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VETERINARY MEETING & EXPO

# Old dogs, new tricks: Canine hematology secrets

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Laboratory Retrievers

Animals can't hide their objective data

# Conflict of Interest Disclosure:

We have financial interest, arrangement or affiliation with:

| Speaker | Name of Organization | Relationship |
|---|---|---|
| Fred Metzger | IDEXX | Speaker |
| Dennis B. DeNicola | IDEXX | Speaker |

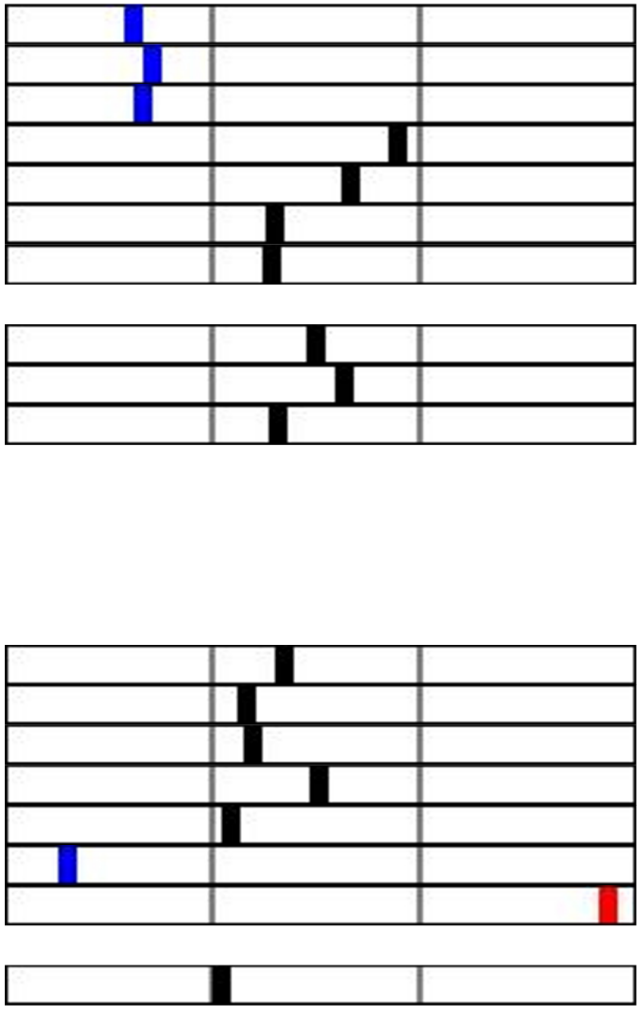
# Complete Blood Count

**Erythrogram**
- RBC mass
- RBC morphology
- Objective measure of BM response Fe availability

**Leukogram**
- WBC mass
- WBC relative distribution
- WBC absolute distribution

**Thrombogram**
- PLT mass
- PLT morphology
- PLT mass

| | | | |
|---|---|---|---|
| RBC | 4.30 M/µL | 5.65 - 8.87 | LOW |
| HCT | 31.1 % | 37.3 - 61.7 | LOW |
| HGB | 10.5 g/dL | 13.1 - 20.5 | LOW |
| MCV | 72.3 fL | 61.6 - 73.5 | |
| MCH | 24.4 pg | 21.2 - 25.9 | |
| MCHC | 33.8 g/dL | 32.0 - 37.9 | |
| RDW | 16.0 % | 13.6 - 21.7 | |
| %RETIC | 1.4 % | | |
| RETIC | 61.5 K/µL | 10.0 - 110.0 | |
| RETIC-HGB | 27.0 pg | 22.3 - 29.6 | |
| WBC | 8.81 K/µL | 5.05 - 16.76 | |
| %NEU | 68.0 % | | |
| %LYM | 20.2 % | | |
| %MONO | 4.1 % | | |
| %EOS | 7.6 % | | |
| %BASO | 0.1 % | | |
| NEU | 5.99 K/µL | 2.95 - 11.64 | |
| LYM | 1.78 K/µL | 1.05 - 5.10 | |
| MONO | 0.36 K/µL | 0.16 - 1.12 | |
| EOS | 0.67 K/µL | 0.06 - 1.23 | |
| BASO | 0.01 K/µL | 0.00 - 0.10 | |
| PLT | * 63 K/µL | 148 - 484 | LOW |
| MPV | 23.7 fL | 8.7 - 13.2 | HIGH |
| PDW | --.-- fL | 9.1 - 19.4 | |
| PCT | 0.15 % | 0.14 - 0.46 | |



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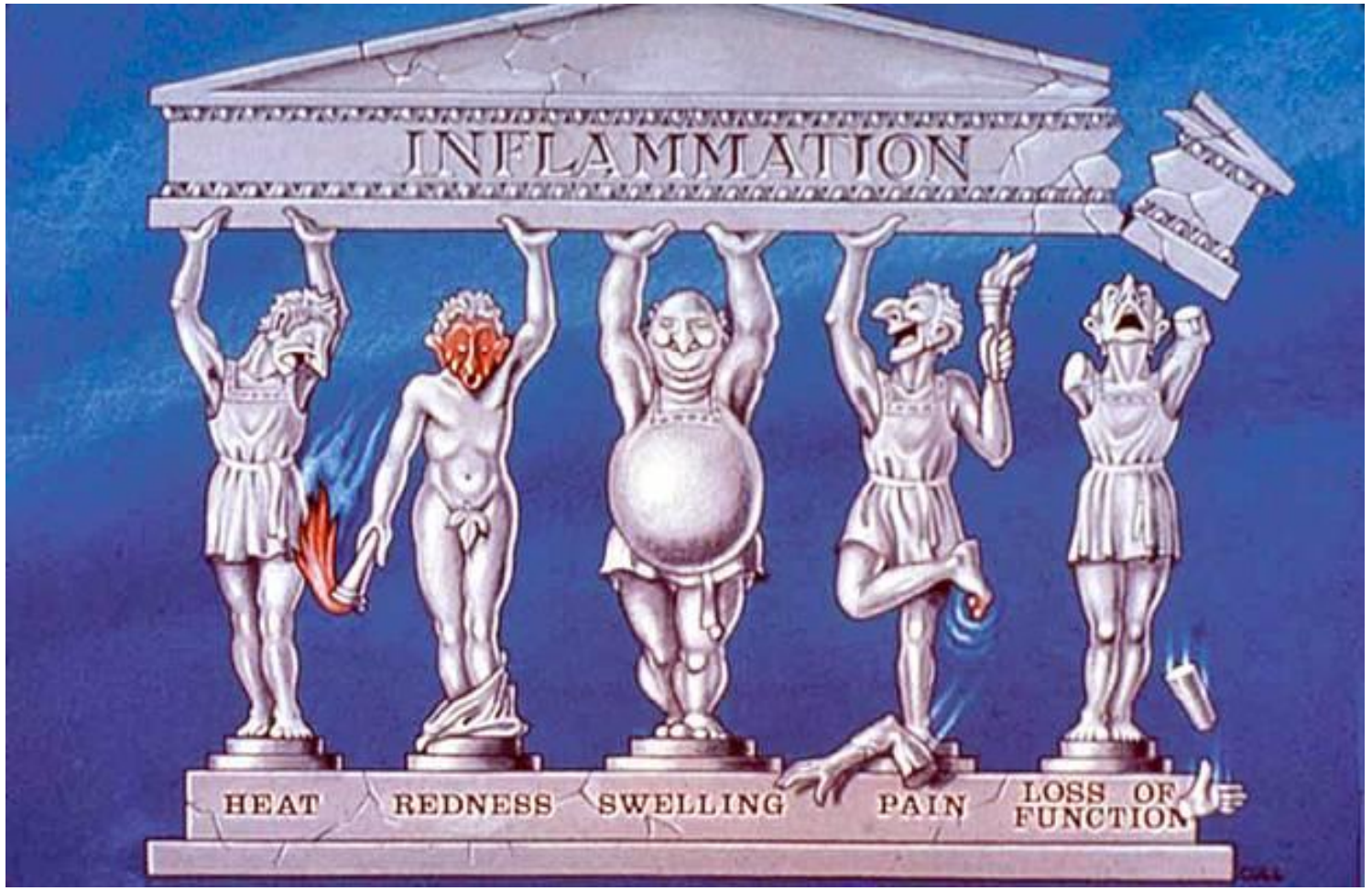
# Complete Blood Count

| | | | |
|---|---|---|---|
| WBC | 8.81 K/µL | 5.05 - 16.76 | |
| NEU | 5.99 K/µL | 2.95 - 11.64 | |

*More than 50% of cases with neutrophilic inflammation have total WBC counts within refererence interval limits*

# Clinical signs of inflammation



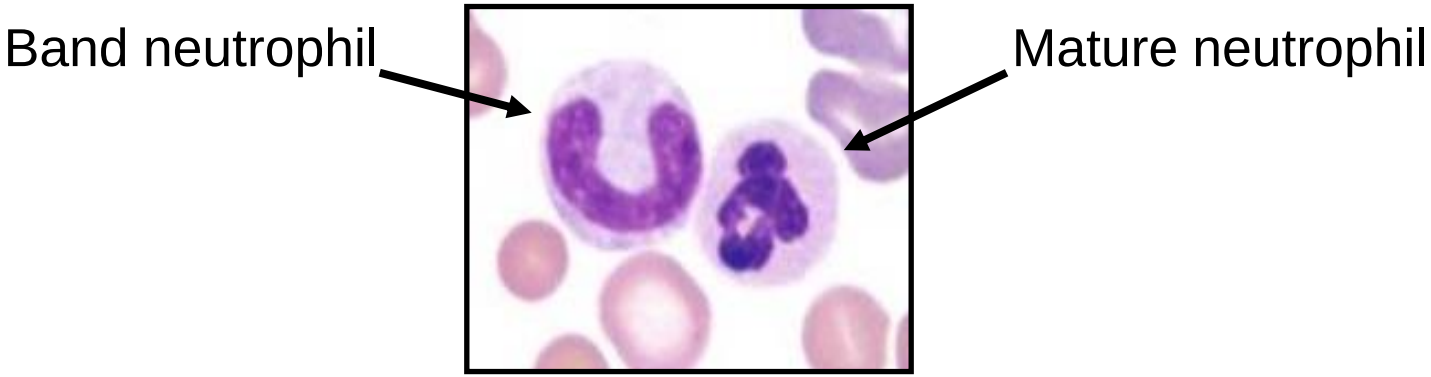

Calore Rubor Tumor Dalore

# Old dogs, old tricks

- Identification of band/immature neutrophils - blood cell morphology
- Cytograms/dot plots

