

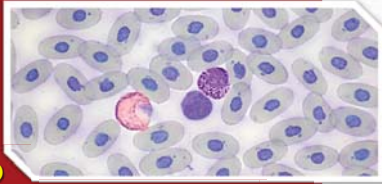
INTRODUCTION TO REPTILE HEMATOLOGY & CYTOLOGY

爬蟲血液學與細胞學概論



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Blood Cells of Reptiles

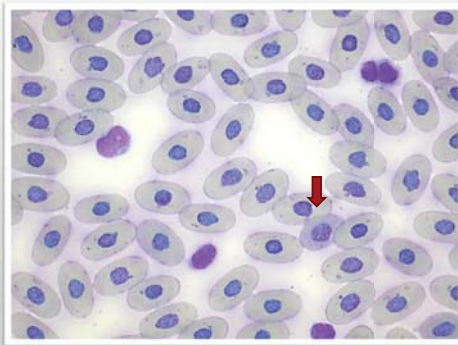
- Erythrocytes
- Leukocytes
- Thrombocytes

- ✓ Similar diagnostic principles as Mammals.
- ✓ Similar in function as Avian.
- ✓ Much more unknowns and variables in Reptiles.
 - Seasons
 - Temperature
 - Age & Sex
 - Physiological status (Shedding, Brumation)

Blood Cells of Reptiles

• Erythrocytes

- Large nucleated RBC
- Long live RBC
- Slow turnover rate

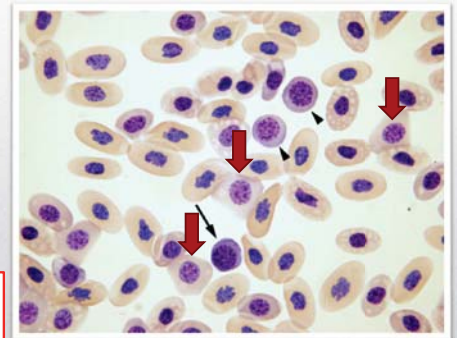


食蛇龜 RBC

Blood Cells of Reptiles

• Erythrocytes

- Mature RBC
- Immature RBC (Polychromasia)
- Very immature RBC (Rubricytes)



- ✓ Signs of regeneration
- ✓ During shedding
- ✓ After brumation

Iguana RBC. Fig 20.8 Veterinary Hematology and Clinical Chemistry 2nd Ed.

Blood Cells of Reptiles

• Erythrocytes

Clinical Evaluation:

- ✓ RBC morphology – blood smear.
- ✓ PCV – capillary tube.
- ✓ Total RBC count – manual dilution, counting chamber.
- ✓ Hb (probably not possible)

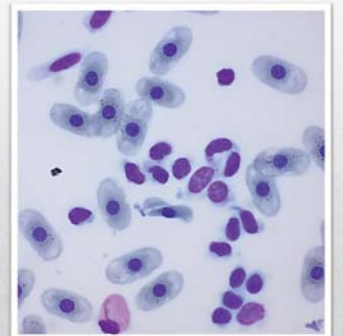
Blood Cells of Reptiles

• Thrombocytes

- Similar to mammalian platelet.
- Polymorphic.
- Not to confuse with lymphocytes.

Clinical Evaluation:

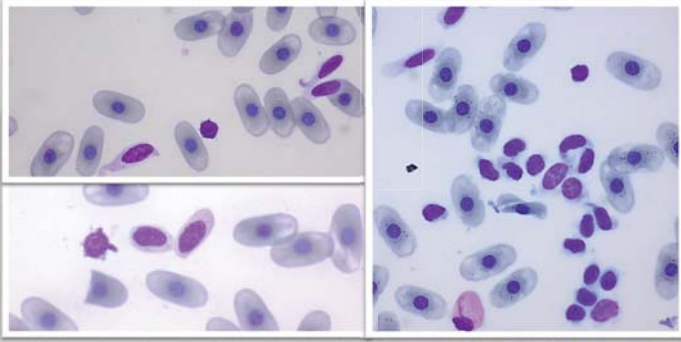
- ✓ Adequate in number.
- ✓ Adequate in morphology.



