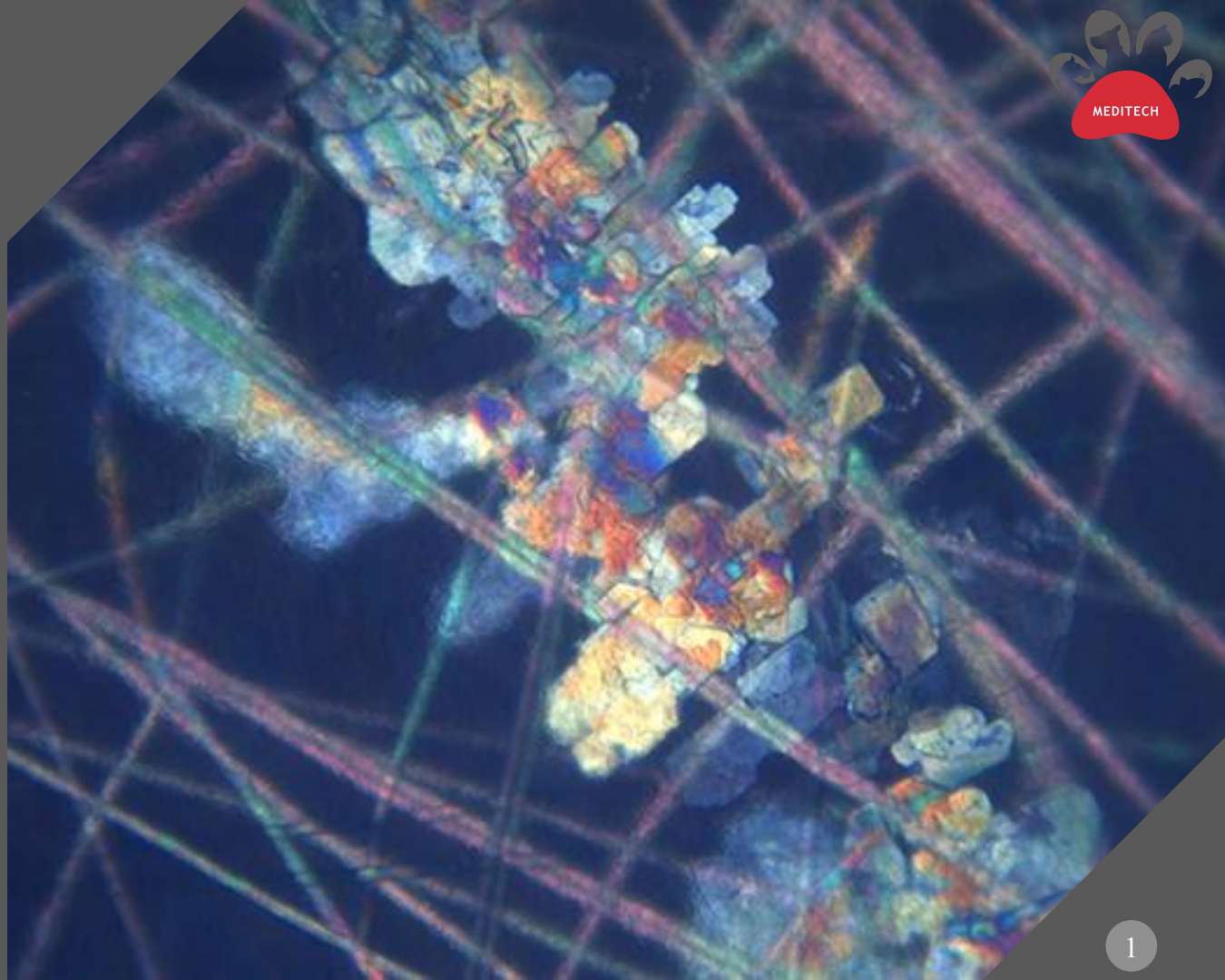
A GAME CHANGING IN VETERINARIAN MORPHOLOGY TECHNOLOGY

Jiaying Liang
DVM



What is a Game Changing Technology?

Two essential factors for innovation:
Needs and Challenges!

- What about in veterinary Diagnostics?

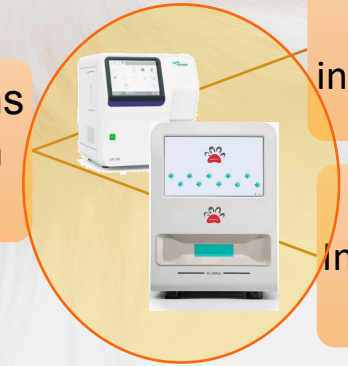
Most Common Laboratory Tests (In-Vito-Diagnostics) in Small Animal Veterinary

- Blood Counting (5-6%)
- Urinalysis (1-2.5%)
- Faecal Examination (region depends 0.2-2%)
- Blood Biochemistry
- Rapid tests for infectious diseases
- Skin and other sample Cytology
- Pathology, microbiology, PCR, Immunoassay.....

Resource: Robinson NJ, etc. Diagnostic testing in first opinion small animal consultations. Vet Rec. 2015

Common Internal Medicine Diagnostics Work Flow in Small Animal Clinics

Clinical Symptoms of fever, diarrhea or respiratory



None-infection?

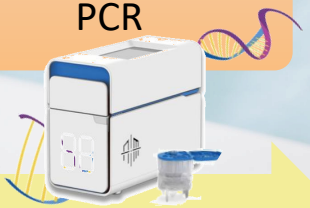
Biomarker, Urinalysis

Cytology (Morphology), Pathology

Infection?

Immuno Assay, Urinalysis, Fecal examination

Mibi culture, PCR



Initial Screening of Hematology and Biochemistry (Routine Tests)

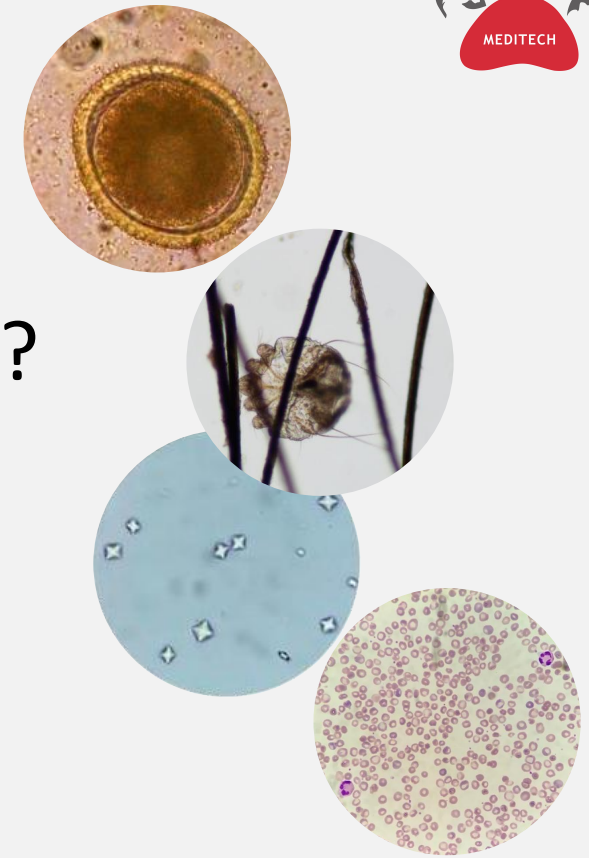
Disease Screening Dx

Confirming Dx

The Most Common Laboratory Device in Small Animal Clinics?

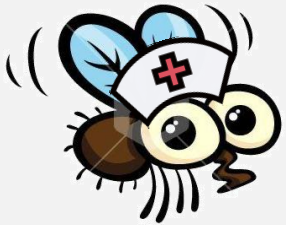
- **Cheap**
- **Multiple Function**
- **Morphology**

Why do we need morphology?



Feces Examination

(Coproscopy)

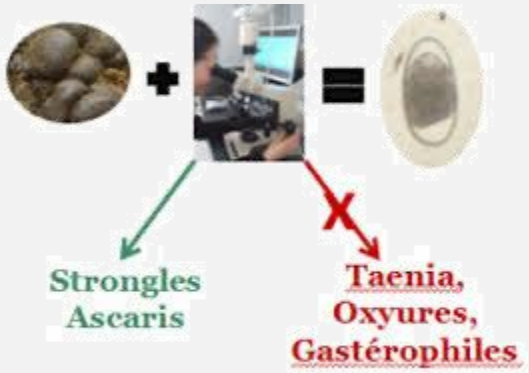


Purpose of Feces Examination and Coproscopy in Small Animal Veterinary

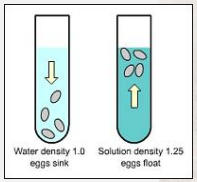
- Parasitology examination!!!
- Maldigestion/malasbsorption
  - exocrine pancreatic insufficiency [EPI]
- dysbiosis
- other reasons

Common Challenges of Coproscopy in Small Animal Veterinary

- Time and labor consuming
- Results vary with personal skill and carefullness/patience
- Contaminative
- Flotation or not?



Challenges of Flotation Methode



Advantages

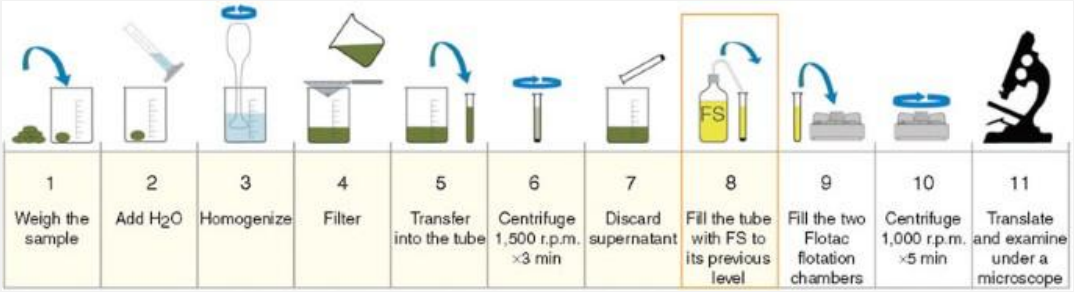
- Effectively concentrate the parasites eggs
- Provide possible clean views
- Reduce the misdiagnostics

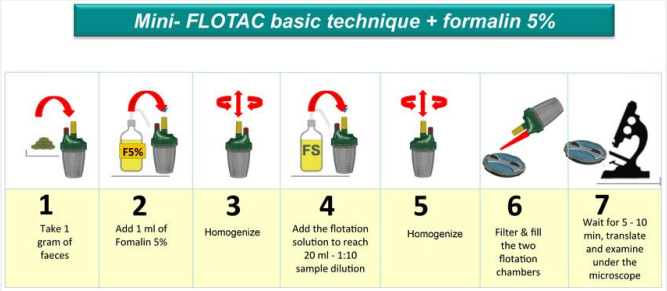
Native(direct) smear is almost useless in parasitology!

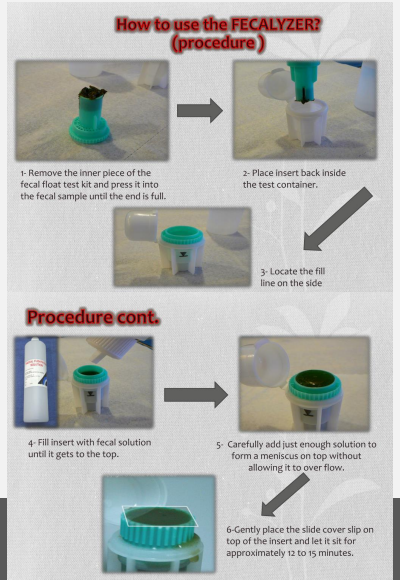
Disadvantages

- 10-30min flotaion (+5min centrifuge)
- Operation complicated
- Test kits / flotation solution costs
- Oocysts deformation
- Trichomonas break
- Some eggs (trematodes) don’t floate

Challenges of Flotation Methode



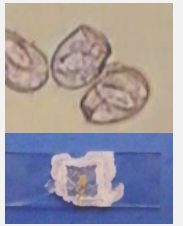




10-30 min floating time!

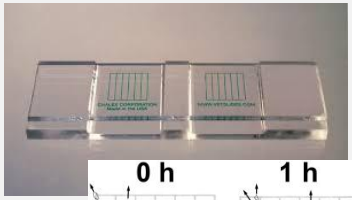
(Sedimentation：30min)

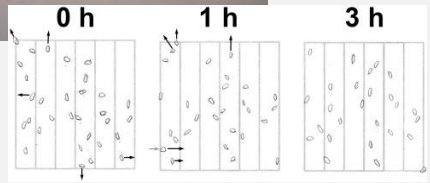
Common problems:

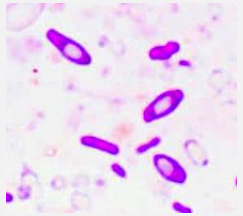


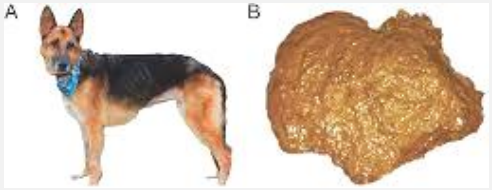
And... more questions:

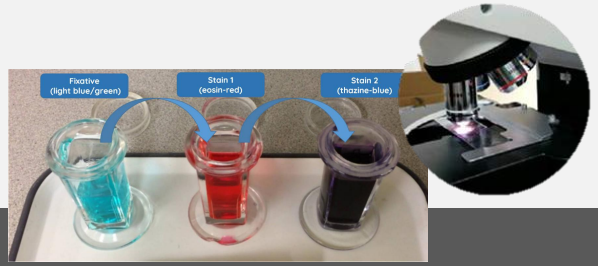
- How do you evaluate/monitor the therapy effect during a long-term antiparasitica therapy?
- Will you check the fecal bacteria types before making the decision of giving antibiotica or only probiotica?
- How important is the cytological and digestive information for you?











Challenges of Feces Examination

Any automation can take over these ‘‘dirty jobs’’ from the vets/vet assistants?

Urinalysis

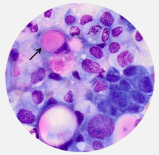
Three Essential Initial Tests of a Clinical Urinalysis for Small Animals

Specific Gravity

Dry Chemistry (Strip-test)

Sediment Analysis

Further urine tests according to the initial examination results:

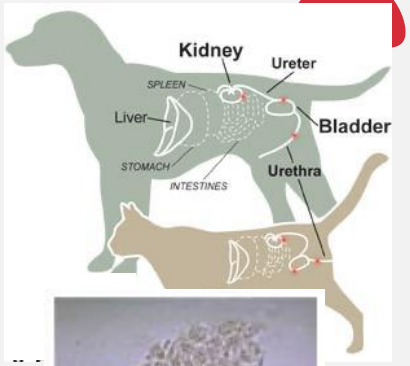


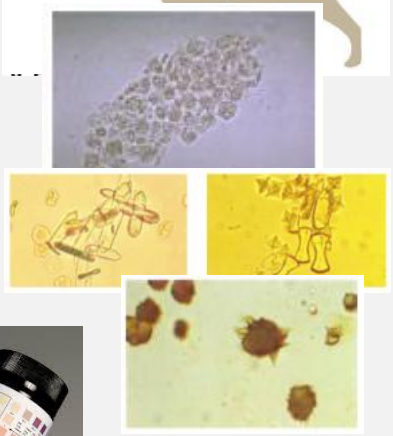
cytology (staining)

Microbiology (Reference lab)

PCR, Immunoassay . . .