# Old dogs, old tricks

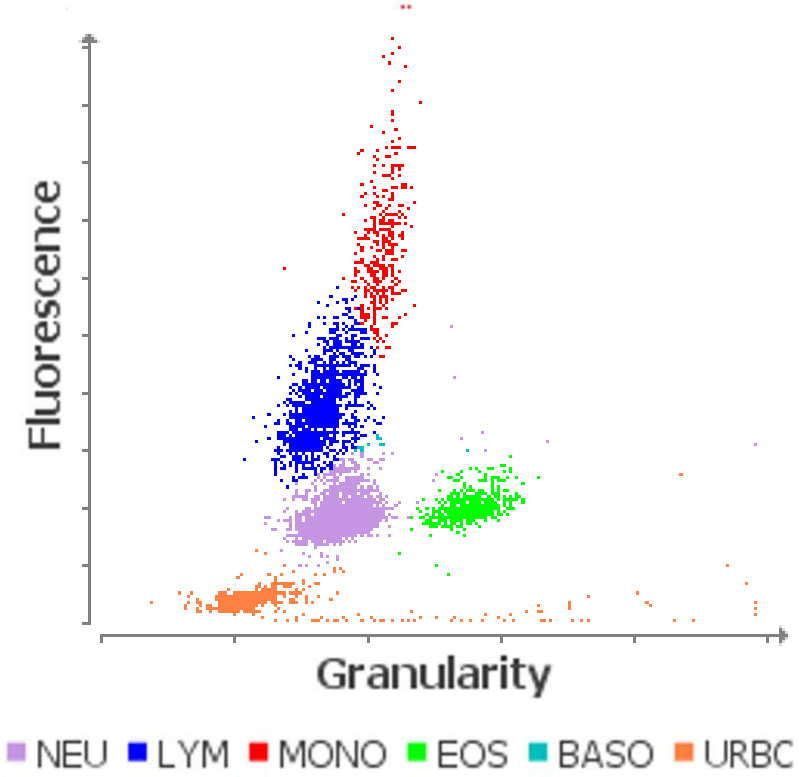
- Definitions
  - A neutrophil with a “horseshoe-shaped” nucleus with parallel-sided nuclear membranes
    - “Slight” nuclear indentations are acceptable



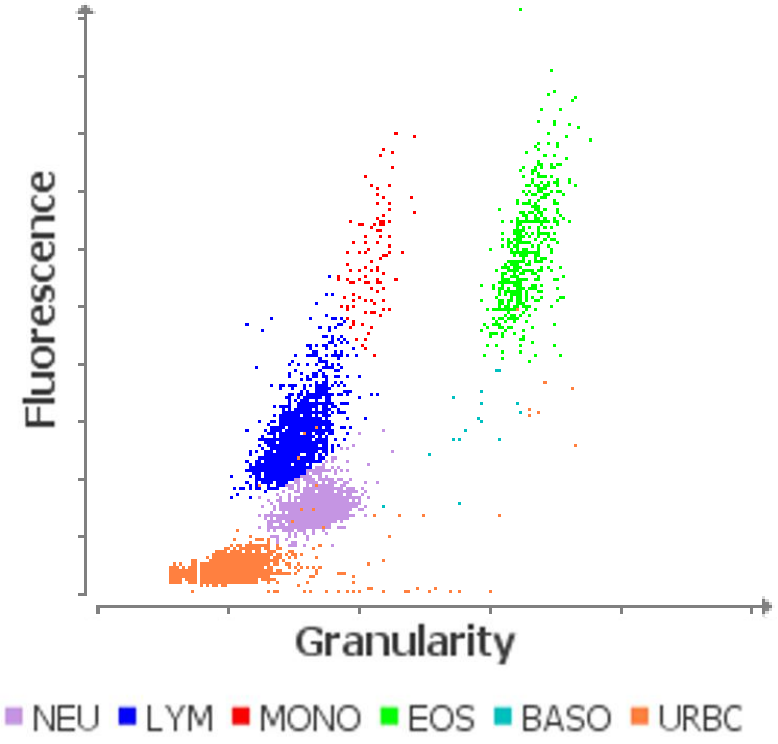

*The immature neutrophil is the “hallmark” of inflammation*

# Normal Canine and Feline WBC Dot Plots

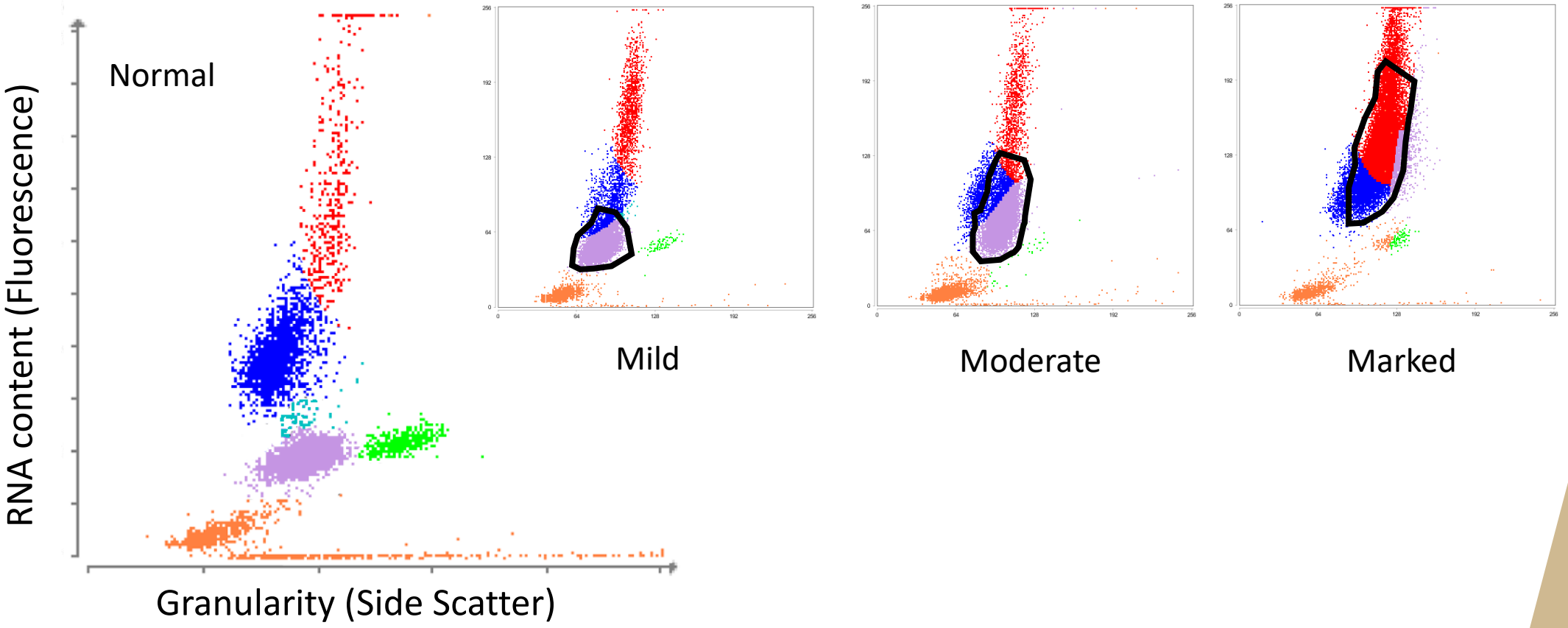
Normal WBC Dot Plot (Canine)




Normal WBC Dot Plot (Feline)