亞達柏拉 象龜

Blood Cells of Reptiles

- Thrombocytes



亞達柏拉 象龜

Blood Cells of Reptiles

- White Blood Cells

- Non-granulocytes:

- Monocytes (Azurophils)
- Lymphocytes

- Granulocytes:

- Heterophils
- Eosinophils
- Basophils

Blood Cells of Reptiles

- White Blood Cells

Clinical Evaluation:

- ✓ WBC morphology – blood smear.
- ✓ Estimated total WBC count – blood smear.
 1. 平均視野WBC數量 x (物鏡倍率)²
 2. 平均視野 WBC: RBC 值 x RBC 總數
- ✓ WBC Differential – blood smear.

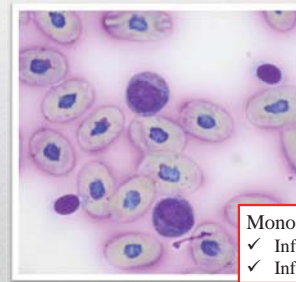
***Quality of blood smear is extremely important!!!!**

Blood Cells of Reptiles

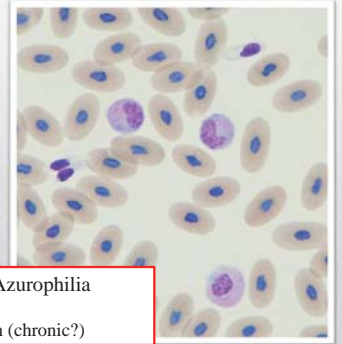
- White Blood Cells

- Non-granulocytes:

- Monocytes (Azurophils)



紅腿象龜



Blood smear of a snake

Monocytosis /Azurophilia
✓ Infection
✓ Inflammation (chronic?)

Blood Cells of Reptiles

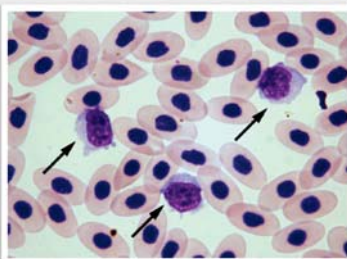
- White Blood Cells

- Non-granulocytes:

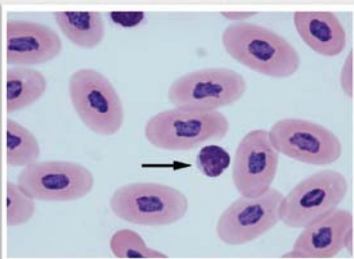
- Lymphocytes

Lymphocytosis:

- ✓ Chronic infection
- ✓ Viral diseases



Lymphocytes of iguana. Fig 20.23
Veterinary Hematology and Clinical Chemistry 2ndEd



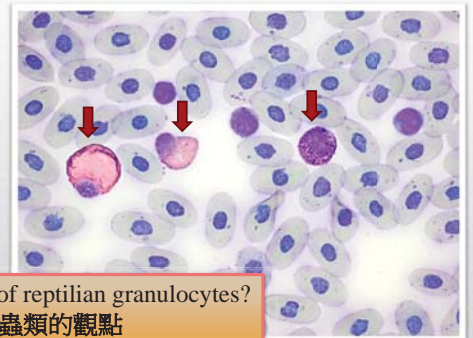
Lymphocytes of a Rosy boa. Fig 20.22
Veterinary Hematology and Clinical Chemistry 2ndEd

Blood Cells of Reptiles

- White Blood Cells

- Granulocytes:

- Heterophils
- Eosinophils
- Basophils



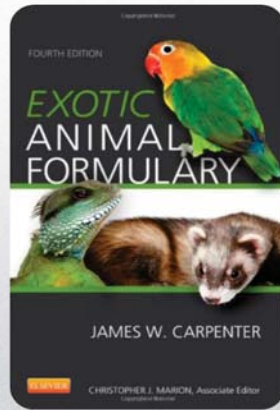
食蛇龜Blood smear

What are the functions of reptilian granulocytes?
哺乳動物的觀點 vs 爬蟲類的觀點

What is the normal WBC differential in this reptile?

Reference Range VS Normal Range!?

- Be careful with what you are reading!
- Be careful with how you interpret a result!
- How was the study performed?
- Selection of animal? (Health evaluation?)
- Juveniles or Adults?
- Captive or Wild?
- Methodology of tests?