Purpose of the Urine Morphology in Small Animal Veterinary



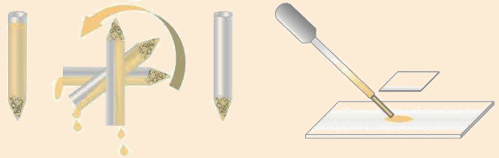


- UTI is one of the most common disease in small animal - but with or without bacteria infection?
- Acute kidney damage can only be found through urine
- Urolith monitoring and preventure
- Poisining diagnostics, liver failture, transitional cell carcinoma...

- Strips are not always relaiable!
  - Blood or hemolysis
  - False negative and false positive of WBC and protein
  - No info about bacteria/fungi

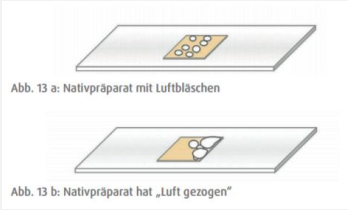
Manual Procedures (without staining)

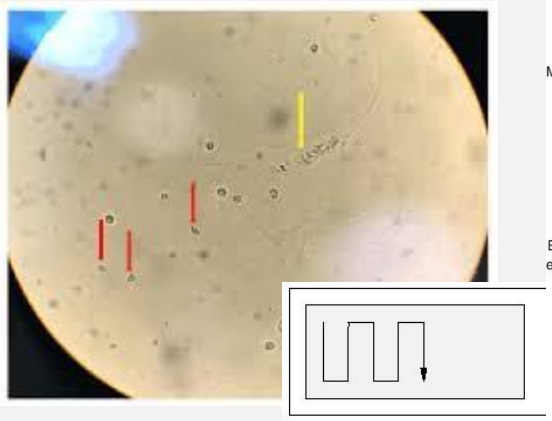
Comparison, reading
and documentation



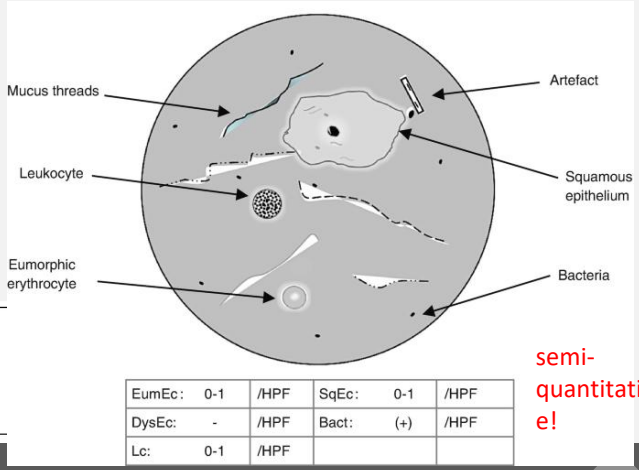
Centrifuge, preparing and manual microscopy of 20 fields (10 min)

Errors:





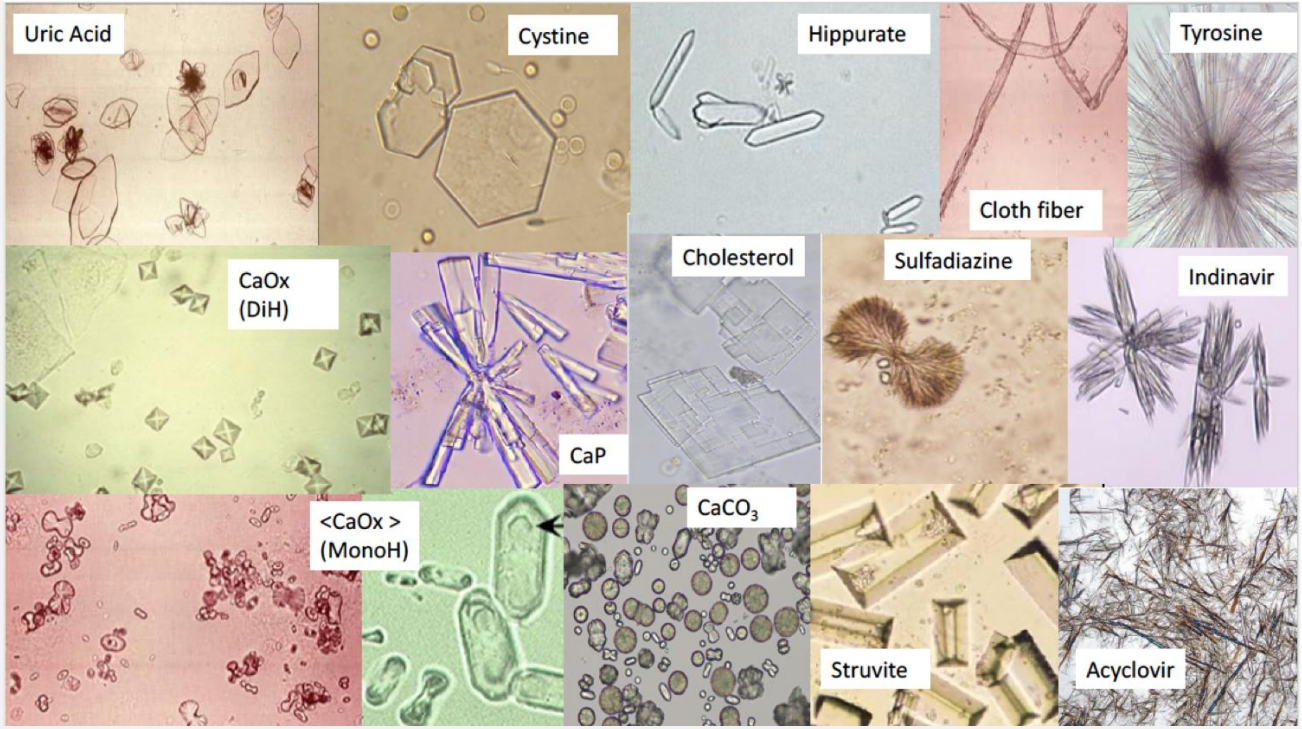
Count RANDOMLY
in 10 LPF and 10-20 HPF
ALL the sediments

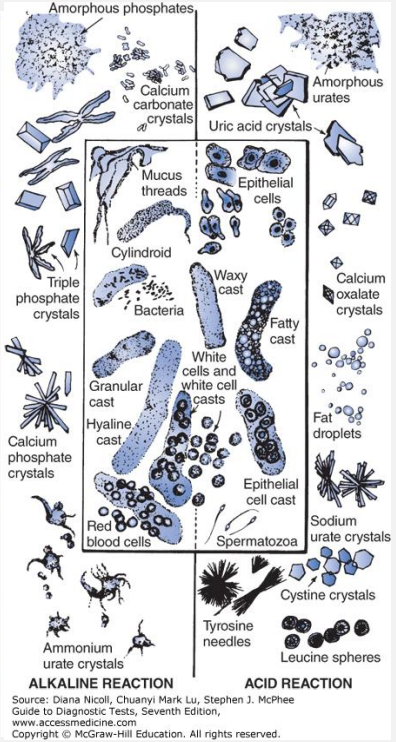


EumEc:	0-1	/HPF	SqEc:	0-1	/HPF
DysEc:	-	/HPF	Bact:	(+)	/HPF
Lc:	0-1	/HPF			

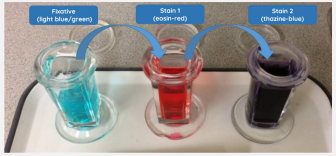
semi-quantitative!

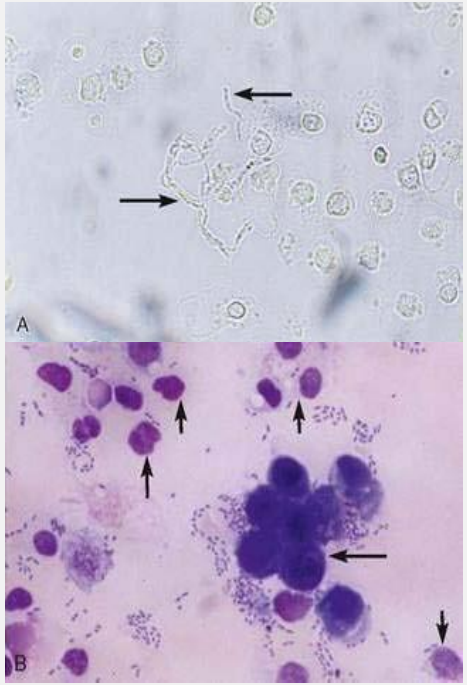
Native (unstained) urine sediment

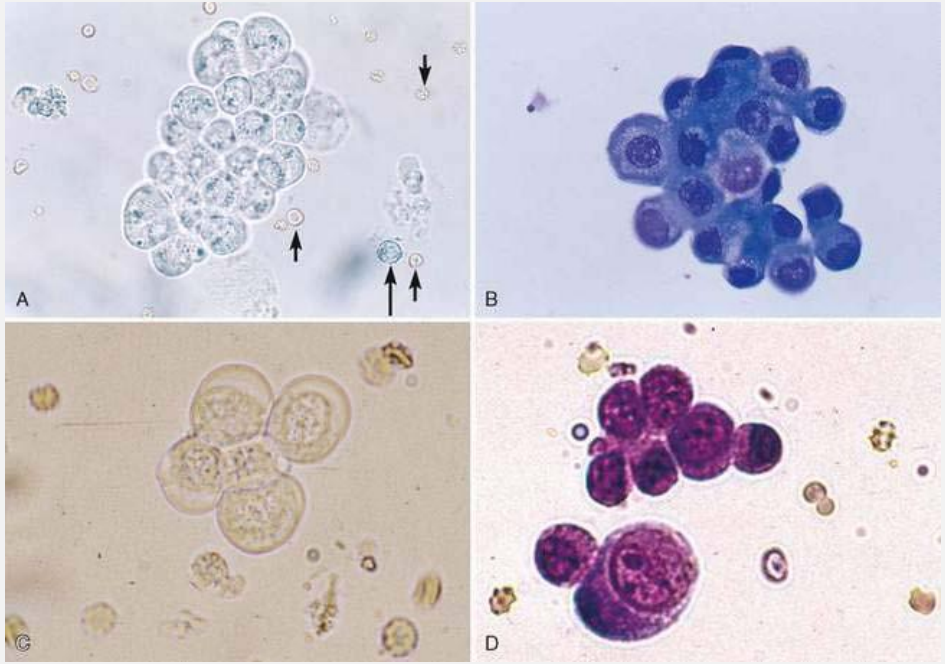




Urine cytology (stained)





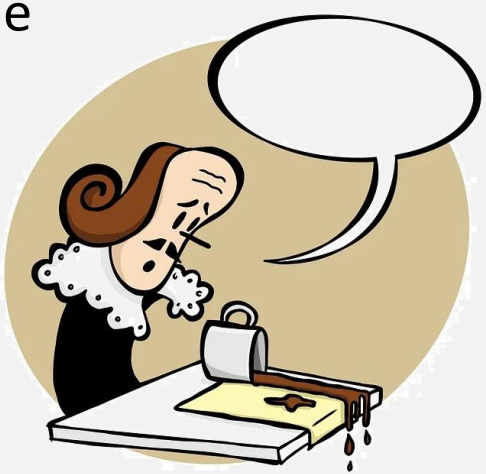


transitional cell hyperplasia vs carcinoma

Challenges of Urine Morphology

- 5-10ml samples required for microscopy (but animals don’t cooperate like humans do!)
- 5-10 min centrifuge + 10-20 fields counting time
- Interpratation skills required
- Semi-quantitative results
- Stain or not stain? (crystals lost during cytological staining)
- Transport or not?

(Urine sediment can change in 30 min-4h)

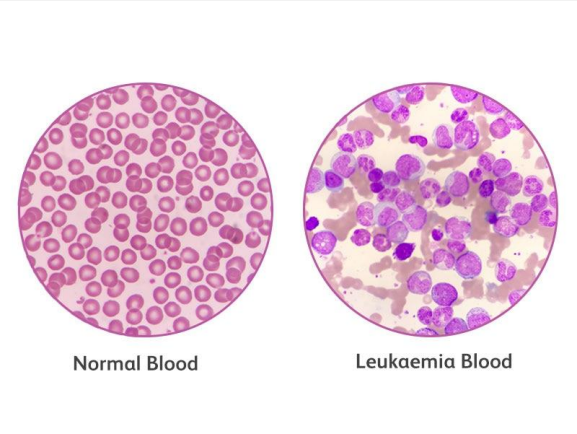


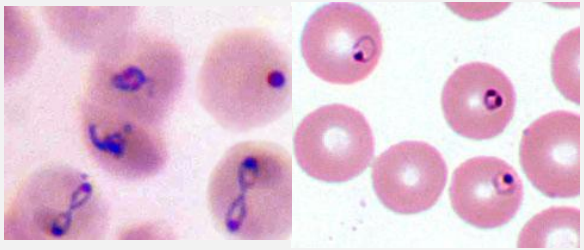
Blood Morphology

Purpose of the Blood Morphology in Small Animal Veterinary

- Anemia diagnostics and classification!
  - 20% of hospital small animal patients in USA
- Thrombocytopenia diagnostics
- WBC count, inflammation classification
- Leukamia/lymphoma
- Blood ‘‘parasites’’
- Poisioning, hereditary blood disease

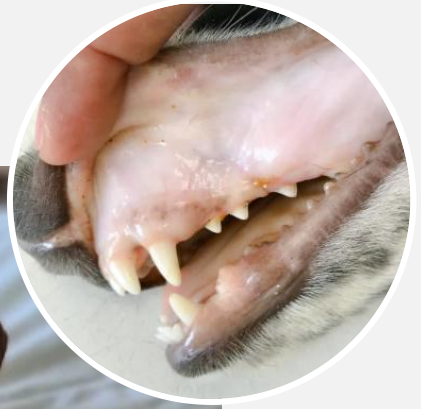
Luckily, CBC is invented! :D





Blood - Clinical Question 1

- If you get a patient with anaemia (low HCT), which further diagnostics will you run, or will you start a general treatment directly?



Anemia, but why?

Non-regenerative = not produce enough

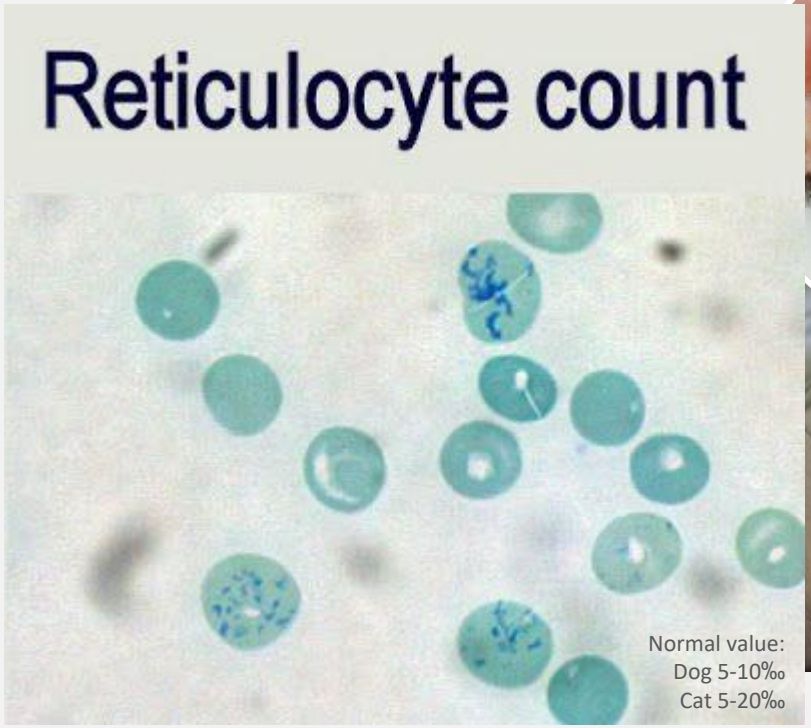
Regenerative = waste too much

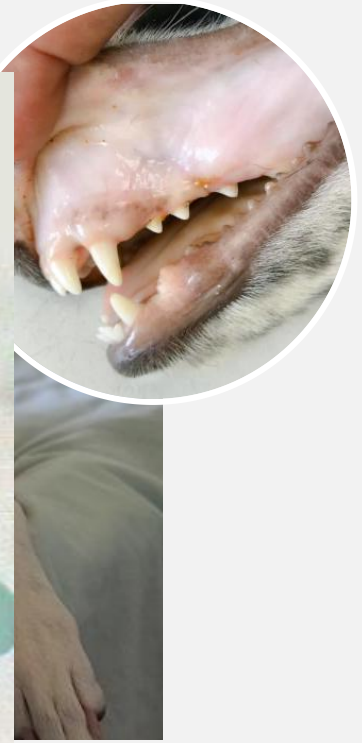
Anemia: Regenerative or Nonregenerative?