# Immature and/or toxic neutrophils

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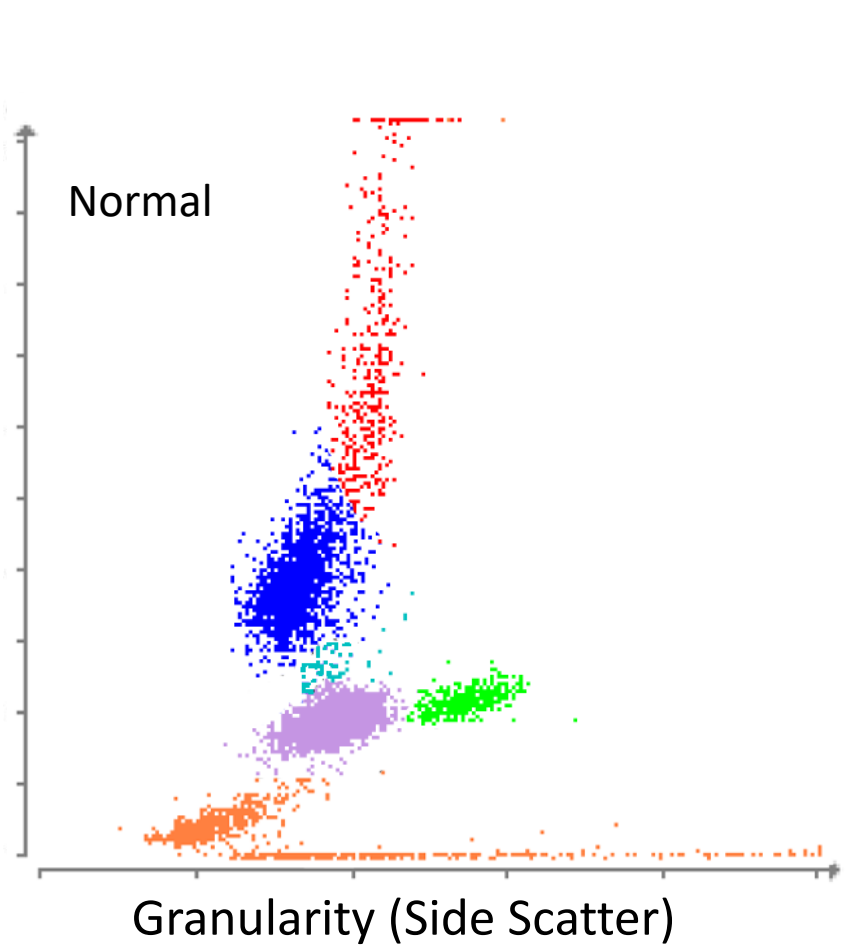
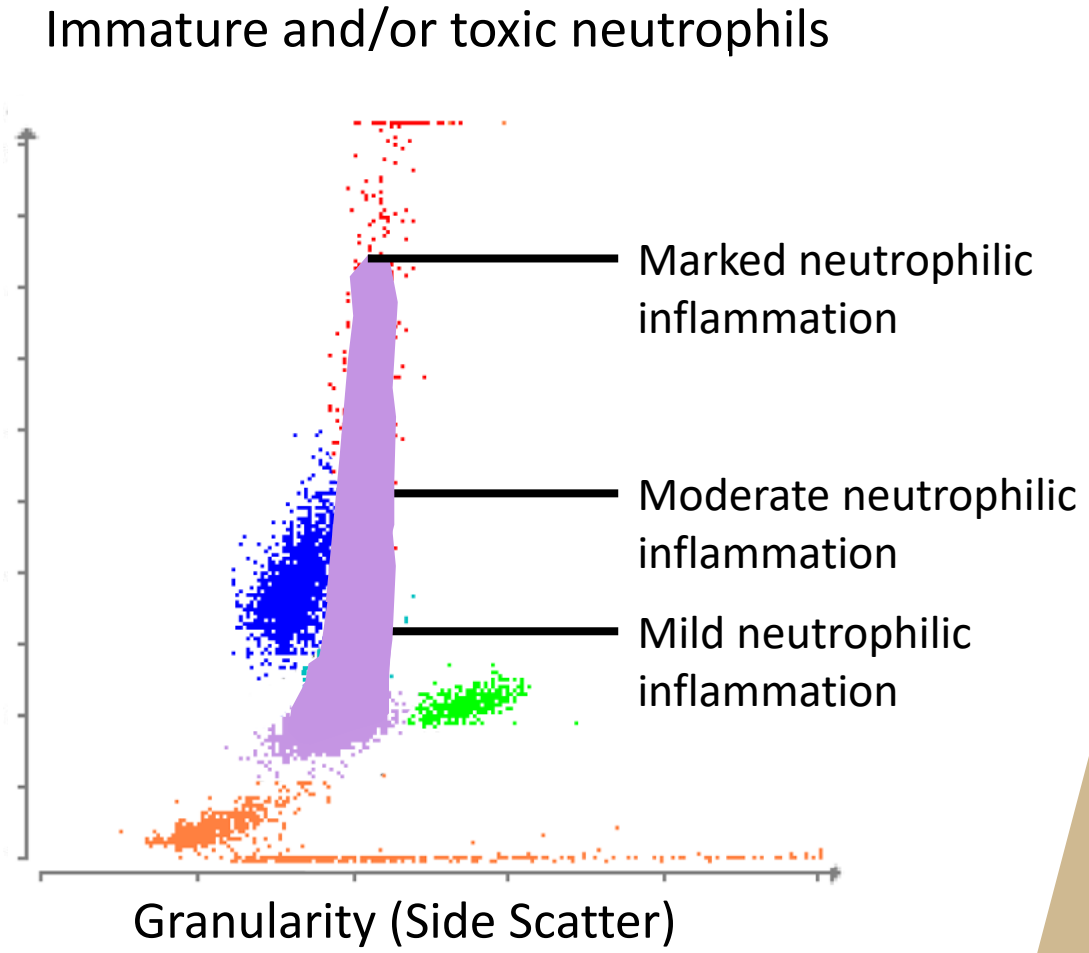
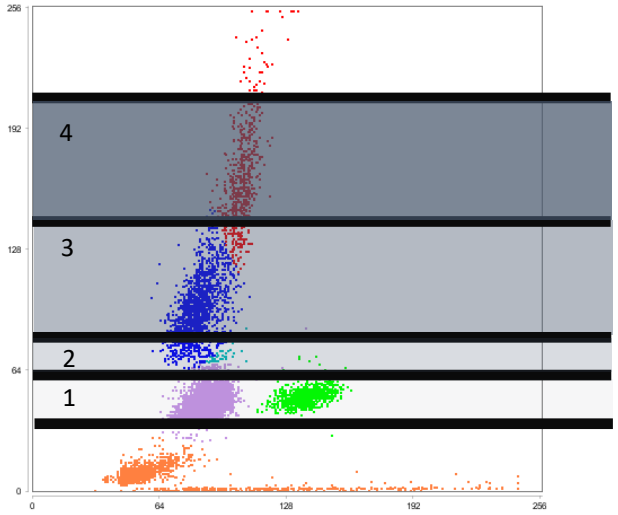
# Immature and/or toxic neutrophils



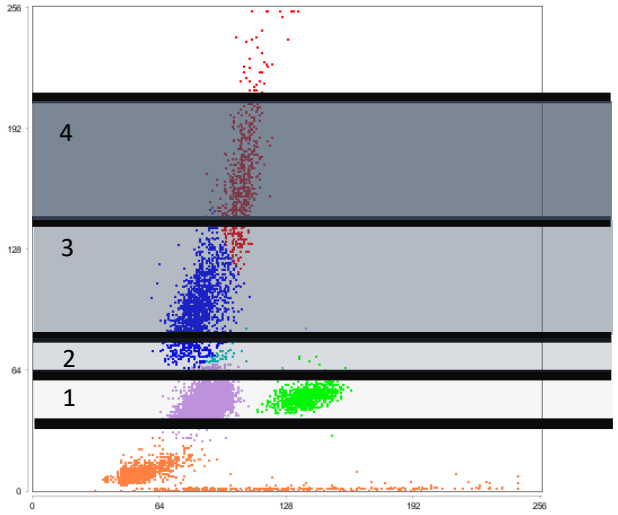



# Degree of immature / toxic neutrophils




4 - Marked inflammation
3 - Moderate inflammation
2 - Minimal to mild inflammation
1 - Normal

# Degree of immature / toxic neutrophils

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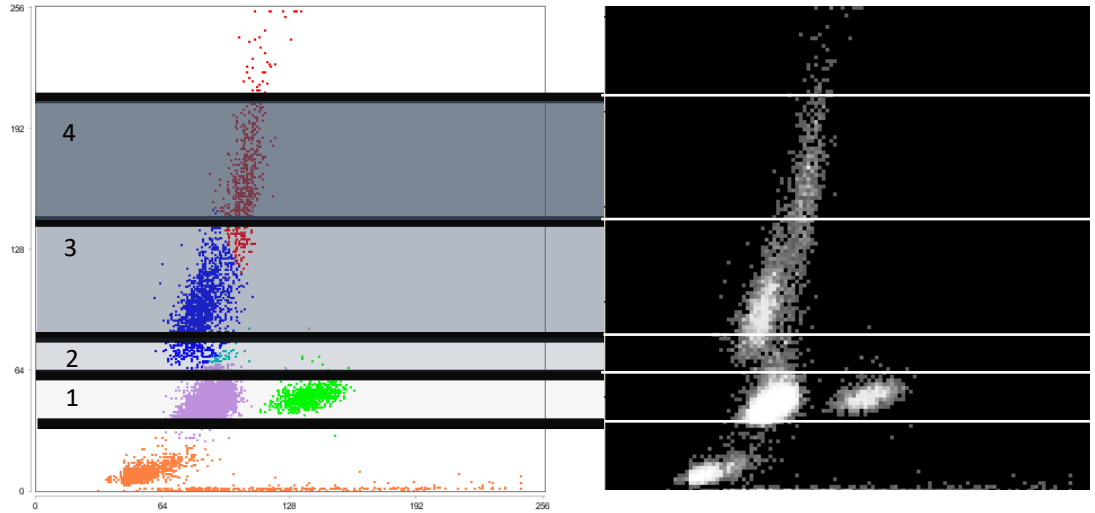
# Degree of immature / toxic neutrophils

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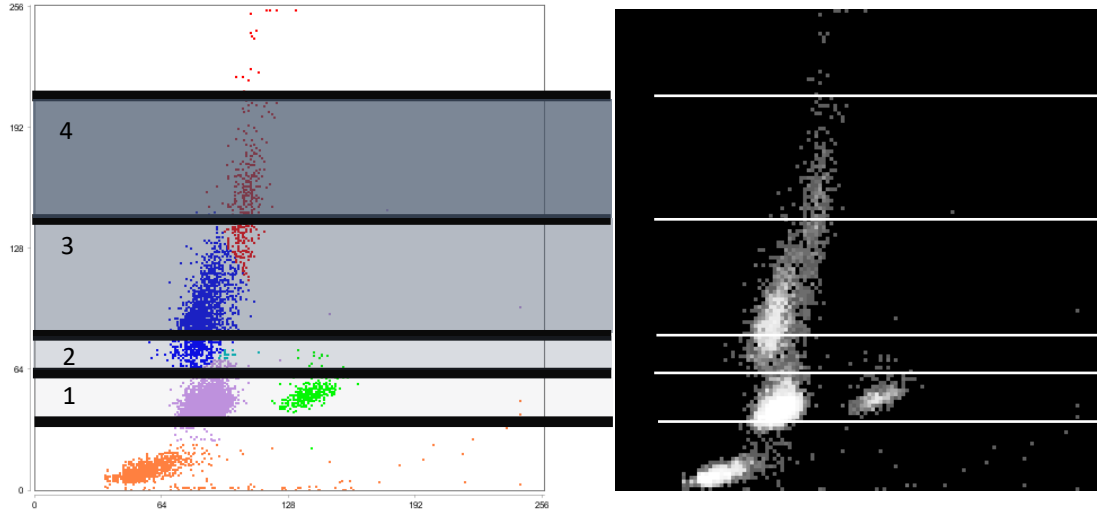
# Canine – Ziggy