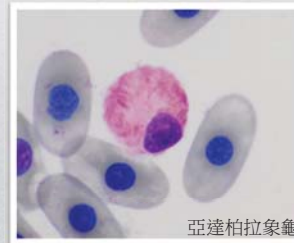


Edition 4 (2013)

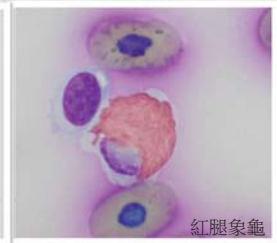
Blood Cells of Reptiles

- White Blood Cells
 - Granulocytes:
 - Heterophil

Heterophilia
✓ Acute inflammation
✓ Infection



亞達柏拉象龜



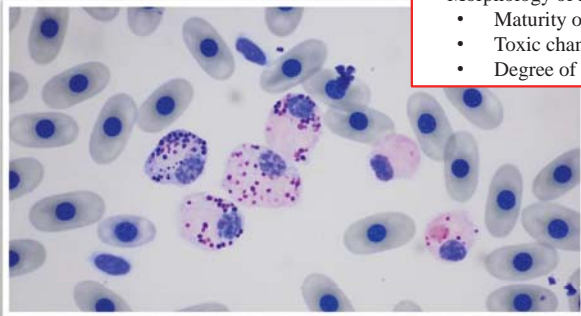
紅腿象龜

Blood Cells of Reptiles

- White Blood Cells
 - Granulocytes:
 - Heterophil

Clinical Evaluation:

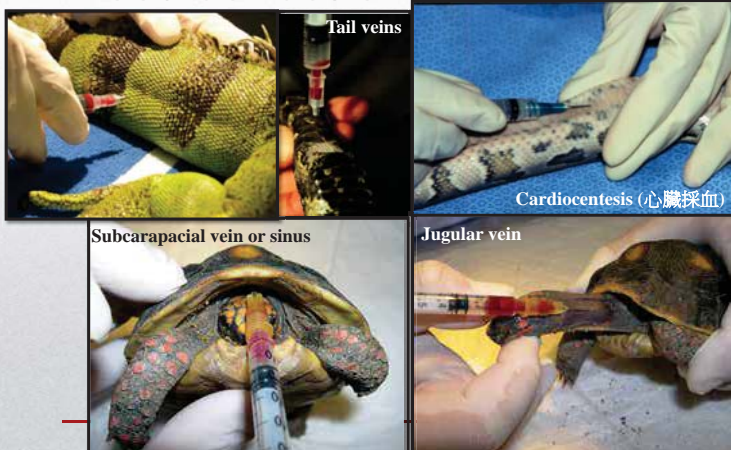
- ✓ Number of heterophils
- ✓ Morphology of heterophils
 - Maturity of heterophils
 - Toxic change?
 - Degree of toxic change?



Blood Sample Preparation

1. Blood collection
2. Selection of anticoagulant
3. Quality blood smear (Very very very important!!!)
4. Staining of blood smear

Blood Collection



Selection of Anticoagulant

- EDTA (紫頭管):
 - May cause hemolysis in some species.
- Heparin (綠頭管):
 - Can be use for blood chemistry analysis.
 - Thrombocyte clumps.



EDTA Tube



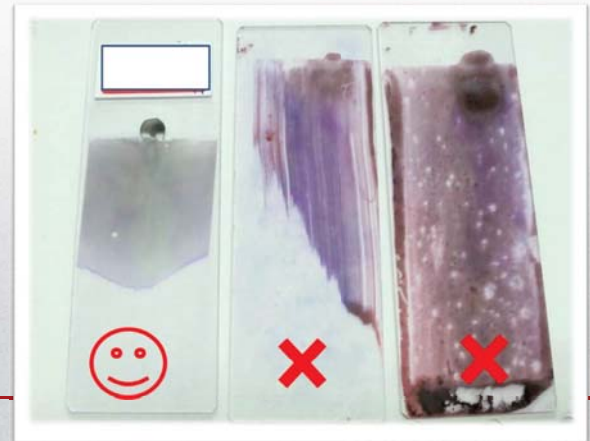
Heparin Tube

Quality blood smear!!!

- Use push-smear technique (推片法)
- Critical for estimate WBC count !!!
- Critical for cell morphology evaluation.



Quality blood smear!!!