(aplastic/hypo-plastic)

IF regenerative → Haemolysis or coagulation disorder / blood losing?

IF nonregenerative → Iron deficiency or bone marrow disorder?





Causes of Regenerative Anemia

- **Blood loss** → moderate regenerative, eventually total protein (TP) ↓
  - – Acute (haemorrhage)
  - – Chronic
    - tumor, infection, inflammation
    - Coagulation disorder
- **Hemolysis** → often great regenerative with icterus & bilirubin↑
  - – Autoimmune
  - – Non-autoimmune

→More common and more dangerous, can die in 1-3 months without targeted therapy

Non-Regenerative Anemia

Non-regenerative = not produce enough

- The production function is damaged and stopped
- The production function is defected, products has poor quality and can't be used

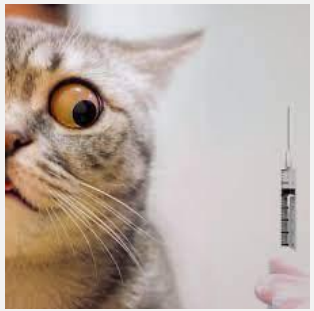
intra bone marrow issues (aplastic anemia)

- The production is intact, but no materials for work
- The production is intact, materials are available, but no orders

extra bone marrow issues

Blood - Clinical Question 2

- If you have a patient with raised WBC after a surgery, how do you distinguish a stress reaction with a real infection?



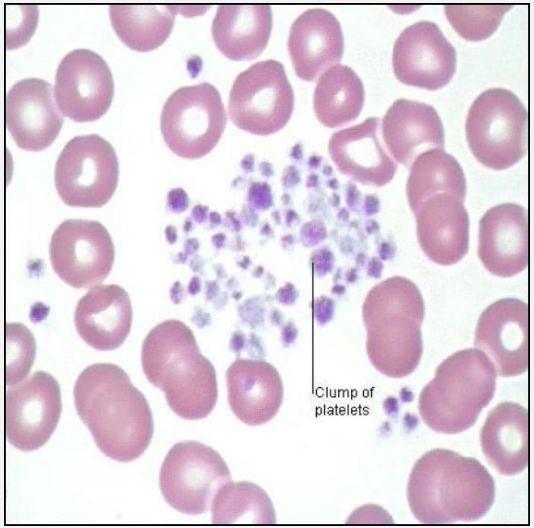
VS

WBC ↑ : infection or stress? acute or chronic?

- If you have a patient with raised WBC after a surgery, how do you distinguish a real infection?

Blood - Clinical Question 3

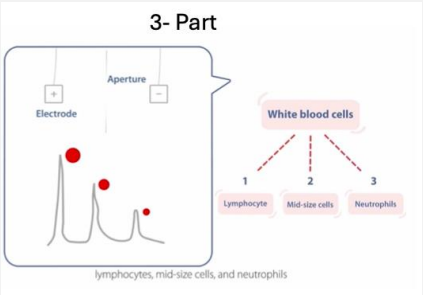
- If a CBC shows low platelets, will you re-view the sample under microscope to rule out the in-vitro agglutination?

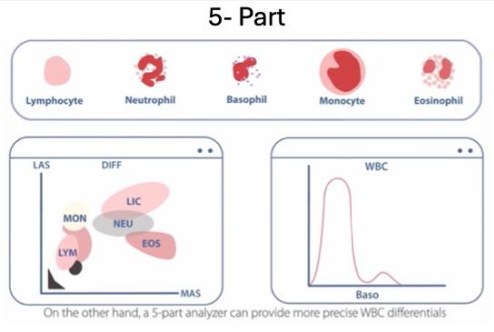


Is CBC enough for vet clinics?

Advantages of Flow-cytometry Hematology (CBC machine)

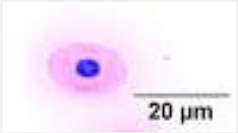
- Easy to use
- Quantitative results
- Small amounts of sample required
- Very quickly





Challenge of in-house CBC in small animal clinics

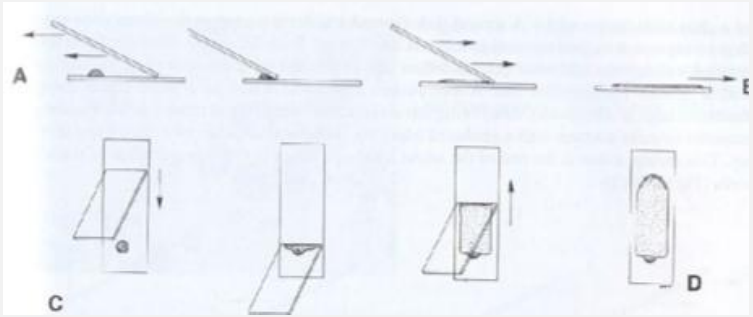
- Most don't have reticulocyts
- WBC Only 3-part or 5-part
- Not visual methods, unable to exame the morphology
- Machine limit/error/interference
- Re-inspection with manual microscope
- Only for mammals blood sample, unsuitable for reptils and birds

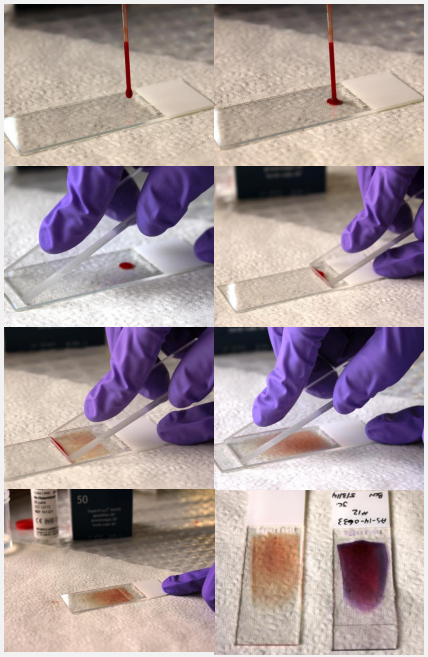


Manual Procedure of Blood Morphology

Blood smear procedure:

1. Blood collecting (EDTA)
2. Gently mixing
3. Smearing and drying



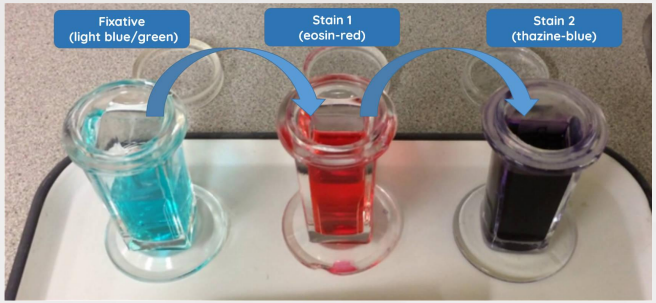


Common mistakes:

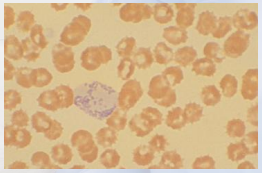
Manual Procedure of Blood Morphology

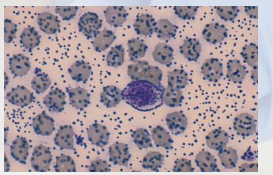
Blood smear procedure:

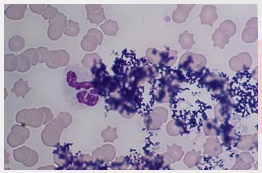
1. Blood collecting (EDTA)
2. Gently mixing
3. Smearing and drying
4. Staining and drying again
5. Manual examing and counting

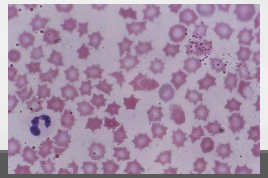


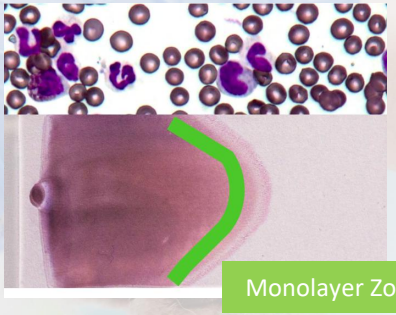
Common mistakes:







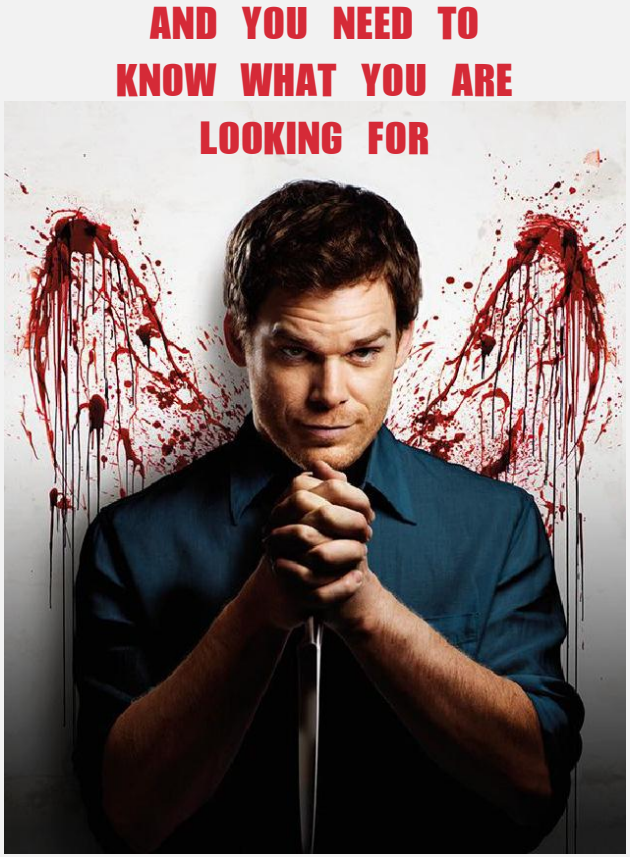




Monolayer Zone

Count total WBCs/platelets/special RBCs with 1000 RBCs;
Count 100-200 WBCs for differential

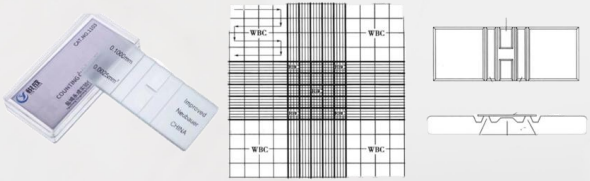
Challenges of Blood Morphology



Challenges of morphology diagnostics in small animal clinics

Advantages of Microscopy

- Cheap
- visual
- multiple function



Challenges of Microscopy

- Time consuming!!!
- Personal skill training required! (Sample preparing & interpretation)
- Intra- and Inter-observer variability
- Results not recordable (difficult)
- Quantitative complicated
- contamination

Challenges of morphology diagnostics in small animal clinics

Advantage of Reference Laboratory

- Accurate
- Morphologist available
- Professional interpretation
- Order of further diagnostics

Challenge of Reference Laboratory

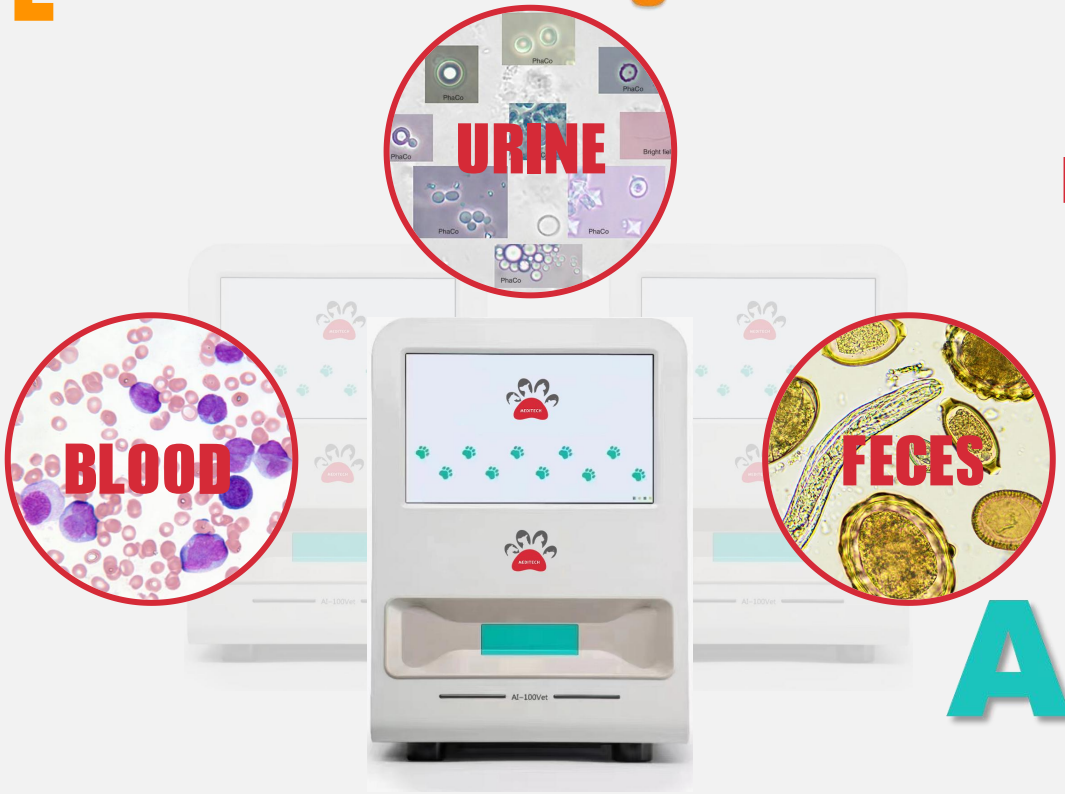
- Turn-around-time too long!
- sample changes during transport (urine, oocyts parasites)
- Price

What if there's a equipment which is...

- Easy and Quickly
- Save the labor
- Accurate
- More clinical information
- Visual and recordable
- Multiple function

  .....
- Like a morphology expert in-house?!