4 - Marked inflammation
3 - Moderate inflammation
2 - Minimal to mild inflammation
1 - Normal

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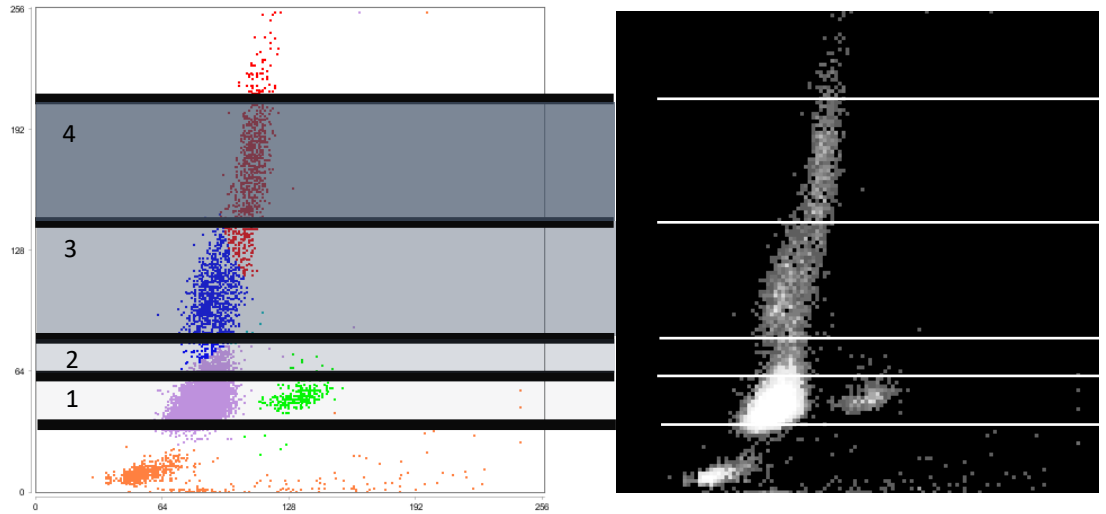
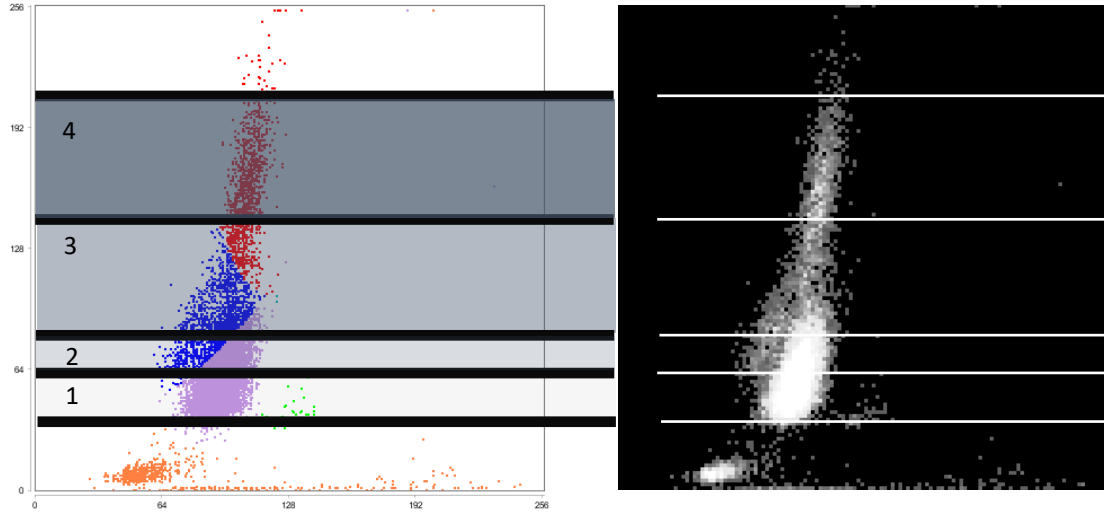
# Canine – Sampson – Mild




4 - Marked inflammation
3 - Moderate inflammation
2 - Minimal to mild inflammation
1 - Normal

# Canine – Lily – Moderate




4 - Marked inflammation
3 - Moderate inflammation
2 - Minimal to mild inflammation
1 - Normal

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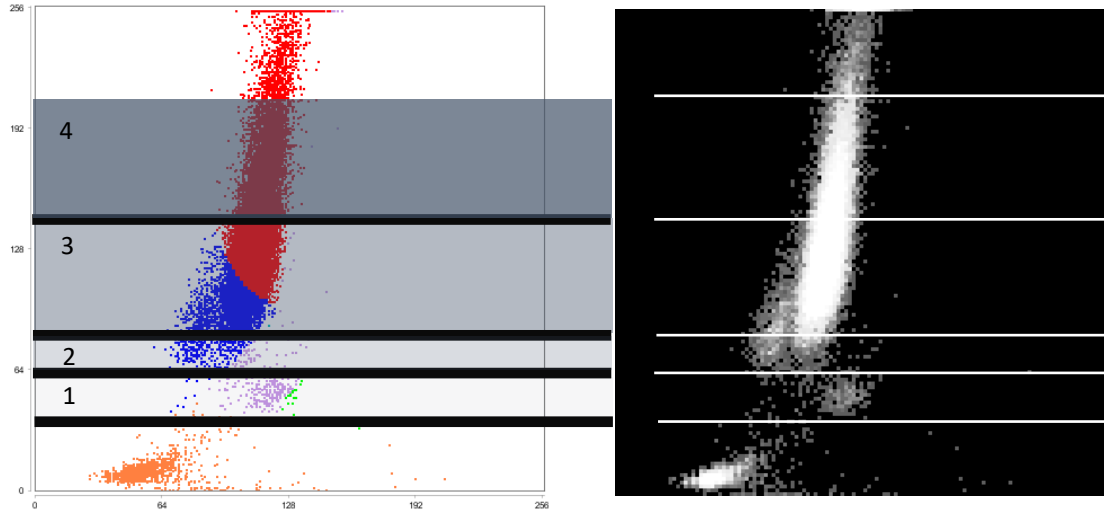
# Canine – Penny -Marked




4 - Marked inflammation
3 - Moderate inflammation
2 - Minimal to mild inflammation
1 - Normal

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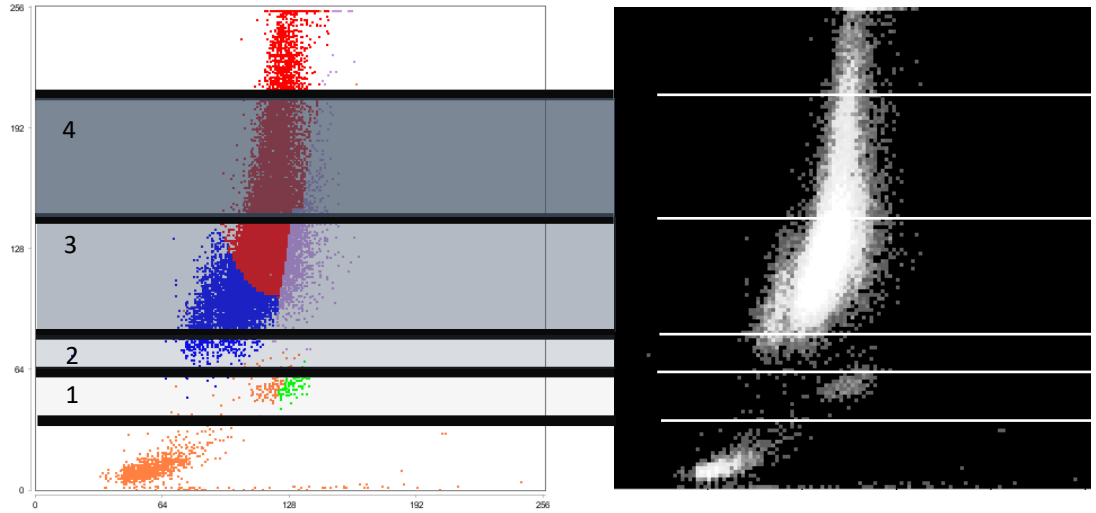
# Canine – Duke 2-Marked




