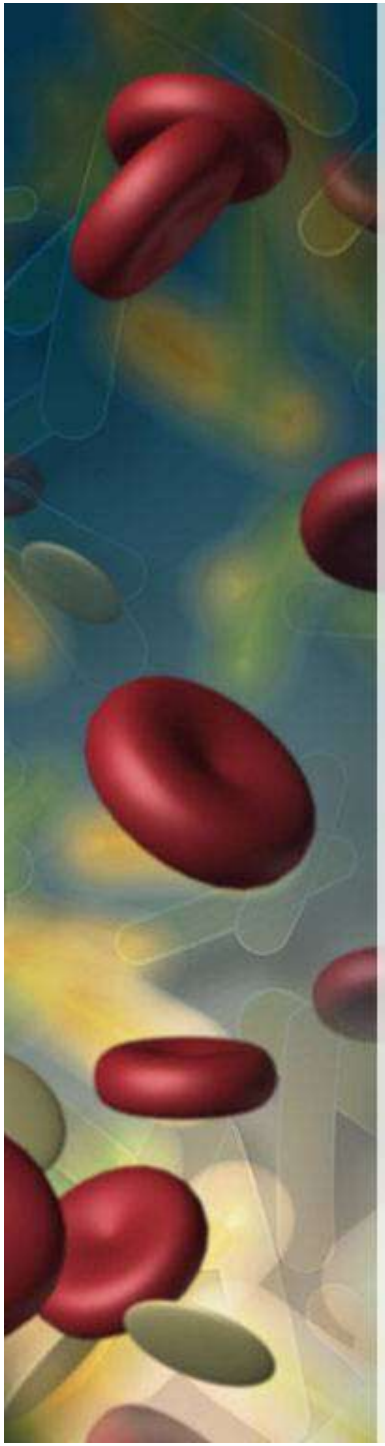
- Due to overwhelming inflammation
  - Normal pyramid of maturation is interrupted in the peripheral blood and bone marrow
  - So there are more young cells than mature
  - Usually, the more mature forms are more plentiful
    - Most Segs
    - Then bands
    - Then metamyelocytes
    - Then myelocytes – marrow only
    - Then promyelocytes – marrow only
    - Fewest myeloblasts – marrow only


Haematopoietic Stem Cell
Myeloid Stem Cell
Lymphoid Stem Cell
Myeloblast
N. Promyelocyte
N. Myelocyte
N. Metamyelocyte
N. band
Neutrophil
Immature Basophil
Basophil
Immature Eosinophil
Eosinophil
Immature Monocyte
Monocyte
Megakaryocyte
Platelets
Pronormoblast
Basophilic Normoblast
Polychromatic Normoblast
Orthochromatic Normoblast
Polychromatic Erythrocyte
Erythrocyte
Lymphocyte



Lymphopenia (& Eosinopenia)

- Severe stress
- corticosteroid administration
- Hyperadrenocorticism
- Some viral infections
  - FIP
  - Infectious canine hepatitis
  - Canine distemper virus
  - Parvovirus
  - Coronavirus
- Acute inflammation
- Loss of lymphocyte rich lymph
  - Chylothorax
  - Protein losing enteropathy, lymphangiectasia
  - Lymphatic disruption by infection, inflammation, neoplasia

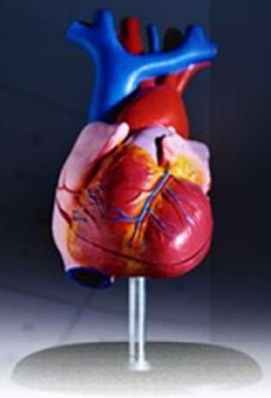


Leukocyte Function Defects

- Canine CD11/CD187 Adhesion Protein Deficiency (CLAD)
- Chronic granulomatous Disease in Doberman Pinschers
- Myeloperoxidase deficiency
- Recurring infections in Weimeraners
- Congenital myelodyplasias
- **Pups die at a young age**

- Acquired neutrophil dysfunctions
  - FeLV, FIV and other immunosuppressive diseases