The Game Changer:



Small Animal Veterinary

3-in-1

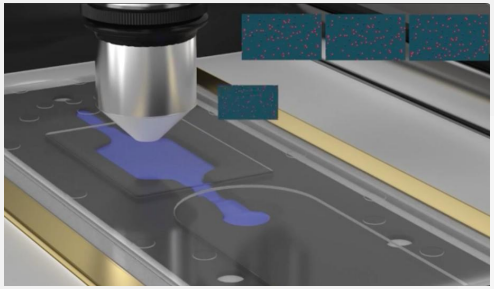
Automated AI Morphology Analyzer

MEDITECH

AI-100Vet

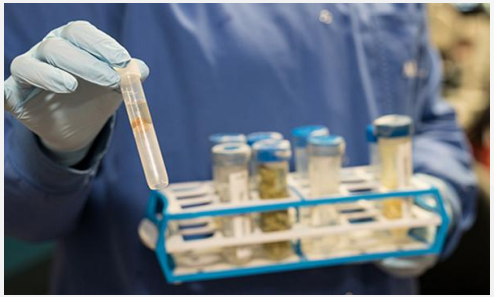
Your In-house AI morphology expert

What is AI-100VET?

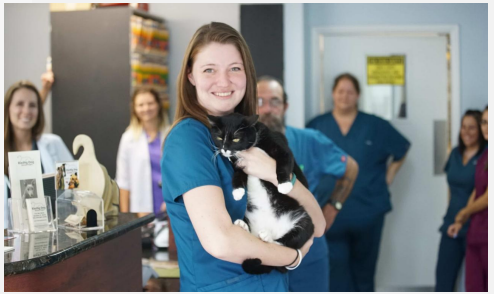


An automated microscope

A deep-learning AI morphologist and parasitologist

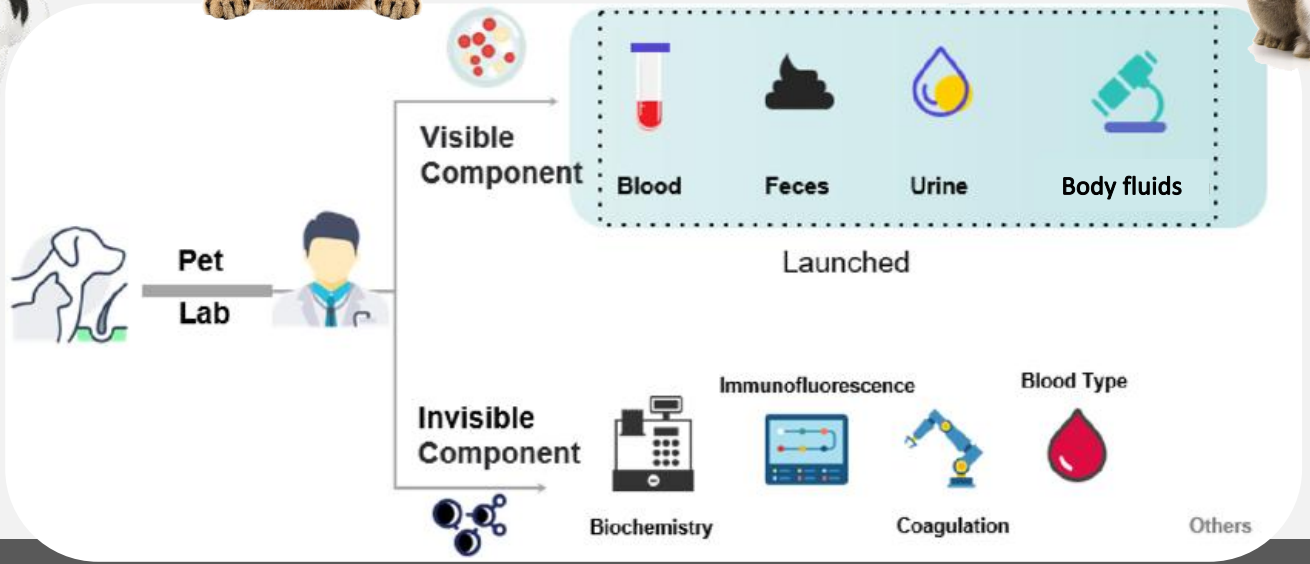


A multiple-function sample preparing and examing plattform

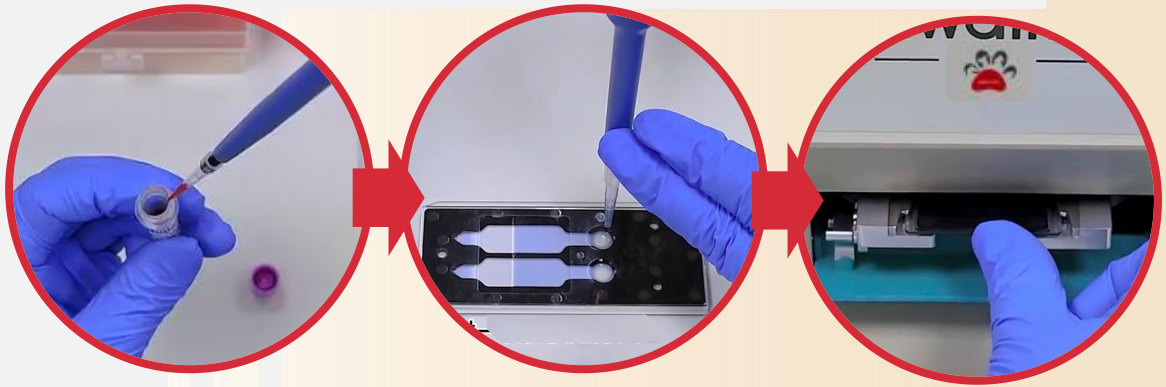


An effective screening tool for clinics/hospitals

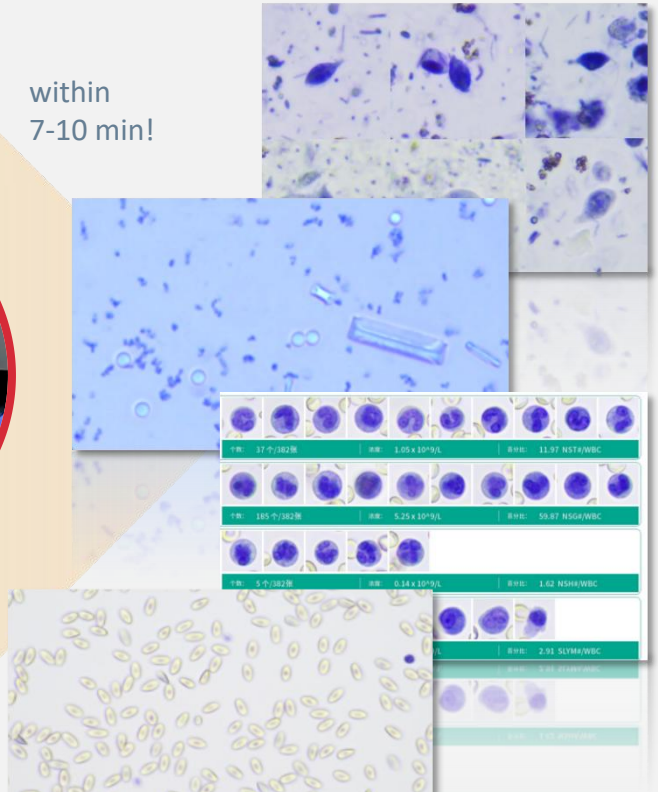
Multiple species and Multiple functions



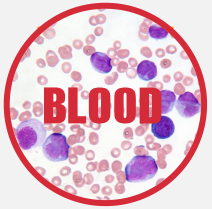
Fully Automated with 3 Simple Steps



within
7-10 min!



1. liquid staining (10-500ul sample)
2. chamber injection
3. plug in and start



Main Features

10uL of Blood

Test requires just **10μL** blood sample.

7.5 Min of Testing

The entire test, including PBS, is completed within **7.5 minutes**

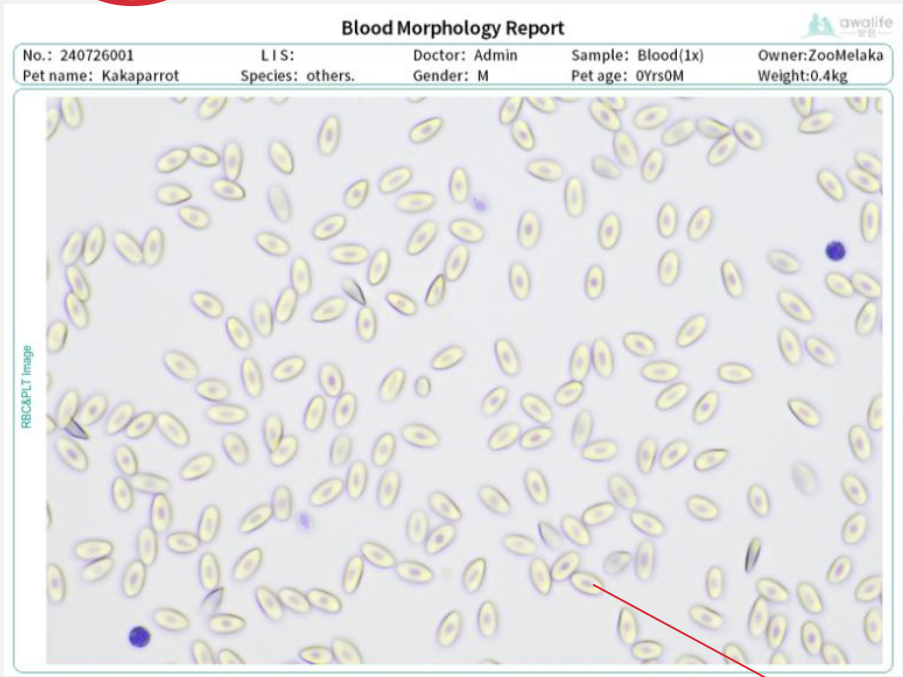
11+ Specieses

Capability to detect various animal with **individual algorithms for each species**, including:

Mammals: dog, cat, rabbit, chinchilla, rat, mouse, hamster, ferret (and others).
Reptiles: bird, turtle, (other reptils).

46 blood parameters

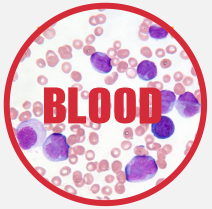
Kakaparrot Blood Morphology



(whole-field-of-view with special blood staining)

(whole-field-of-view of same position in hemoglobin channel)

Nucleated red blood cells



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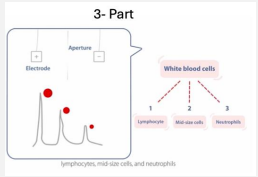
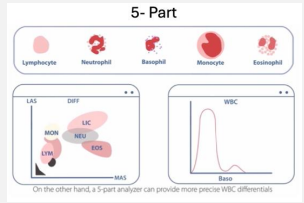
46 blood parameters

Surpassing 9 part diff. diagnostics including:

Left shift and right shift
Nucleated red blood cells and Reticulocytes
Ghost cells and spherocytes
Large platelet and agglutenated platelet

Introduction and Classification of Blood Cells





Blood Cells

- RBC
  - Reticulocyt
  - Nucleted RBC
  - Spherocytosis
  - Ghost cell RBC
  - Agglutinated RBC
  - Normal

RBC x 5 types

- WBC
  - monocyte
  - Intermediate cell
  - lymphocyte

3-part

- Eosinophils
- Basophils
- Neutrophils

5-part

- Hyper Segmented
- Band
- Segmented

Classifiy Inflammation

WBC-9 part

- PLT
  - LPLT
  - PLT
  - APLT

PLT x 3 types

Why vets need these parameters?

01 Anemia classification

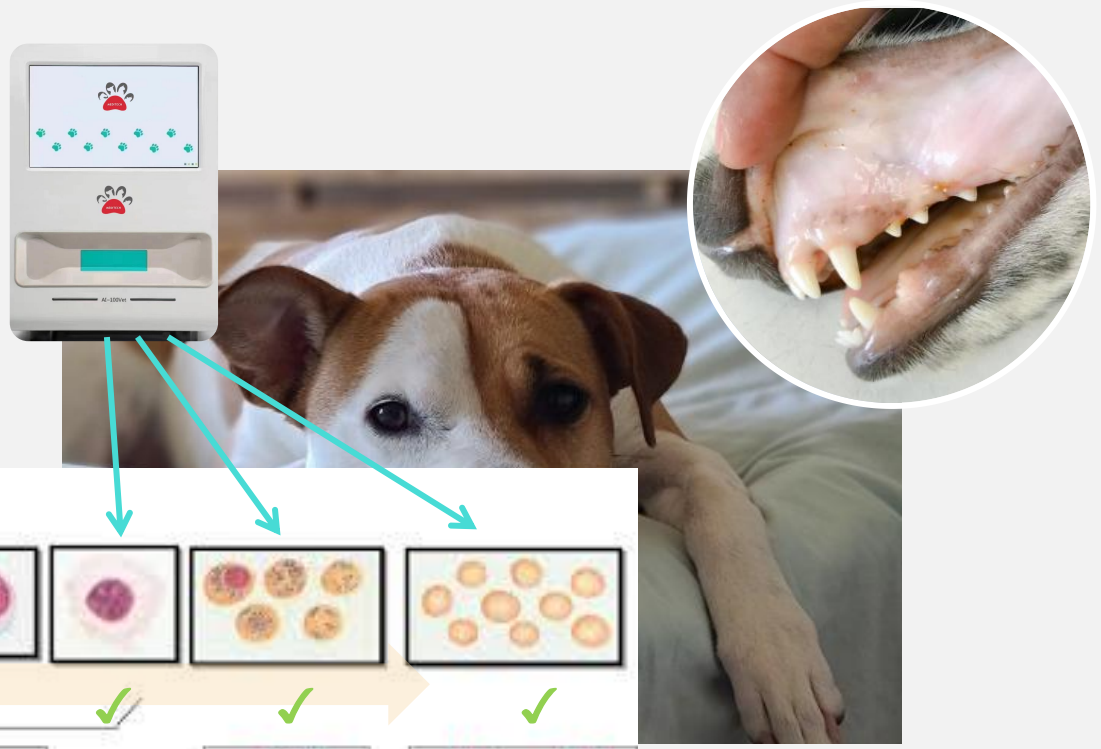
02 Monitoring the disease progress

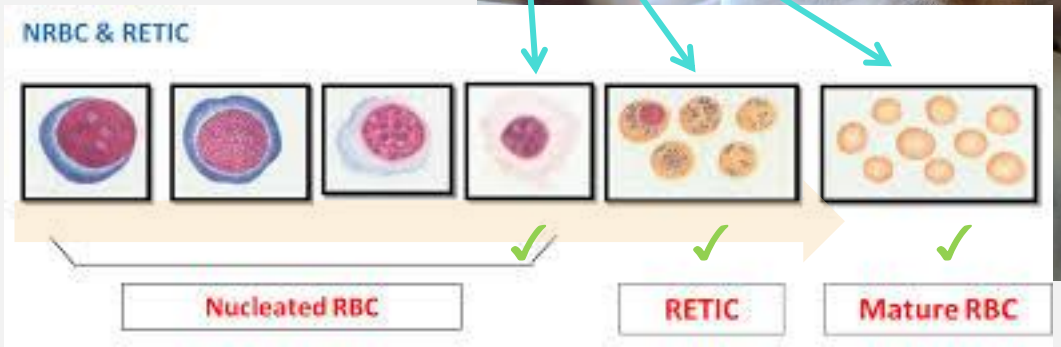
03 Avoid machine erros (misdiagnostics) and manual re-inspection

Anemia: Regenerative or Nonregenerative?