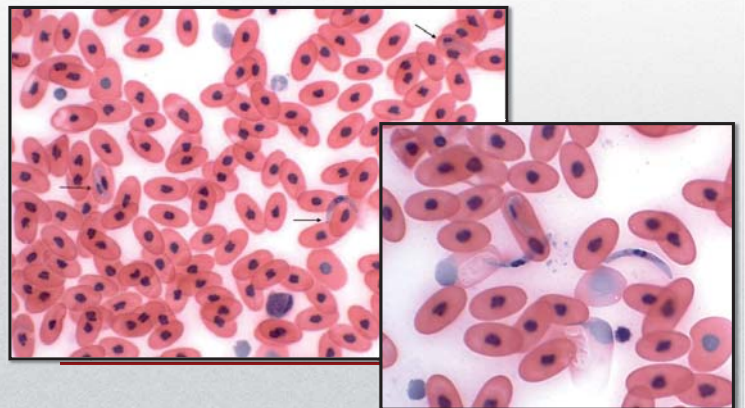
Staining of blood smear

- Wright-Giemsa Stain – **standard, traditional**
- Diff Quik Stain – **universal modified Wright-Giemsa**
- Liu's Stain? – Taiwan produced, for human use, questionable for exotic species!!



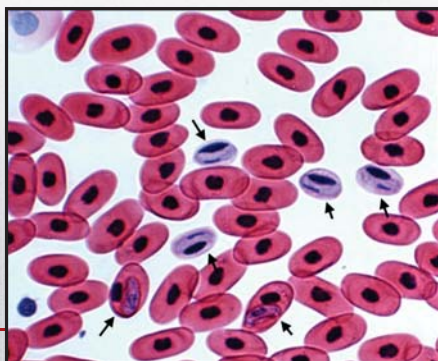
Case Study

- Boa constrictor bloodsmear (H&E stain)



Case Study

- Amazone tree boa blood smear (H&E stain)

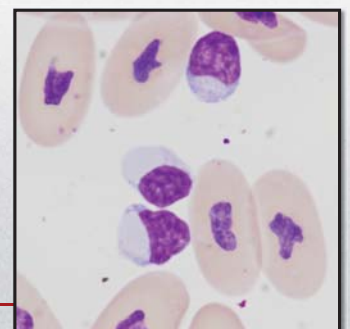


Case Study

Boa constrictor

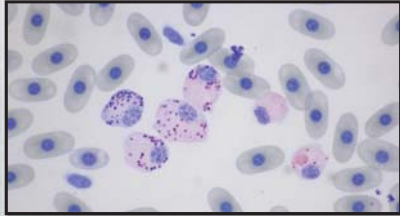
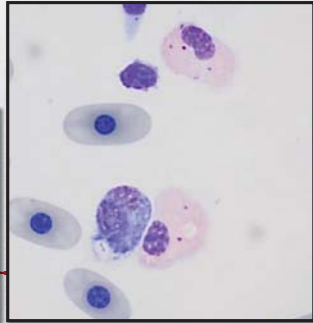
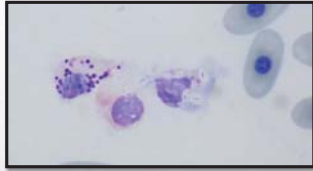
- Adult female, 5.5 kg
- History:
 - Anorexia for 4 months, weight loss, (BCS 2/5).
 - Two boas that were housed together recently died of anorexia.
- Palpation: excess gas in GI

Total WBC: 40,000 /uL (4,000~10,000 /uL)
Marked lymphocytosis, mild azurphilia



Case Study

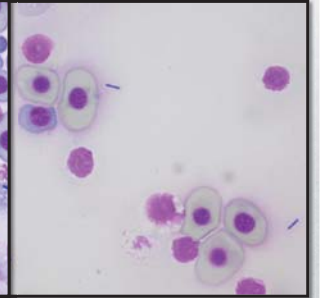
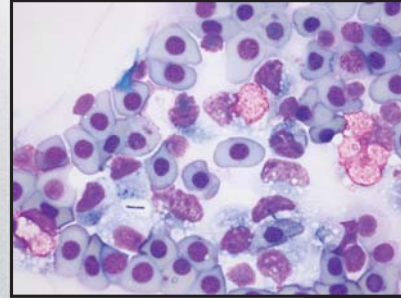
- 亞達柏拉 象龜
- **History:** Depressed, anorexia, poor response to supportive cares.