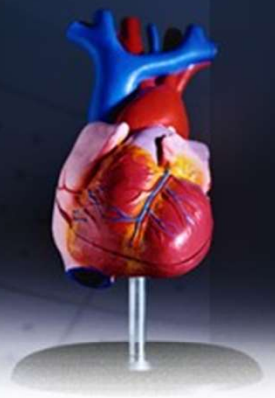
Cyclic Neutropenia



Aka gray collie syndrome, cyclic hematopoiesis

- Autosomal recessive in gray collies
- Neutropenia as low as 200/ul every 10-12 days
- Puppies usually smaller than littermates and show signs of infection by 8-12 weeks of age
  - Fever, diarrhea, joint pain, pneumonia, pyoderma
- Untreated, will eventually die of sepsis
- All cell lines affected, but because cycle is short, RBC and platelet decreases are less clinically significant
- Can be seen with longer cycle in FeLV+ cats and after cyclophosphamide treatment in some dogs

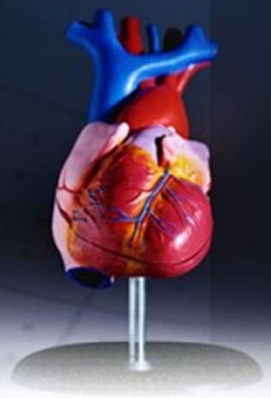
Cyclic Neutropenia



Aka grey collie syndrome, cyclic hematopoiesis

- Gray merle and sable merle collies, not blue merle or tricolor merle collies (dilute -- no black or dark red)
- Gray/brown nose rather than black nose - pathognomonic
- A few have responded well to gene therapy
- Several doses lentivirus coded with GCSF (WSU)

Cyclic Neutropenia



Sugar

Treated at WSU as a puppy and then retuned to owner

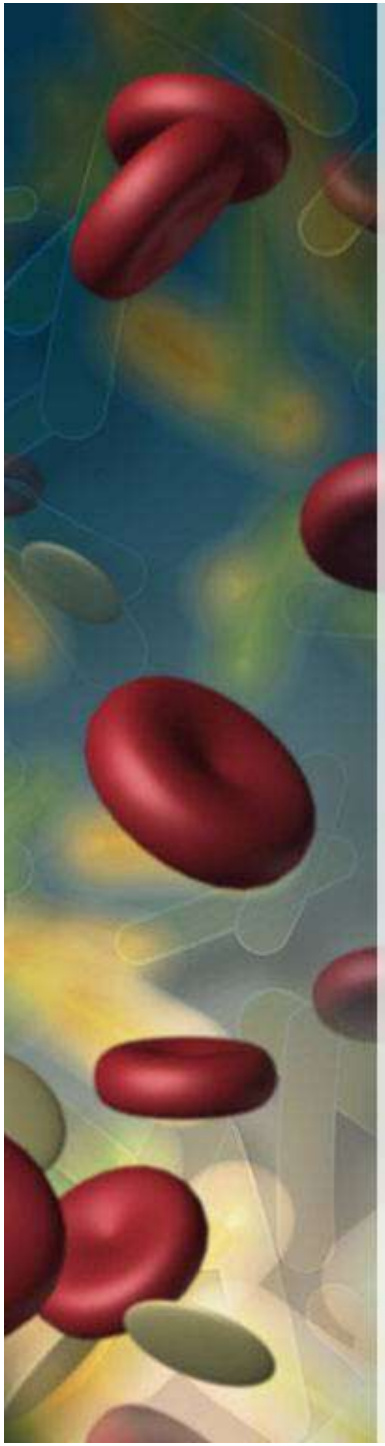
No further treatment until time of death

Died of liver cancer at 5 years old

Summary

PowerPoints - Leukopenia

- .pptx
- .pdfs – 1 and 6 slides per page



Acknowledgements

Chapter 2: The Complete Blood Count, Bone Marrow Examination, and Blood Banking

- Douglass Weiss and Harold Tvedten
- Small Animal Clinical Diagnosis by Laboratory Methods, eds Michael D Willard and Harold Tvedten, 5th Ed 2012

Chapter 4: Leukocyte Disorders

- Harold Tvedten and Rose Raskin
- Small Animal Clinical Diagnosis by Laboratory Methods, eds Michael D Willard and Harold Tvedten, 5th Ed 2012