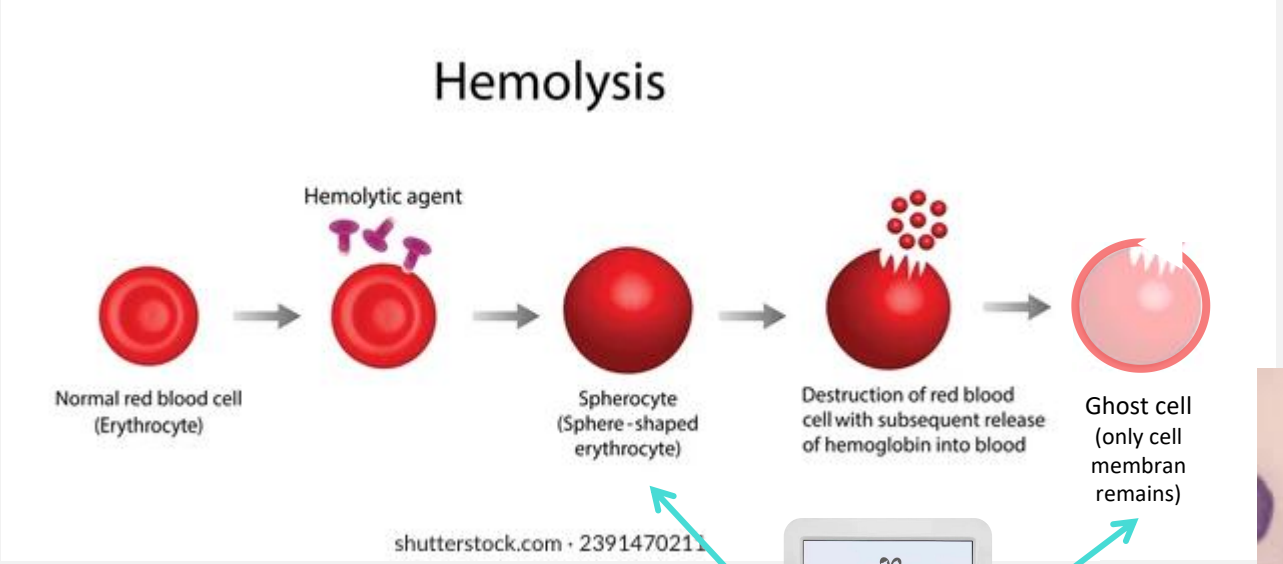
IF regenerative → Hemolysis or coagulation disorder / blood losing?

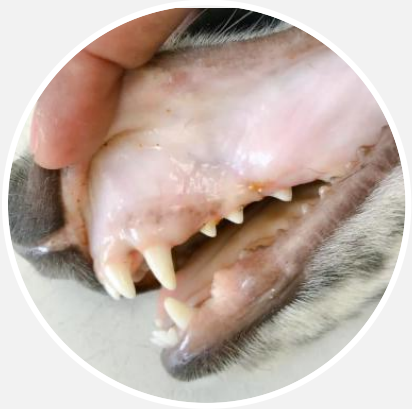
IF nonregenerative → Iron deficiency or bone marrow disorder?

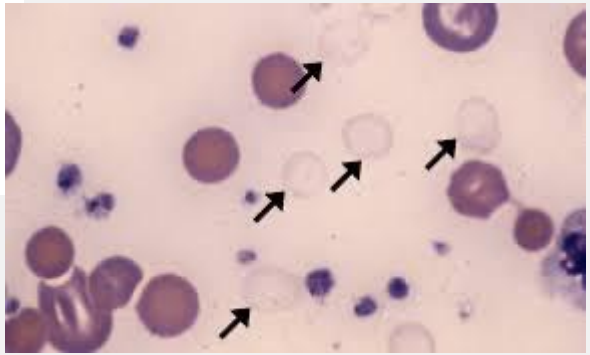


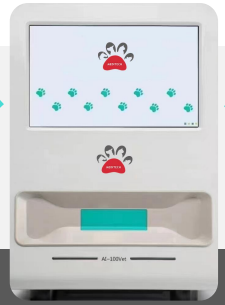


Regenerative Anemia: Hemolysis or not?



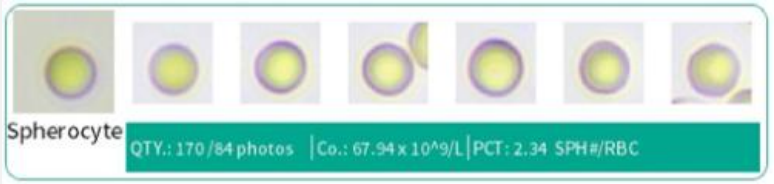






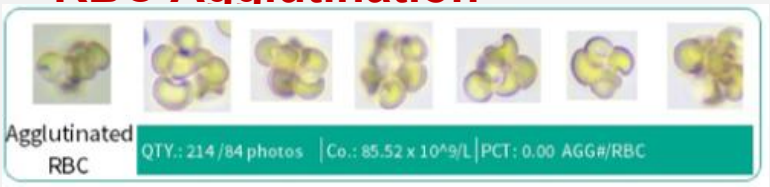
Hemolysis Anemia: Cortisol or not?

Spherocytes

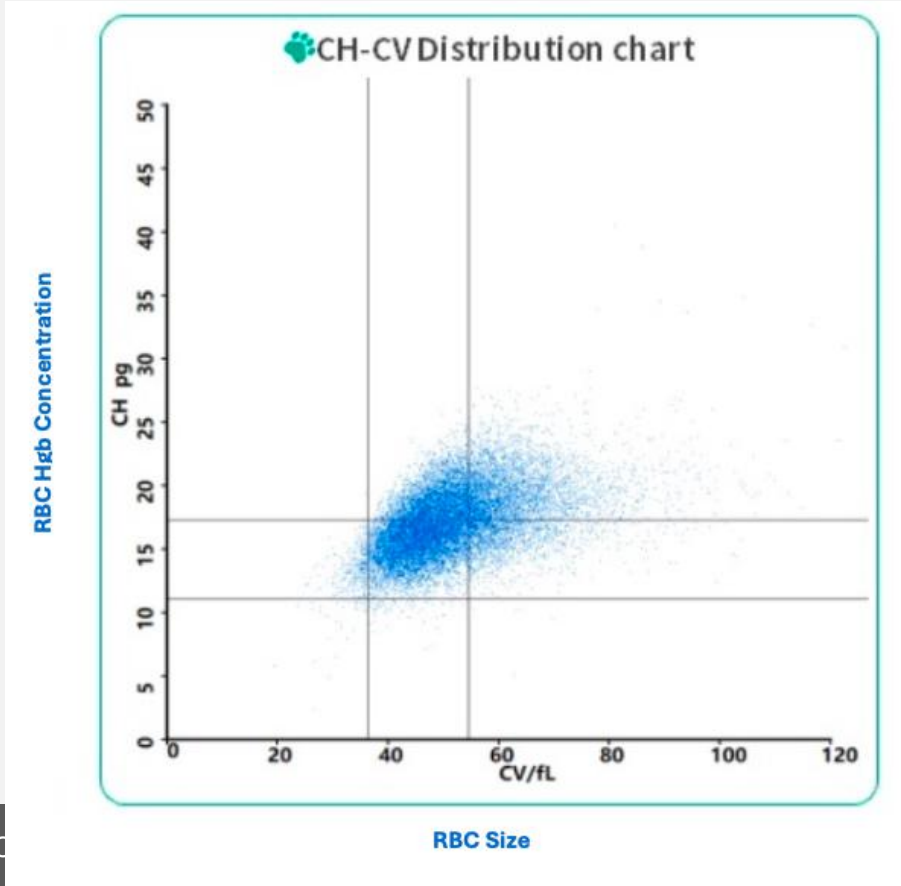


Erythrocyte Ghost Cell

RBC Agglutination



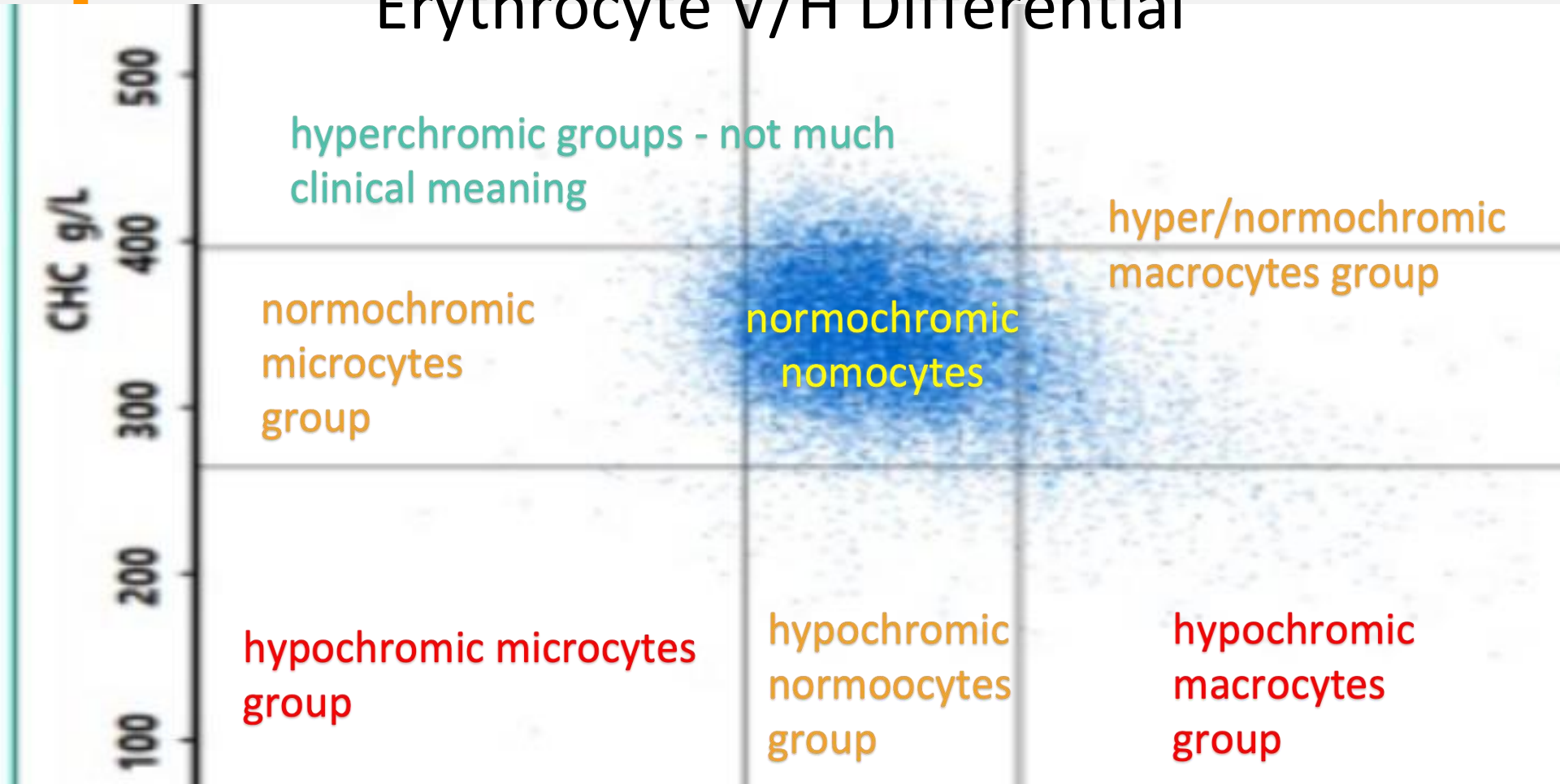
Non-regenerative Anemia: Causal?



0.01	24.32	21.62
2.01	42.58	8.87
0.20	0.35	0.03

- **Erythrocyte V/H Differential: the first real RBC-differential analyzer for small animal vests**
- Direct information of micro-/nomo-/macrocytes and hypo-/normo-/hyperchromic indicate different causals of anemia
- A further step of erythrocyte indices (MCV/MCH/MCHC): more sensitive and easy to understand

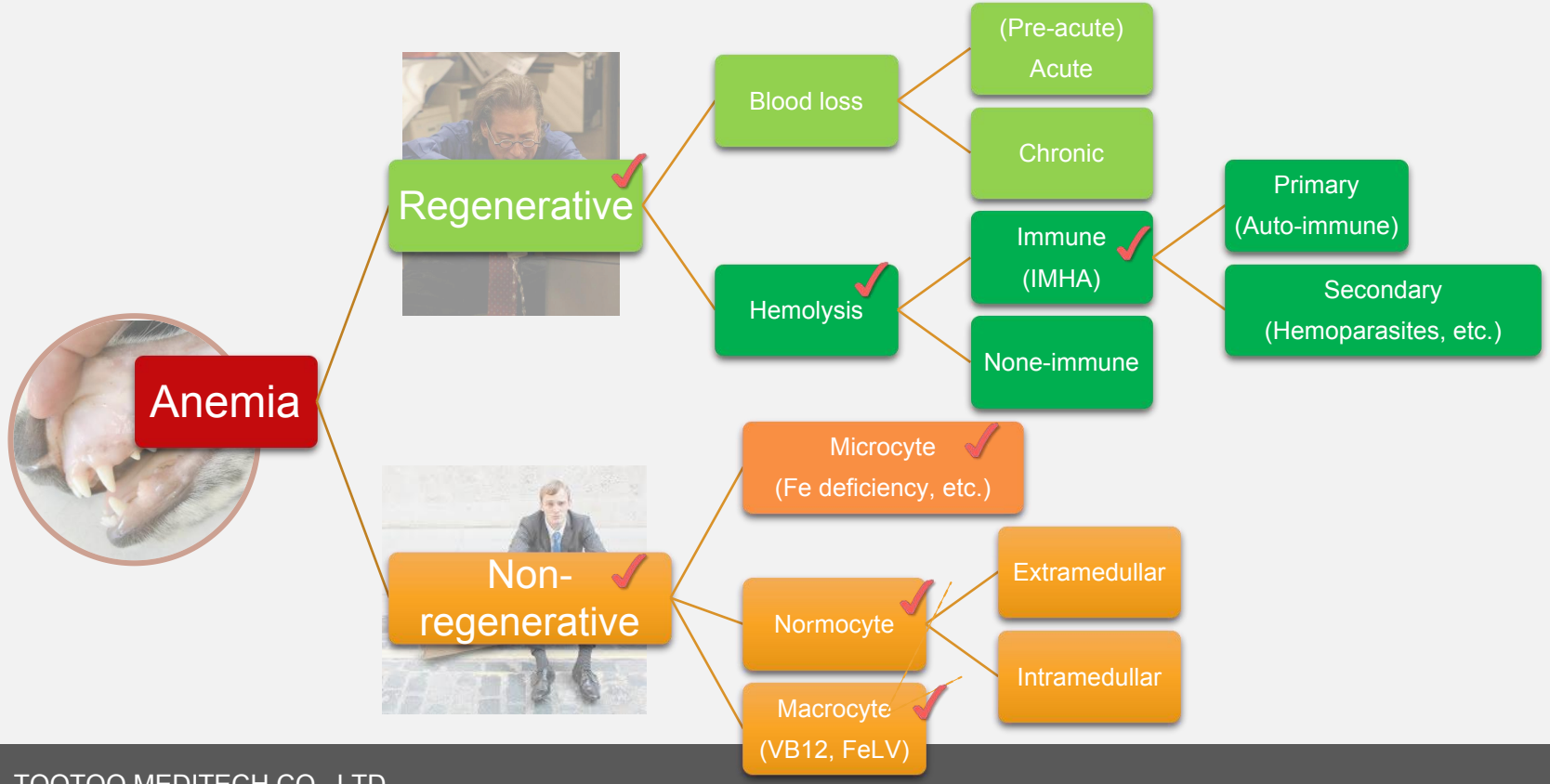
Erythrocyte V/H Differential



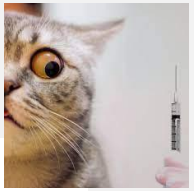
Erythrocyte V/H Differential

	Microcytic	Normocytic	Macrocytic
Hyperchromic		Dehydration (MCH↑, MCHC normal)	Megaloblastic: VB12 or folate deficiency (e.g. dysbiosis); Myelodysplasia (leukemia, FeLV); Sulfonamid, methotrexat; Regenerative response (Reticulocyte)
Normochromic	Portosystemic Shunt (PSS) (Akita + Shiba NORMAL)	Hemolysis Acute blood loss Acute pancreatitis Chronic renal disease, heart-kideny-failure (EPO↓) Endocrine disease (hypothyriesis, Addison syndrom, estrogen) Protein deficiency/cachexia (tumor, chronic disease/inflammation) Bone marrow failture (immunogic aplastic, FIV, FIP, Leishmaniosis, Ehrlichiosis, tumor metastasia into BM, chemo therapy, radiation damage, intoxication e.g.lead, chloramphenicol)	
Hypochromic	Iron deficiency Cupfer deficiency Lead/cupfer poisoning Sideroblastic anemia Chronic blood loss Chronic inflammation	Mild iron deficiency (Acute IMHA)	Megaloblast or reticulocyte with 2nd. iron deficiency (Chronic IMHA)

Powerful Screening Tool for Anemia Diagnostics



Infection or Stress? Acute or chronic?