4 - Marked inflammation
3 - Moderate inflammation
2 - Minimal to mild inflammation
1 - Normal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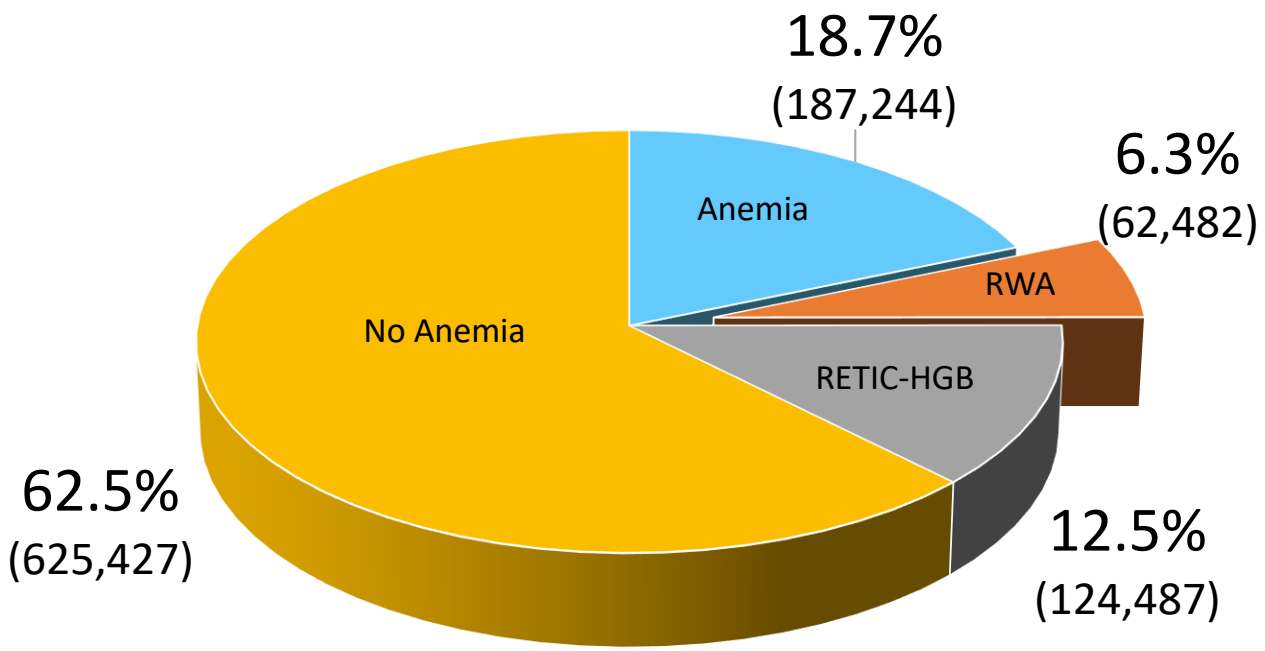
# New Tricks from Old Dogs

- Absolute Reticulocyte Count

# The value of reticulocytes




- Reticulocytosis without anemia (RWA):
  - Potential for identifying underlying and possibly occult serious disease
  - “Compensated” hemolytic or blood loss disease

Data analysis based on 1,000,000 CBCs randomly collected from the global field of ProCyte Dx® Hematology Analyzers in 2017.

# New Tricks from Old Dogs

- Absolute Reticulocyte Count
- Reticulocytes without anemia (RWA)
- Reticulocyte Hemoglobin

# Iron Deficient vs Iron Limited RBC Production

Normal Iron Delivery

Normocytic
Normochromic

Inflammation

Limited Iron Delivery

Small RETICs with less hemoglobin

Potential microcytosis and hypochromasia with longstanding inflammation

Chronic blood loss

Deficient Iron Delivery

Small RETICs with less hemoglobin

Eventual microcytic and hypochromic RBCs

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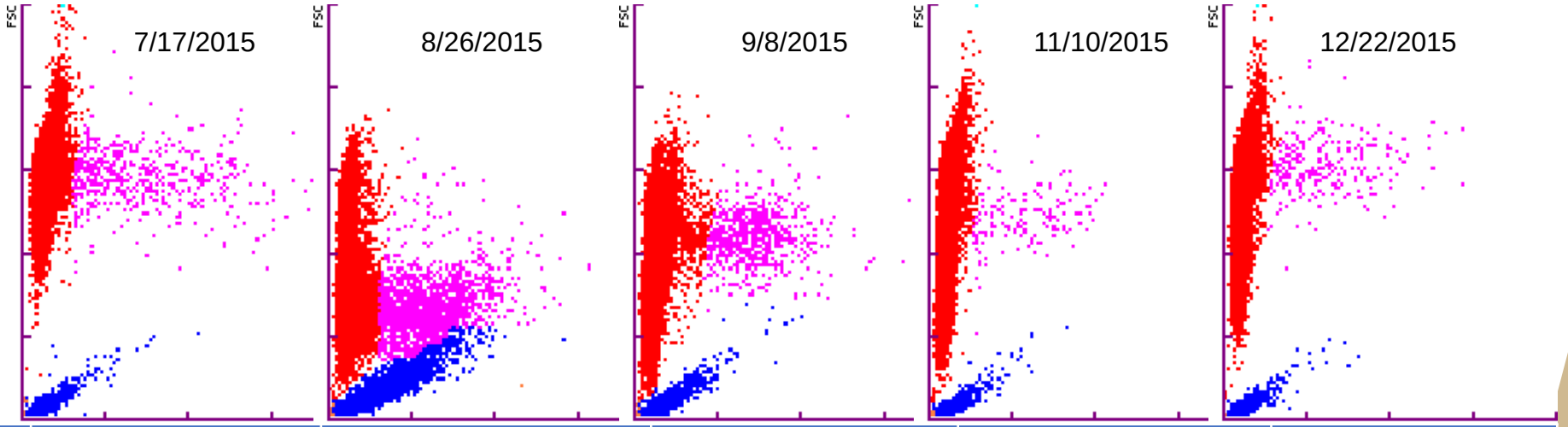
# Maxi: Serial dot plots and RETIC-HGB




| Date | 07/17/15 | 08/26/15 | 09/08/15 | 11/10/15 | 12/22/15 |
|---|---|---|---|---|---|
| HCT (%) (37.3 0 61.7) | 41.1 | 11.2 | 25.4 | 25.4 | 41.6 |
| MCV (fL) (61.6 – 73.5) | 65.9 | 40.7 | 44.7 | 52.2 | 60.3 |
| RETIC (K/µL) (10 – 110) | 141.6 | 239.5 | 171.0 | 51.11 | 72.5 |
| RETIC-HGB (pg) (22.3 – 29.6) | 25.1 | 13.0 | 17.5 | 19.6 | 26.7 |

# New Tricks from Old Dogs

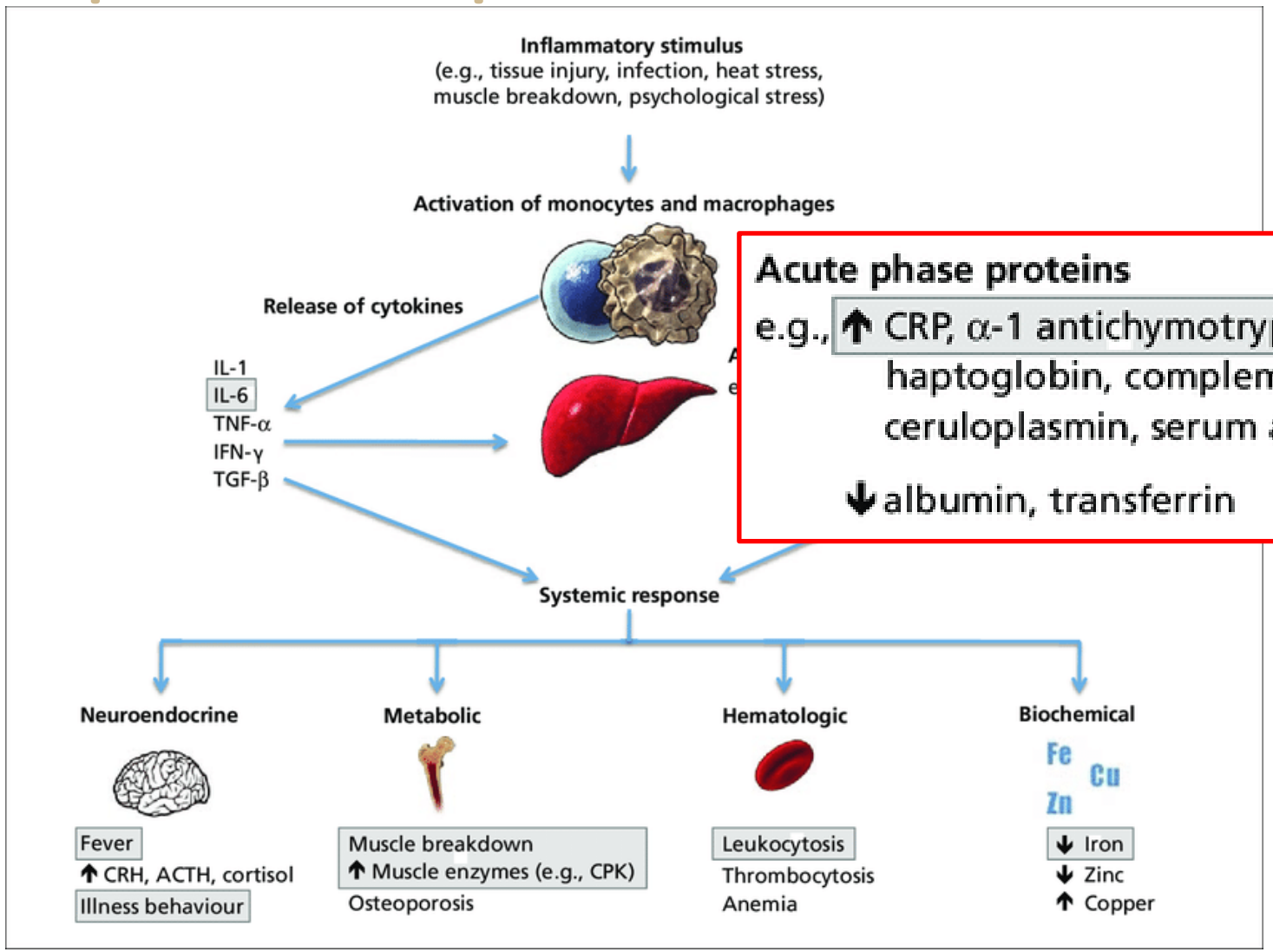
- Absolute Reticulocyte Count
- Reticulocytes without anemia (RWA)
- Reticulocyte Hemoglobin
- CRP-C Reactive Protein

# Cool new tests!

# New Tricks from Old Dogs

- Reticulocytes without anemia (RWA)
- Absolute Reticulocyte Count
- Reticulocyte Hemoglobin
- CRP-C Reactive Protein

# Acute phase response



# In-clinic testing options

- Various in-house testing options
  - Latex agglutination immunoassay
    - Antibodies bind lo latex beads which bind to SAA and precipitate
- Species validated assays
  - Often anti-human antibodies
  - Cross-reactivity across species
- Rapid
  - Can lack accuracy
- Discriminate inflammatory vs non-inflammatory