Case Study

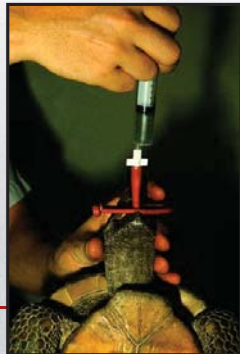
食蛇龜

- **History:** Depressed for couple days, normal appetite, hemocyst on one of the forelimb.
- PCV: <10



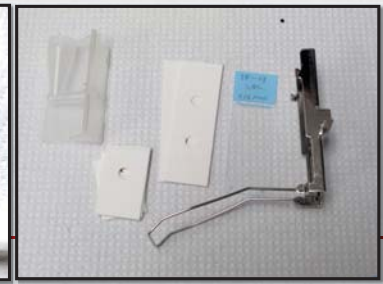
Sample Collection

- **Cytological Preparations**
 - Direct smear of tissue sample, discharge, feces
 - Lung/tracheal wash
 - Stomach/gastric wash



Sample Collection

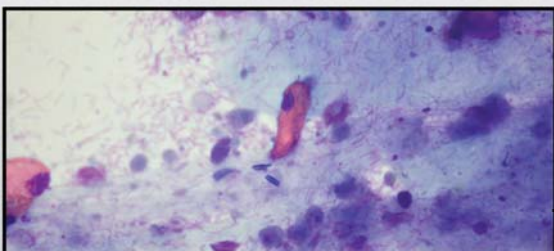
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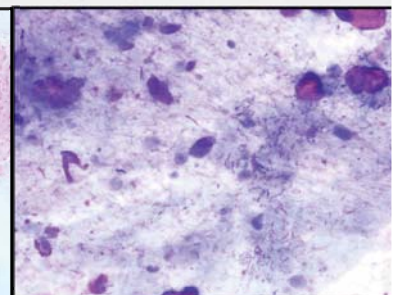
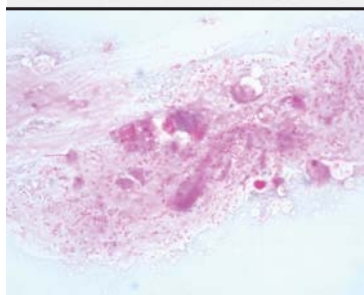
Case Study

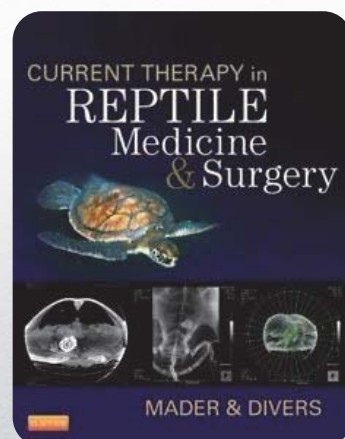
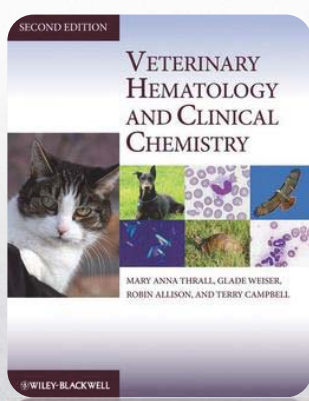
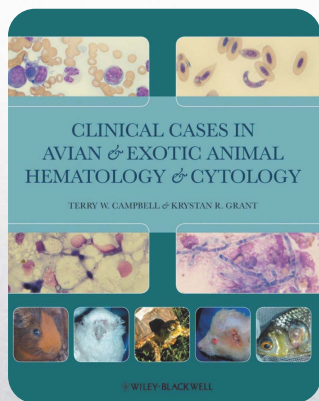
Burmese python

- Adult, 8 kg
- **History:** Anorexia for several months, had not been eating for a month, a lot of discharge in the mouth.
- X-ray: no apparent sign of pneumonia



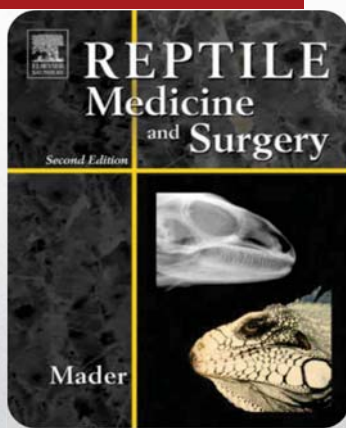
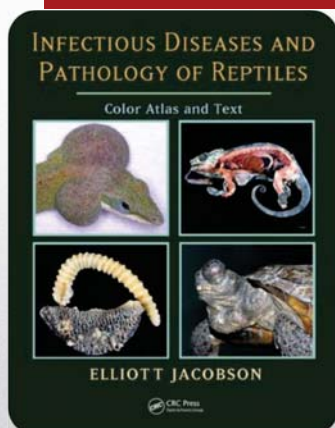
Case Study





~~Further Readings...~~

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~~Further Readings...~~

Many thanks to

Dr. Nichole Stacy
Dr. Elliott Jacobson

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