Enemy Attack!

- Left Shift:

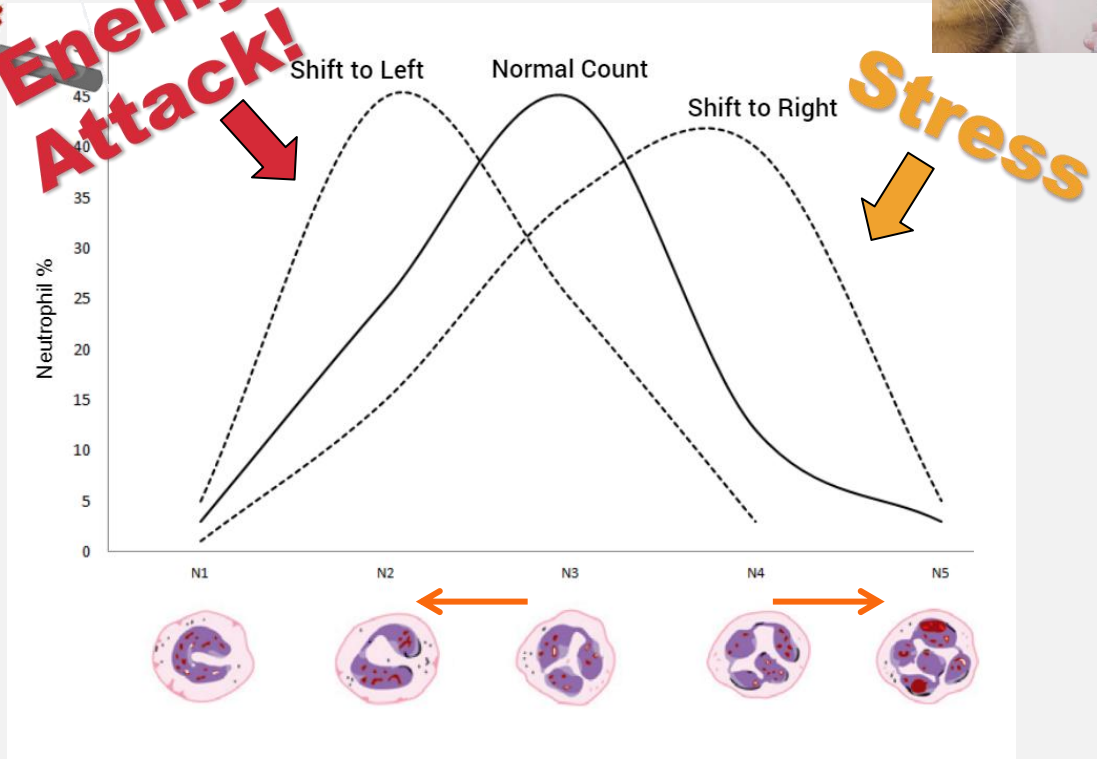
increasing of immature band neutrophils suggests more severe inflammation, often associated with a bacterial infection

(Productive leucocytosis)

- Right Shift:

stress/excitement leukogram

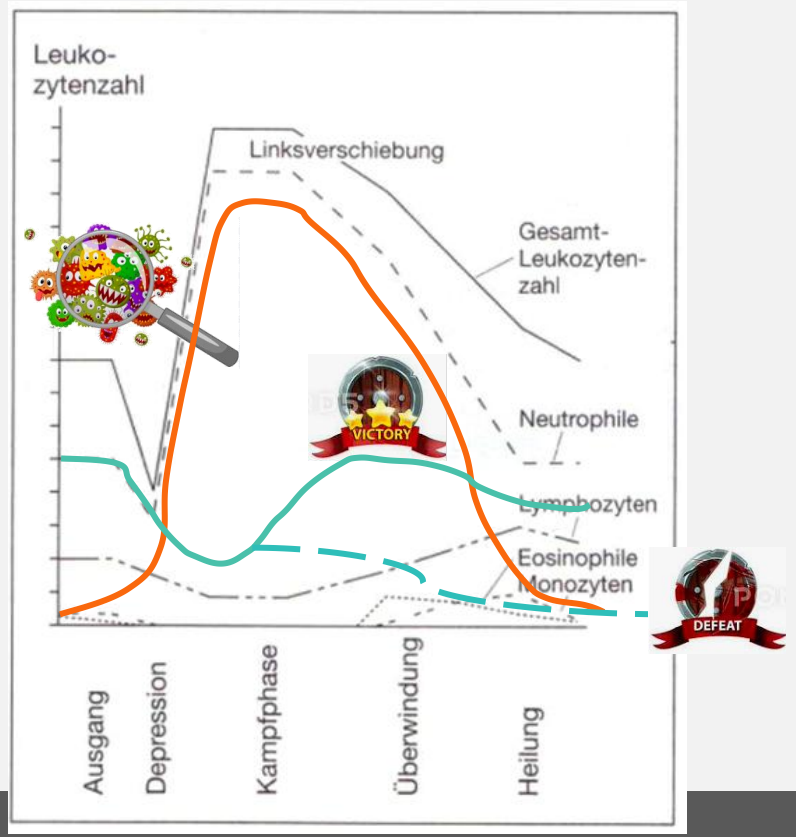
(Pseudoleucocytosis)



Infection: Acute or Chronic? Prognosis?

- Infection and recover process:

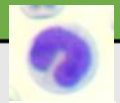
1. WBC depression (initial phase)
2. WBC (band neutrophil) increasing - fighting phase
3. WBC decreasing (neutrophil↓, lymphocyts↑) (recover phase)



AI-100Vet: First WBC 9-part Differential

Detection items	Result	Unit
1.WBC	**2.RBC**	**3.PLT**
1-1.NEU#	2-1.HGB	3-1.PCT
1-2.NST# band neutrophile	2-2.HCT	3-2.MPV
1-3.NSG# segmented neutrophile	2-3.MCV	3-3.LPLT#
1-4.NSH# hypersegmented neutrophile	2-4.MCH	3-4.P-LCR
1-5.LYM#	2-5.MCHC	3-5.APLT#
1-6.MON#	2-6.RDW-SD	3-6.PDW-SD
1-7.EOS#	2-7.RDW-CV	3-7.PDW-CV
1-8.BAS#	2-8.HDW-SD	
1-9.NEU%	2-9.HDW-CV	
1-10.NST/WBC%	2-10.RET#	
1-11.NSG%	2-11.RET%	
1-12.NSH/WBC%	2-12.NRBC# nucleated RBC	
1-13.LYM%	2-13.NRBC/WBC%	
1-14.MON%	2-14.ETG#	
1-15.EOS%	2-15.ETG%	
1-16.BAS%	2-16.SPH#	
1-17.NST/NEU%	2-17.SPH%	
1-18.NSH/NEU%	2-18.AGG#	

WBC Differentiation: 9-part VS 3-/5-part

3 part	5 part	AI 100VET—7 Types, 9 Part
Granulocyte	Neutrophil	 Band neutrophil
		 Segmented neutrophil
		 Hypersegmented neutrophil
	Eosinophil	Eosinophil
	basophil	basophil
Lymphocyte	Lymphocyte	Lymphocyte
monocyte	monocyte	monocyte

For Better Monitoring and Accurate Prognosis

DDx According to the WBC 9-PART Differential

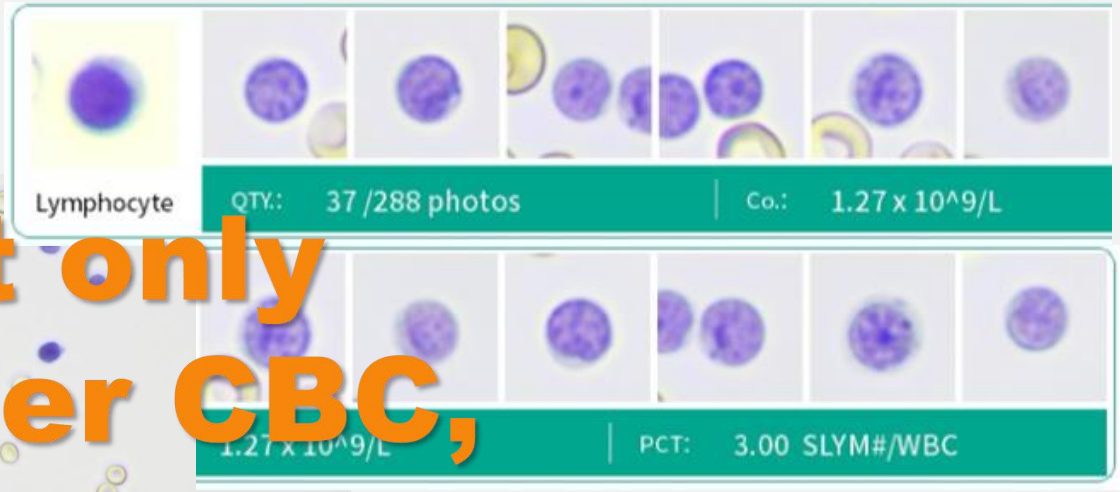
Disease	WBC	Segmented Neutrophils	Band Neutrophils	Lym	Mon	Eos	(CRP/SAA)
Acute inflammation	Stongly Increased	***Increased***	***Increased***	Decreased/ Normal	Varies	Decreased	increased
		Strongly Increased					
Severe inflammation	Decreased /NoChange	***Decreased/ Normal***	***Increased***	Decreased/ Normal	Varies	Varies	(strongly) increased
		Normal/**Slight Increased**					
Mild/chronic inflammation	Increased	***Increased***	***Slightly Increased/ Normal***	Varies	Increased	Increased/ Varies	slightly increased
Excitement Leukogram	Increased	***Increased/ Normal***	***Normal***	Normal/ Increased in cats	Varies	Varies	Normal
		Normal/**Slight Increased**					
Stress leukogram	Increased	***Increased***	***Normal***	Decreased	Normal/ Increased in dogs	Decreased/ Varies	Normal/ increased in aseptic inflammation
		Increased					

Thrombocytopenia: real or misdiagnosed?

Large Platelet (LPLT) differencial with RBC

Agglutinated Platelet differencial with WBC

Moreover...

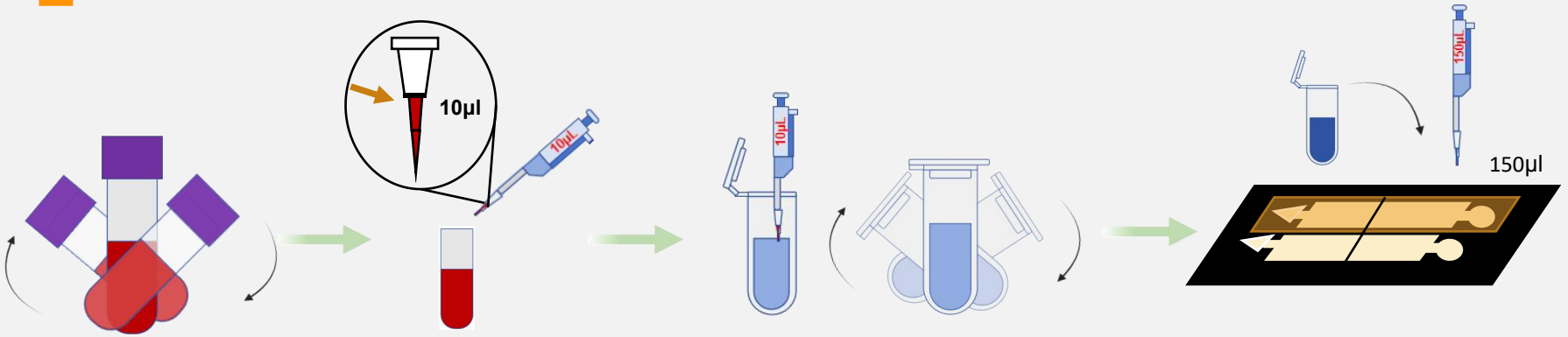


Not only another CBC, but Morphology!

Discovery of Leukemia!

(highly possible small-cell lymphoma)

4-Steps Procedure Blood Testing for Dogs and Cats



1

Before starting the test, gently and thoroughly mix the EDTA-blood sample (reptiles:Heparin-blood) and ensure there are no obvious blood clots.

2

Draw **10μl** of blood, ensuring the volume of blood is at the 10μl mark. Scrape off any excess blood from the outer wall at the mouth of the collection tube.

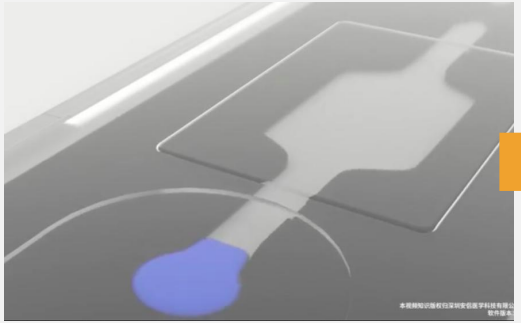
3

Add the blood sample to the blood staining solution (Reagent, 2.5ml) and gently invert to thoroughly mix the blood sample with the staining solution.

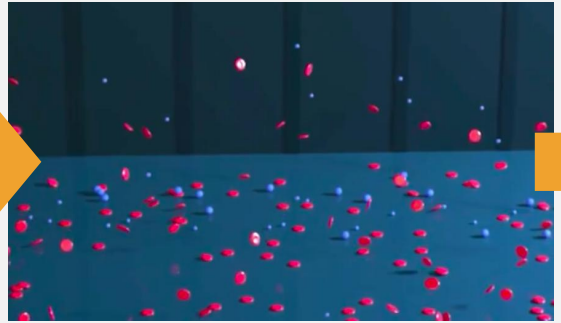
4

After mixing thoroughly, immediately draw **150μl** of the stained sample and quickly inject it into the chip channel in a single motion, then proceed with machine testing.