# CRP in diagnosing and managing inflammatory conditions

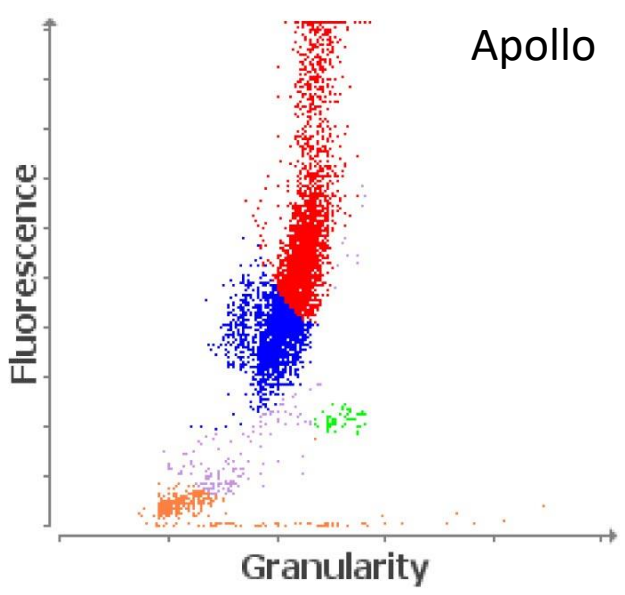
- Increases within 6 hours of onset systemic inflammation

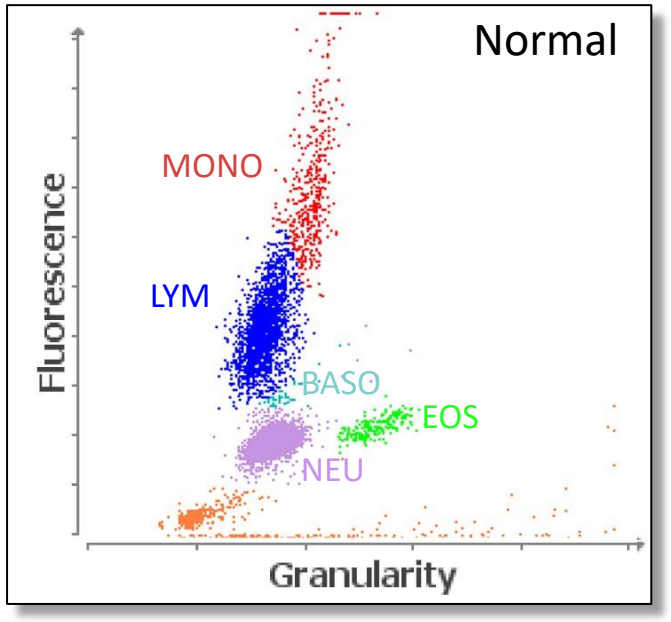
- CRP increased
  - Supports systemic inflammation – treat, investigate further, monitor frequently

- CRP normal
  - Does not support systemic inflammation - investigate further

- CRP during therapeutic trial
  - Decreases rapidly (short t ½) with successful treatment → supports diagnosis

# Apollo – 6y M/N Great Dane

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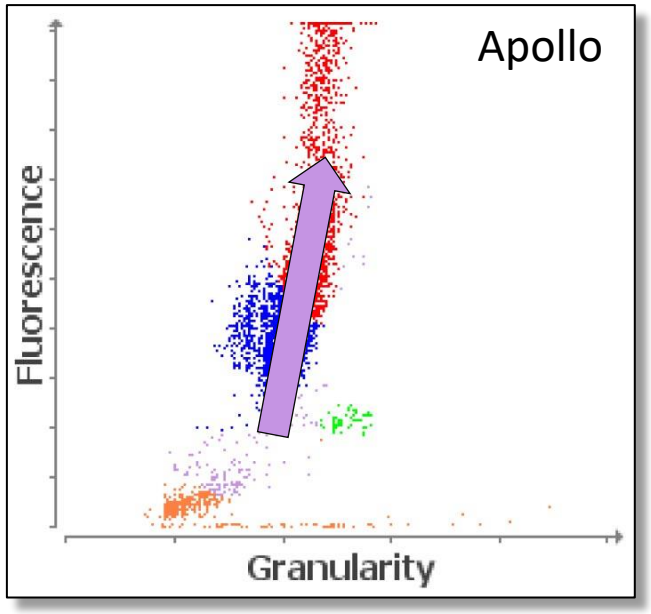
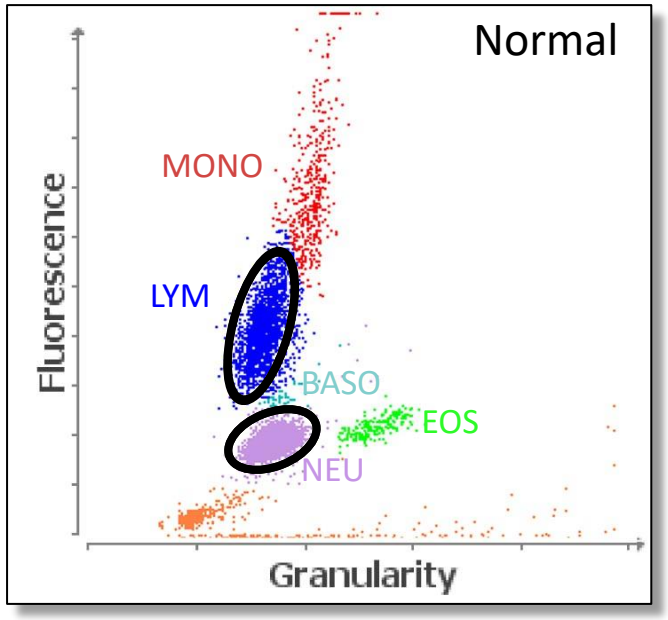
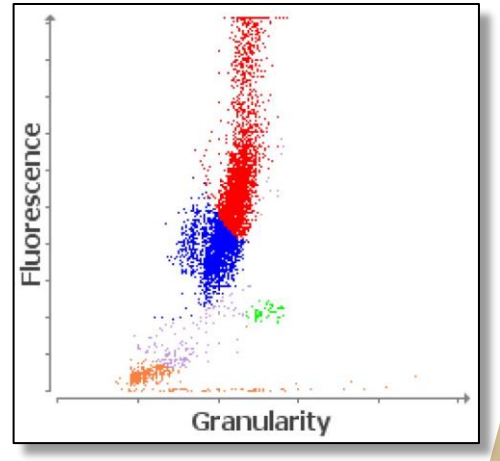
# Apollo – 6y M/N Great Dane



# Apollo – 6y M/N Great Dane

| Test | Results | Reference Interval | LOW / NORMAL / HIGH |
|---|---|---|---|
| ProCyte Dx (August 10, 2017 10:27 AM) | | | |
| WBC | 7.16 K/µL | 5.05 - 16.76 | |
| NEU | * 0.16 K/µL | 2.95 - 11.64 | LOW |
| BAND | * Suspected | | |
| LYM | * 2.87 K/µL | 1.05 - 5.10 | |
| MONO | * 4.07 K/µL | 0.16 - 1.12 | HIGH |
| EOS | 0.06 K/µL | 0.06 - 1.23 | |
| BASO | 0.00 K/µL | 0.00 - 0.10 | |
| Band neutrophils suspected | | | |
| WBC Abnormal Distribution | | | |

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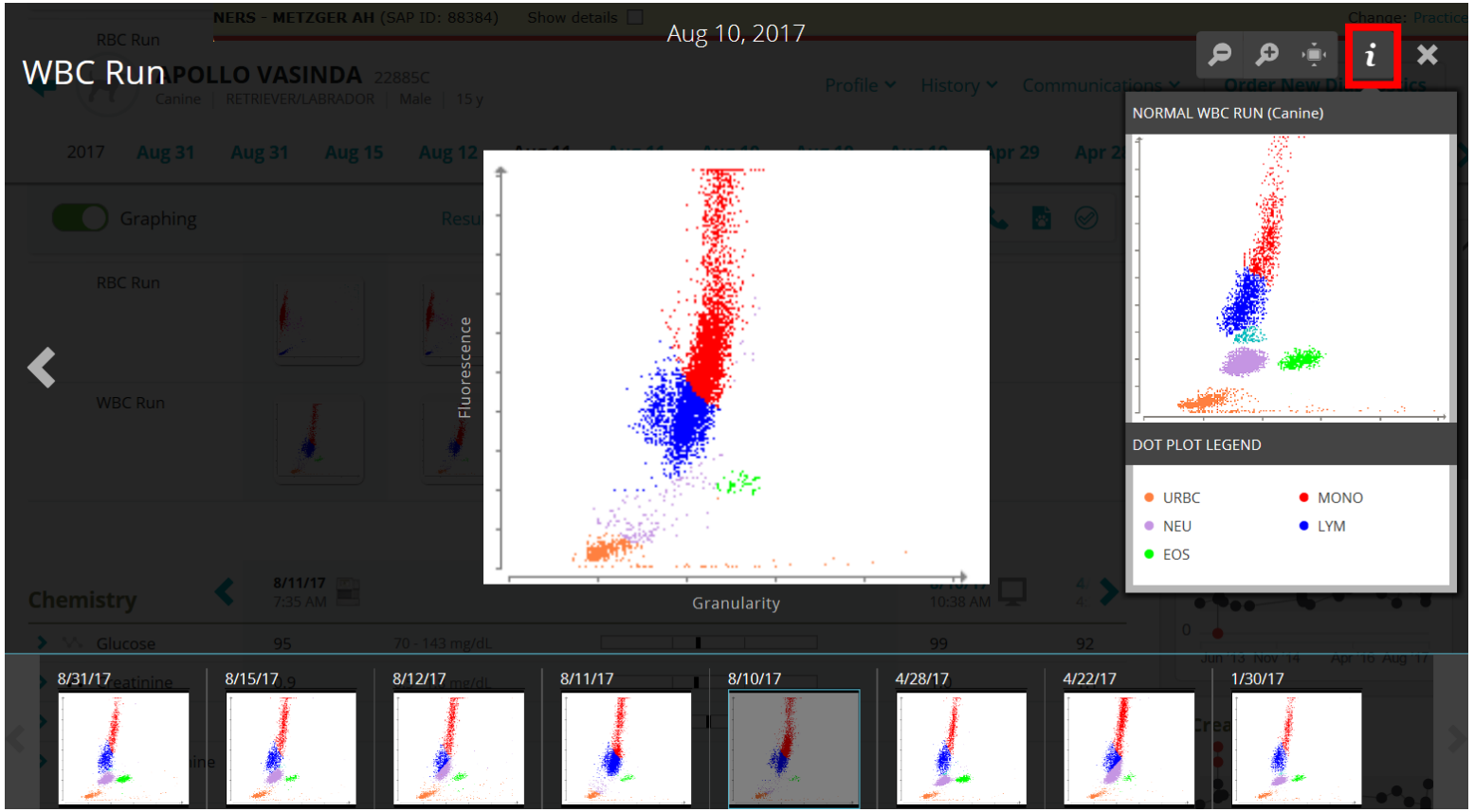
# Apollo