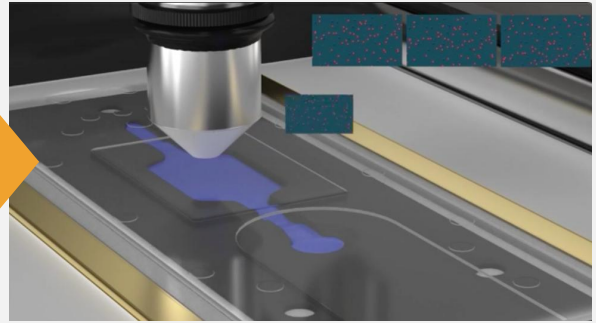
Automated Processing in 7.5 Minutes



Micro-Flow Chamber



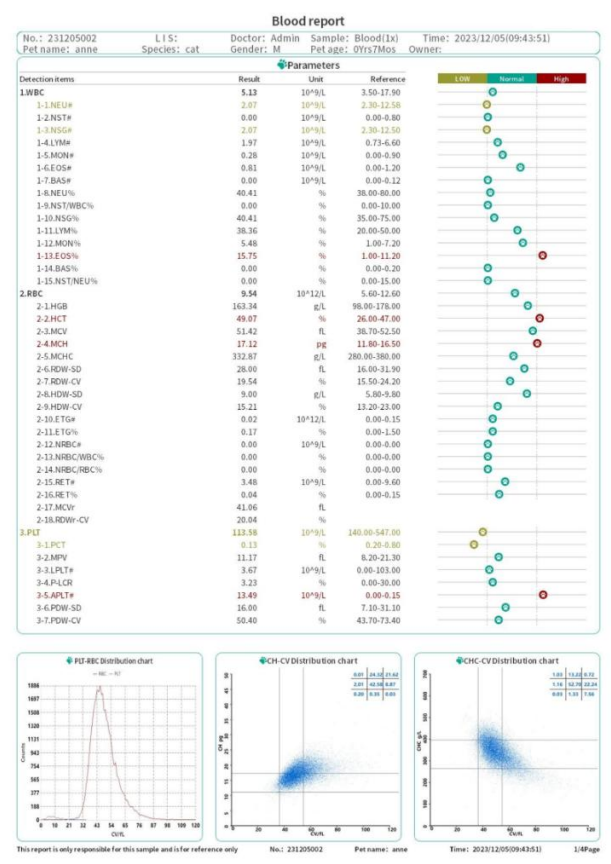
Sedimentation to monolayer



Scann under 40x10 magnification 200-500K cells*, shooting 500+ full-fields of view images

***Cell counting comparison:**
Microscope: 1000 cells
Flow-cytometry: 20K cells

Blood Report with 45 Parameters



Blood report

No.: 231205002 LIS: Doctor: Admin Sample: Blood(1x) Time: 2023/12/05(09:43:51)
Pet name: anne Species: cat Gender: M Pet age: 0Yrs7Mos Owner:

Parameters

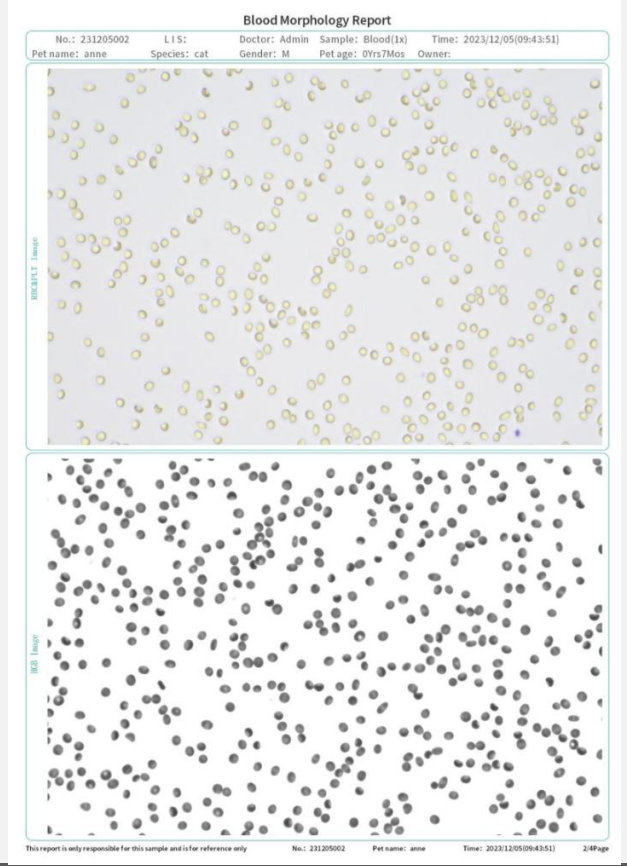
Detection items	Result	Unit	Reference
1.WBC	5.13	10^9/L	3.50-17.90
1-1.NEU#	2.07	10^9/L	2.30-12.58
1-2.NST#	0.00	10^9/L	0.00-0.80
1-3.NSG#	2.07	10^9/L	2.30-12.50
1-4.LYM#	1.97	10^9/L	0.73-6.60
1-5.MON#	0.28	10^9/L	0.00-0.90
1-6.EOS#	0.81	10^9/L	0.00-1.20
1-7.BAS#	0.00	10^9/L	0.00-0.12
1-8.NEU%	40.41	%	38.00-80.00
1-9.NST/WBC%	0.00	%	0.00-10.00
1-10.NSG%	40.41	%	35.00-75.00
1-11.LYM%	38.36	%	20.00-50.00
1-12.MON%	5.48	%	1.00-7.20
1-13.EOS%	15.75	%	1.00-11.20
1-14.BAS%	0.00	%	0.00-0.20
1-15.NST/NEU%	0.00	%	0.00-15.00
2.RBC	9.54	10^12/L	5.60-12.60
2-1.HGB	163.34	g/L	98.00-178.00
2-2.HCT	49.07	%	26.00-47.00
2-3.MCV	51.42	fL	38.70-52.50
2-4.MCH	17.12	pg	11.80-16.50
2-5.MCHC	332.87	g/L	280.00-380.00
2-6.RDW-SD	28.00	fL	16.00-31.90
2-7.RDW-CV	19.54	%	15.50-24.20
2-8.HDW-SD	9.00	g/L	5.80-9.80
2-9.HDW-CV	15.21	%	13.20-23.00
2-10.ETG#	0.02	10^12/L	0.00-0.15
2-11.ETG%	0.17	%	0.00-1.50
2-12.NRBC#	0.00	10^9/L	0.00-0.00
2-13.NRBC/WBC%	0.00	%	0.00-0.00
2-14.NRBC/RBC%	0.00	%	0.00-0.00
2-15.RET#	3.48	10^9/L	0.00-9.60
2-16.RET%	0.04	%	0.00-0.15
2-17.MCV	41.06	fL	
2-18.RDW-CV	20.04	%	
3.PLT	113.58	10^9/L	140.00-547.00
3-1.PCT	0.13	%	0.20-0.80
3-2.MPV	11.17	fL	8.20-21.30
3-3.LPLT#	3.67	10^9/L	0.00-103.00
3-4.P-LCR	3.23	%	0.00-30.00
3-5.APLT#	13.49	10^9/L	0.00-0.15
3-6.PDW-SD	16.00	fL	7.10-31.10
3-7.PDW-CV	50.40	%	43.70-73.40

PLT-RBC Distribution chart

CH-CV Distribution chart

CHC-CV Distribution chart

This report is only responsible for this sample and is for reference only No.: 231205002 Pet name: anne Time: 2023/12/05(09:43:51) 1/4Page

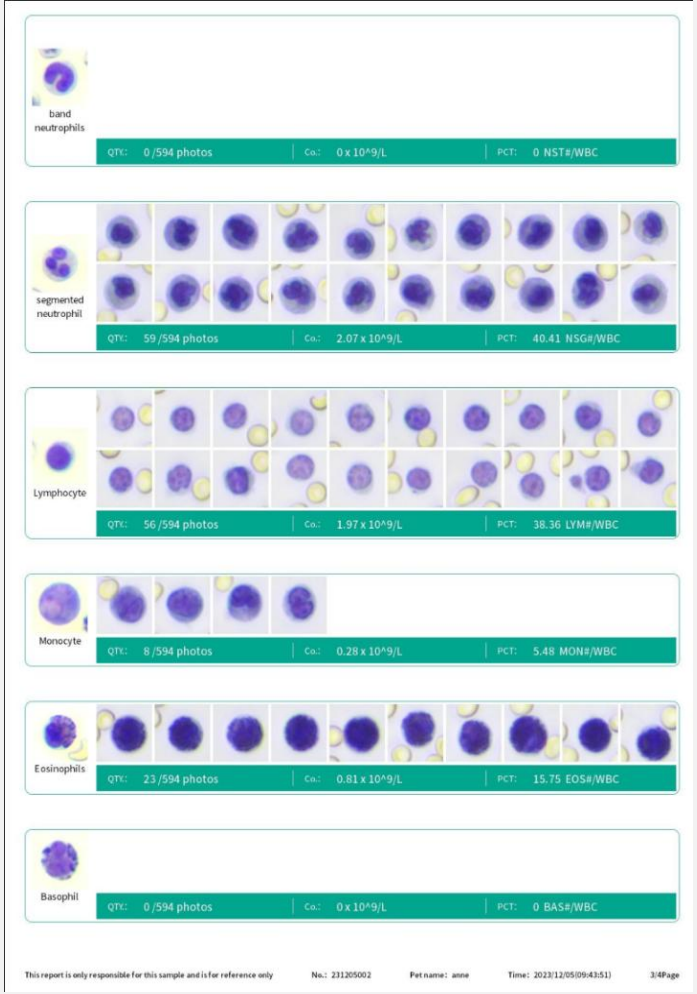


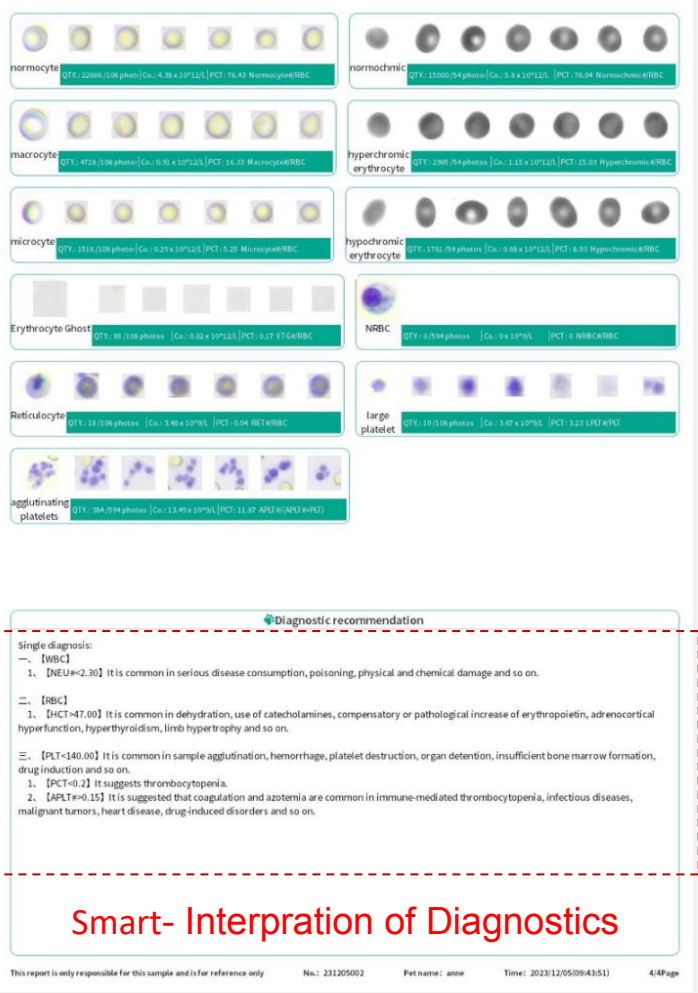
Blood Morphology Report

No.: 231205002 LIS: Doctor: Admin Sample: Blood(1x) Time: 2023/12/05(09:43:51)
Pet name: anne Species: cat Gender: M Pet age: 0Yrs7Mos Owner:

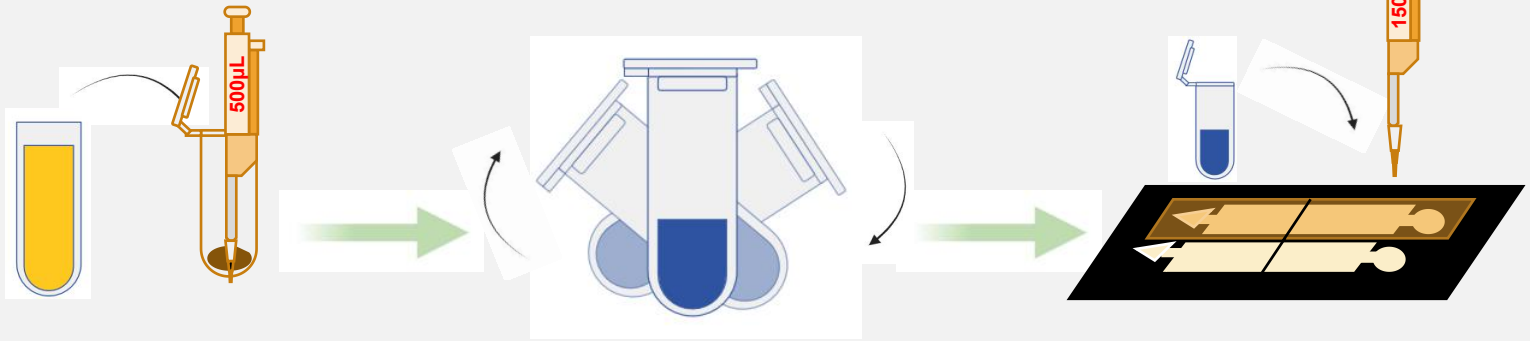
This report is only responsible for this sample and is for reference only No.: 231205002 Pet name: anne Time: 2023/12/05(09:43:51) 2/4Page

Blood Report





3-Steps Procedure for Urine Test



1

Draw **500μl** of urine from the bottom of the test tube into the dye solution.

2

Mix the urine and dye solution thoroughly until there are no obvious dye sediments visible in the test tube.

3

Draw **150μl** of the sediment sample from the bottom of the test tube and add it to the chip for machine testing.

Getting report in 9 min

21 Parameters of Urine Sediments:

Cast types x4
(chronic kidney disease inflammation infection)

hyaline, cellular, granular, waxy

For acute kidney injury!

Crystals x6
(Gout, kidney failure, urinary tract infection, hypothyroidism)

Magnesium ammonium phosphate crystal (Struvite), calcium oxalate dihydrate crystal, calcium oxalate monohydrate crystal, calcium phosphate crystal, uric acid crystal, cystine crystal

Cells x6
(Urinary tract infection, urinary tract stones, nephritis, etc.)