IDEXX VetConnect PLUS

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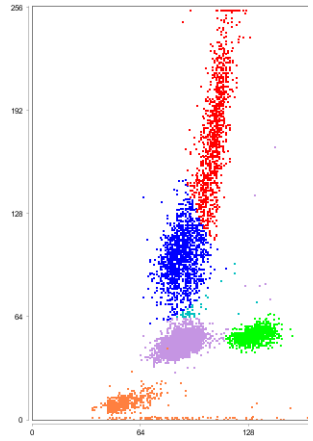
# Apollo – 6y M/N Great Dane




| Date | 4/28/17 |
|---|---|
| Band | - |
| WBC (K/µL) (5.05–16.76) | 10.58 |

RED = Abnormal high  Blue = Abnormal low

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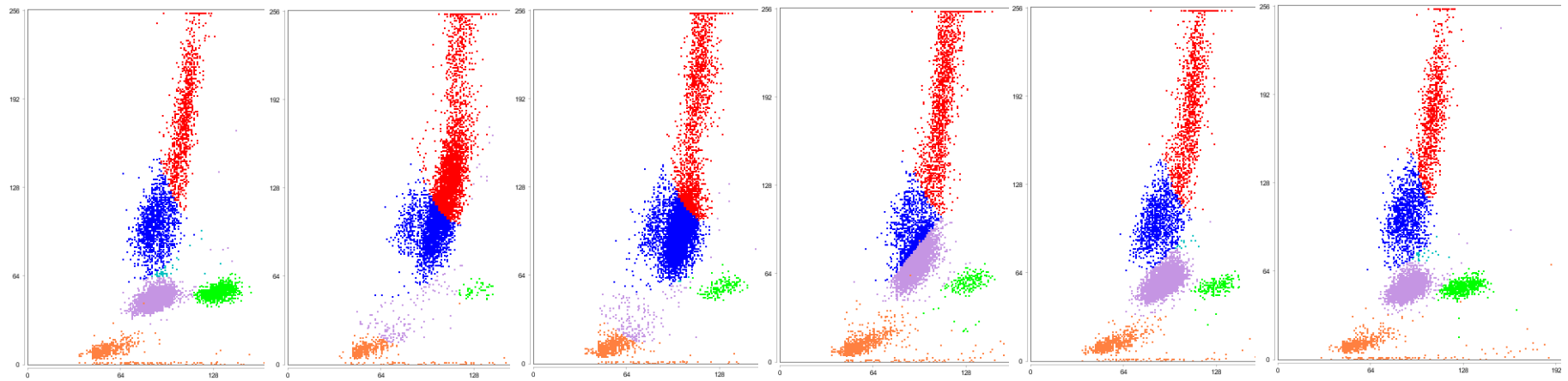
# Apollo – 6y M/N Great Dane



| Date | 4/28/17 | 8/10/17 | 8/11/17 | 8/12/17 | 8/15/17 | 8/31/17 |
|---|---|---|---|---|---|---|
| Band | - | + | + | + | + | - |
| WBC (K/µL) (5.05–16.76) | 10.58 | 7.16 | 8.72 | 8.84 | 11.08 | 10.23 |

RED = Abnormal high  Blue = Abnormal low

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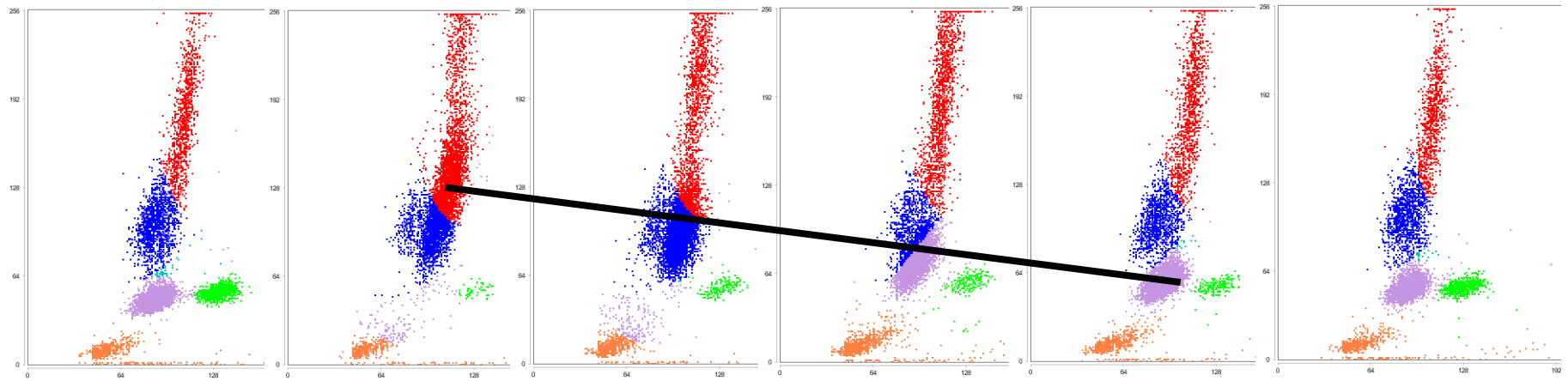
# Apollo – 6y M/N Great Dane



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|---|---|---|---|---|---|---|
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RED = Abnormal high  Blue = Abnormal low

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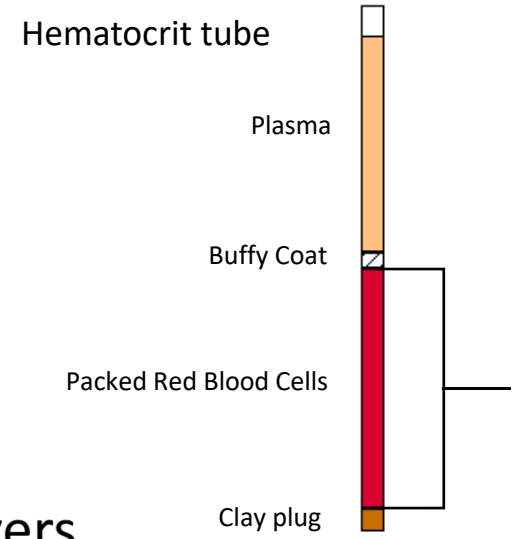
# New Tricks

- Reticulocyte Hemoglobin
- Reticuloytes-with and without anemia
- CRP-C Reactive Protein
- Red Cell and Platelet Indices

# Platelets by the numbers

- Thrombogram
  - PLT / PCT – count / mass

| Test | Results | Reference Interval | LOW | NORMAL | HIGH |
|---|---|---|---|---|---|
| PLT | 225 K/µL | 148 - 484 | | | |
| MPV | 12.6 fL | 8.7 - 13.2 | | | |
| PDW | 12.3 fL | 9.1 - 19.4 | | | |
| PCT | 0.28 % | 0.14 - 0.46 | | | |




Analogous to HCT

HCT (%) = (RBC x MCV) / 10

# Platelets by the numbers

- Thrombogram
  - PLT / PCT – count / mass

| Test | Results | Reference Interval | LOW | NORMAL | HIGH |
|---|---|---|---|---|---|
| PLT | 225 K/µL | 148 - 484 | | | |
| MPV | 12.6 fL | 8.7 - 13.2 | | | |
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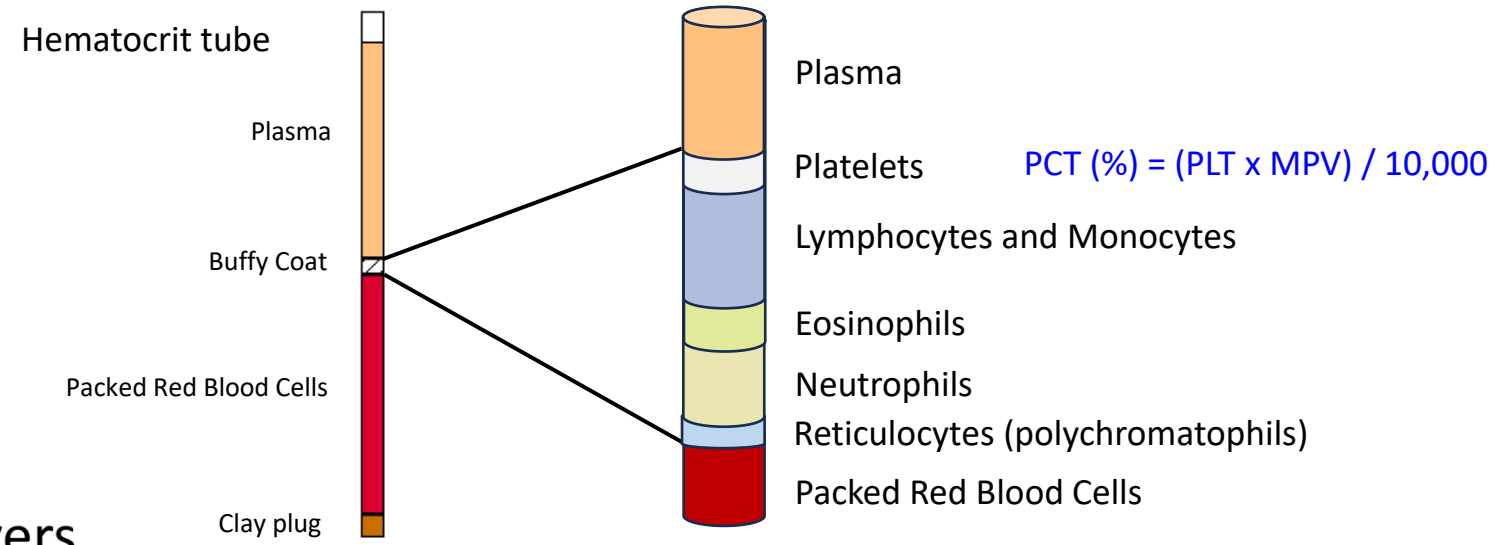
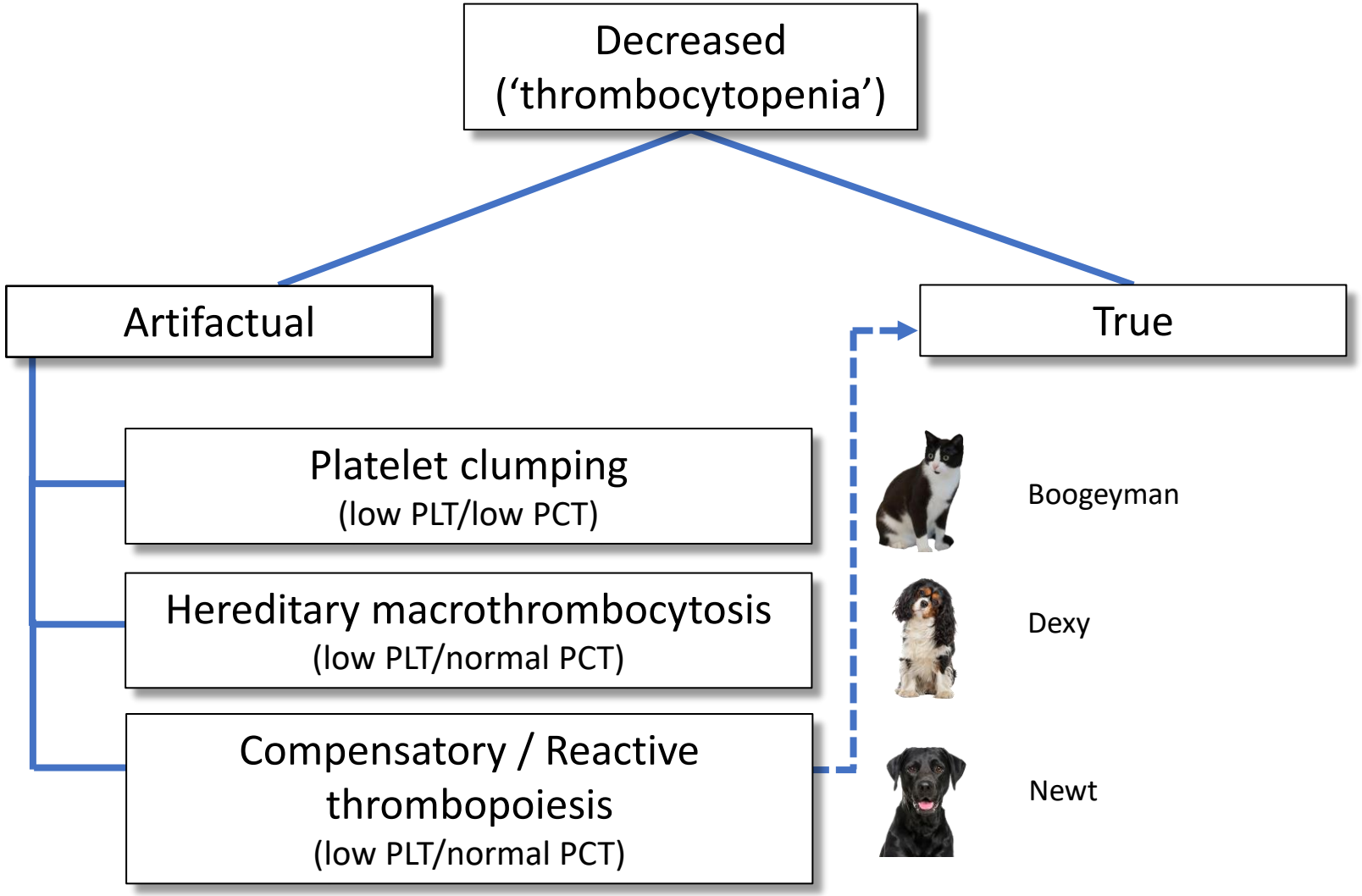



PCT (%) = (PLT x MPV) / 10,000

# Approach to the evaluation of platelets

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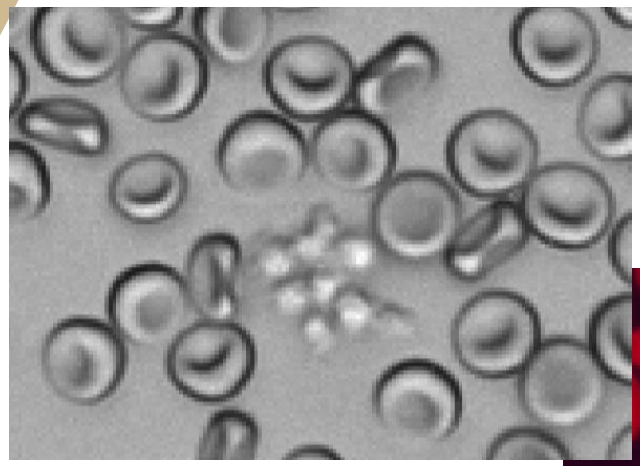
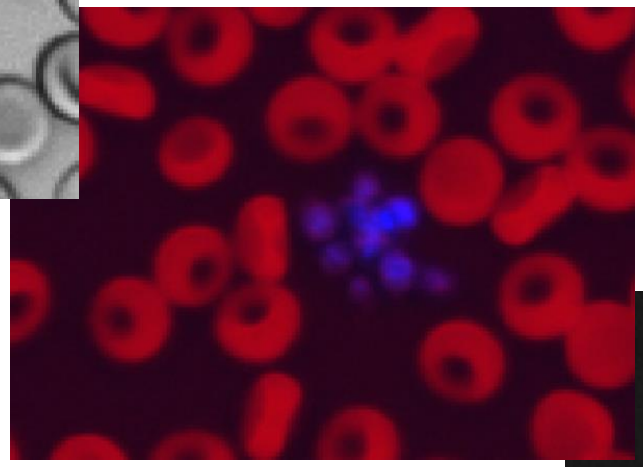
# New Tricks from Old Dogs

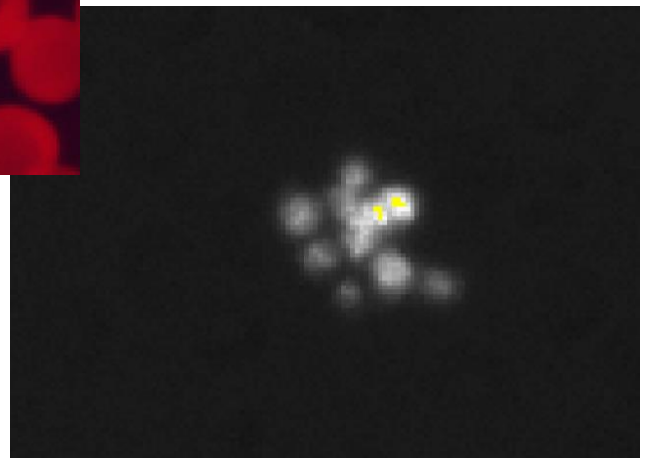
- Absolute Reticulocyte Count
- Reticulocytes without anemia (RWA)
- Reticulocyte Hemoglobin
- CRP-C Reactive Protein
- Red Cell and Platelet Indices
- AI blood morphology

# IDEXX InVue Dx Cellular Analyzer



Platelet Clumping





PCT (%) = (PLT x MPV) / 10,000

# New Tricks from Old Dogs

- Reticulocytes without anemia (RWA)
- Absolute Reticulocyte Count
- Reticulocyte Hemoglobin
- CRP-C Reactive Protein
- Red Cell and Platelet Indices
- AI blood morphology
- Canine Pancreatic Lipsae
- Cortisol
- Canine Cancer Test

# Catalyst New Menu Consistently Drives Adoption at Scale

% of **U.S. Catalyst** customers **adopted in the first year of launch***

| >65% | >55% | >50% | >50% |
|---|---|---|---|
|  |  |  |  |
| Catalyst® **Lyte 4 CLIP** | Catalyst® **Total T4 Test** | Catalyst® **SDMA** | Catalyst® **Pancreatic Lipase** |
| *Launched December 2008* | *Launched February 2015* | *Launched January 2018* | *Launched September 2024* |

*Customers who adopted in first year of launch had run at least one consumable slide on Catalyst Dx® Chemistry Analyzer or Catalyst One® Chemistry Analyzer in the last 30 days of 12 months post-launch for Lyte 4 CLIP, Total T4 and SDMA, and at least one consumable slide on Catalyst Dx® Chemistry Analyzer or Catalyst One® Chemistry Analyzer in the last 30 days as of 7/30/25 for Pancreatic Lipase.



Laboratory Retrievers
Animals can't hide their objective data

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