RBC, WBC, renal tubular epithelial cells, squamous epithelia cells, transitional epithelia cells, sperm cells

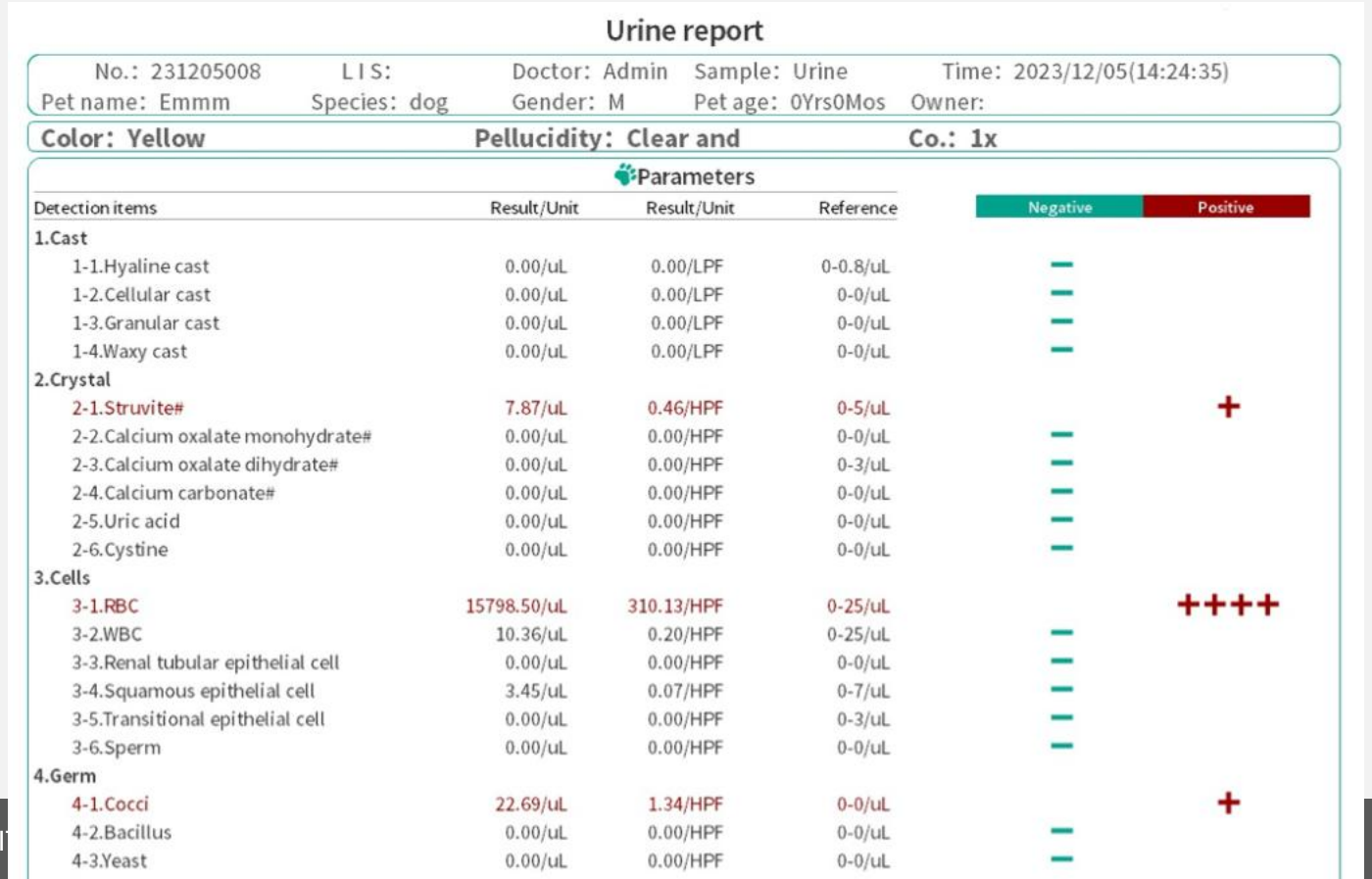
Pathogenic microorganisms x3
(Urinary tract infection)

cocci, bacilli, yeasts

Others x2
(Differencial from Artefacts)

lipid drop, mucus, (unintentified objects)

Urine Morphology Report with 21 Parameters



Urine report

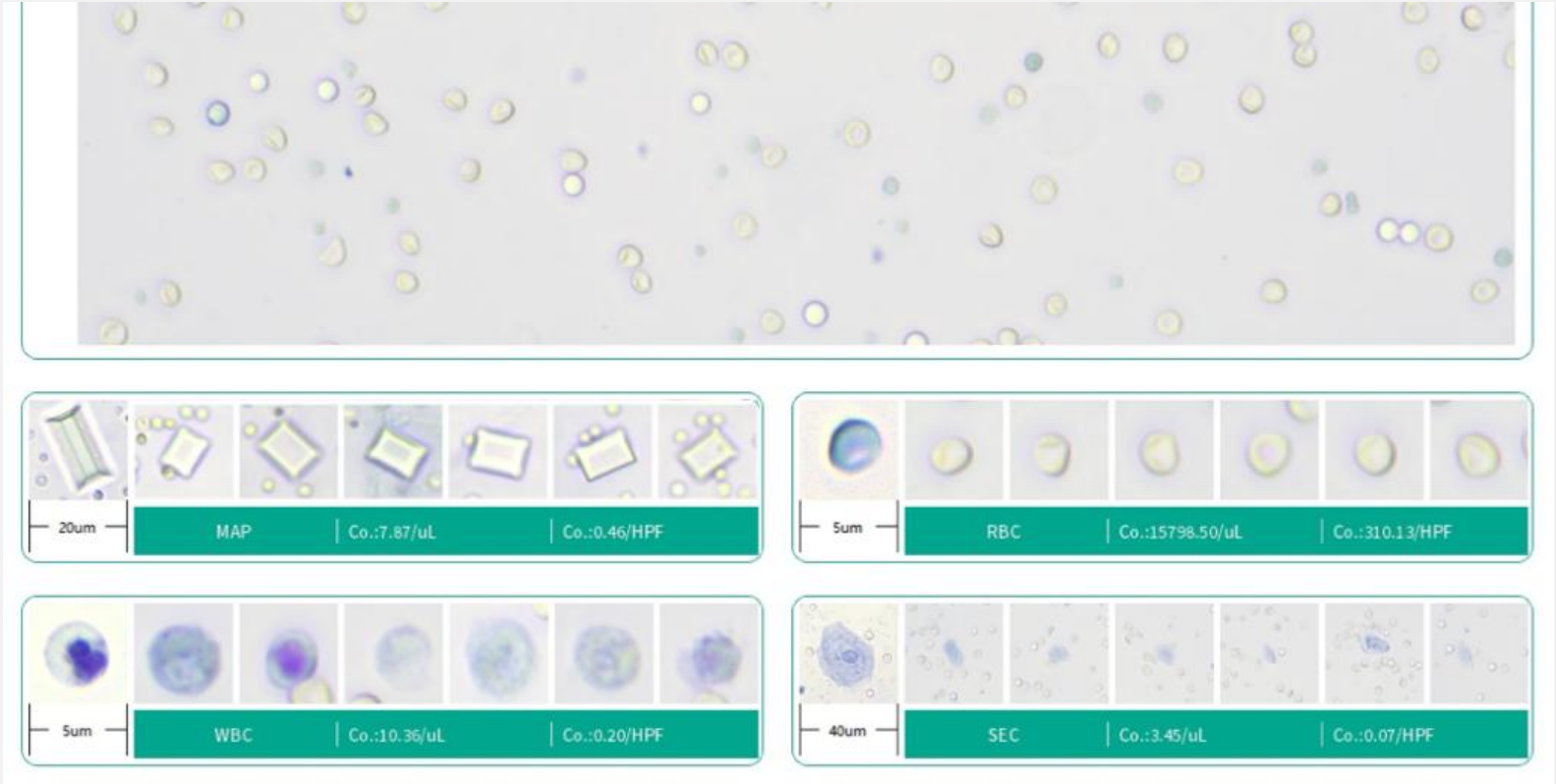
No.: 231205008 LIS: Doctor: Admin Sample: Urine Time: 2023/12/05(14:24:35)
Pet name: Emmm Species: dog Gender: M Pet age: 0Yrs0Mos Owner:

Color: Yellow **Pellucidity: Clear and** **Co.: 1x**

Parameters

Detection items	Result/Unit	Result/Unit	Reference	Negative	Positive
1.Cast					
1-1.Hyaline cast	0.00/uL	0.00/LPF	0-0.8/uL	−	
1-2.Cellular cast	0.00/uL	0.00/LPF	0-0/uL	−	
1-3.Granular cast	0.00/uL	0.00/LPF	0-0/uL	−	
1-4.Waxy cast	0.00/uL	0.00/LPF	0-0/uL	−	
2.Crystal					
2-1.Struvite#	7.87/uL	0.46/HPF	0-5/uL		+
2-2.Calcium oxalate monohydrate#	0.00/uL	0.00/HPF	0-0/uL	−	
2-3.Calcium oxalate dihydrate#	0.00/uL	0.00/HPF	0-3/uL	−	
2-4.Calcium carbonate#	0.00/uL	0.00/HPF	0-0/uL	−	
2-5.Uric acid	0.00/uL	0.00/HPF	0-0/uL	−	
2-6.Cystine	0.00/uL	0.00/HPF	0-0/uL	−	
3.Cells					
3-1.RBC	15798.50/uL	310.13/HPF	0-25/uL		++++
3-2.WBC	10.36/uL	0.20/HPF	0-25/uL	−	
3-3.Renal tubular epithelial cell	0.00/uL	0.00/HPF	0-0/uL	−	
3-4.Squamous epithelial cell	3.45/uL	0.07/HPF	0-7/uL	−	
3-5.Transitional epithelial cell	0.00/uL	0.00/HPF	0-3/uL	−	
3-6.Sperm	0.00/uL	0.00/HPF	0-0/uL	−	
4.Germ					
4-1.Cocci	22.69/uL	1.34/HPF	0-0/uL		+
4-2.Bacillus	0.00/uL	0.00/HPF	0-0/uL	−	
4-3.Yeast	0.00/uL	0.00/HPF	0-0/uL	−	

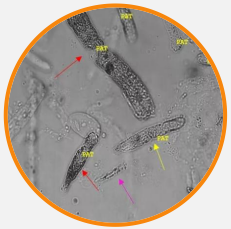
Urine Morphology Report with 21 Parameters



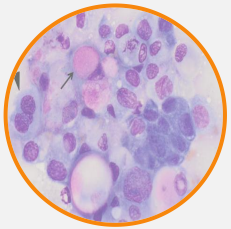
Urine Morphology Report with 21 Parameters

Diagnostic recommendation

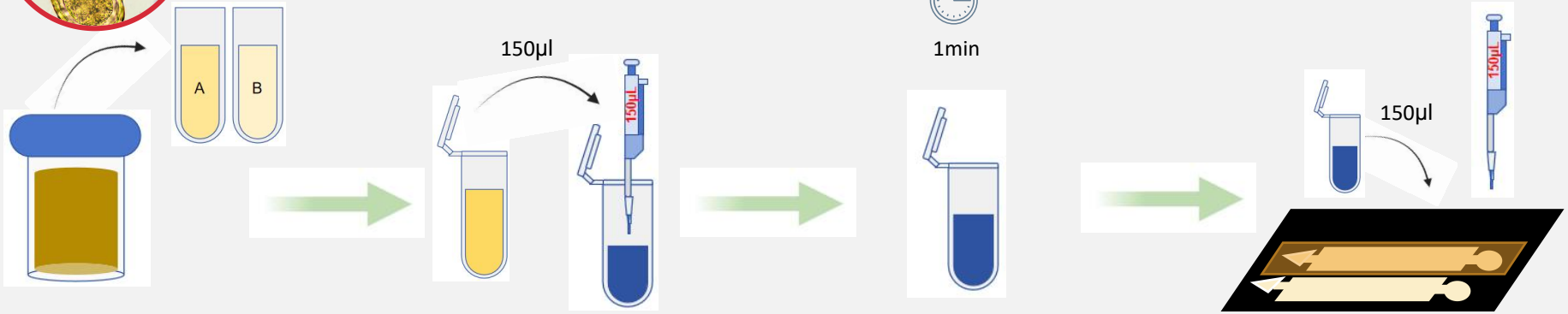
1、【Yellow】It is common in normal urine.
2、【MAP#>5】It is common in urinary tract bacterial infection, low urine volume, alkaline urine or elevated magnesium level in diet.
3、【COS#>0】There are many interference factors (such as amorphous crystallization, etc.) in bacterial detection of suspected cocci overgrowth or urinary tract cocci infection. This result is for reference only. It is recommended to confirm bacterial culture.
4、【RBC#>25】Common in urinary tract bleeding (cystitis, urinary calculi, urinary crystallization).



+



4-Steps Procedure for Feces Test



1

Use a turbidity card to determine if the sample concentration is appropriate.
(Solid feces should be dipped from variant sides by fecal wand and diluted in saline)

2

Draw **150μl** of the appropriately concentrated sample solution and add it to the dye solution, then invert to mix well.

3

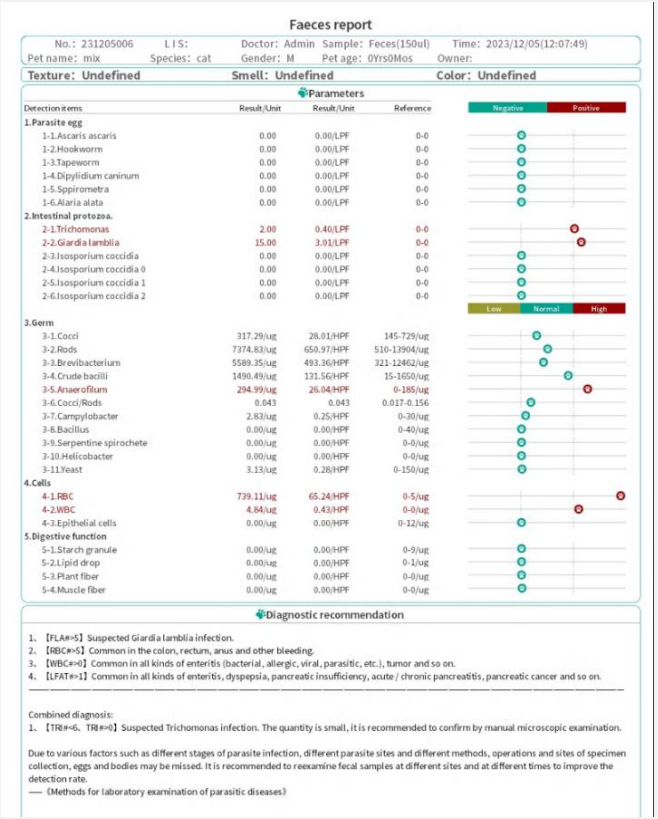
Leave the test tube uncapped and let it stand for 1 minute.

4

Draw 150μl of the sample from the bottom of the test tube and add it to the chip for machine testing.

Getting report in 9 min

Feces Report with 31 Parameters



Faeces report

No.: 231205006 LIS: Doctor: Admin Sample: Feces(150ul) Time: 2023/12/05(12:07:49)
Pet name: mix Species: cat Gender: M Pet age: 0Yrs0Mos Owner:

Texture: Undefined Smell: Undefined Color: Undefined

Parameters

Detection items	Result/Unit	Result/Unit	Reference
1.Parasite egg			
1-1.Ascaris ascaris	0.00	0.00/LPF	0-0
1-2.Hookworm	0.00	0.00/LPF	0-0
1-3.Tapeworm	0.00	0.00/LPF	0-0
1-4.Dipylidium caninum	0.00	0.00/LPF	0-0
1-5.Spirometra	0.00	0.00/LPF	0-0
1-6.Ataria alata	0.00	0.00/LPF	0-0
2.Intestinal protozoa.			
2-1.Trichomonas	2.00	0.40/LPF	0-0
2-2.Giardia lamblia	15.00	3.01/LPF	0-0
2-3.Isosporium coccidia	0.00	0.00/LPF	0-0
2-4.Isosporium coccidia 0	0.00	0.00/LPF	0-0
2-5.Isosporium coccidia 1	0.00	0.00/LPF	0-0
2-6.Isosporium coccidia 2	0.00	0.00/LPF	0-0
3.Germ			
3-1.Cocci	317.29/ug	28.01/HPF	145-729/ug
3-2.Rods	7374.83/ug	650.97/HPF	510-13904/ug
3-3.Brevibacterium	5589.35/ug	493.36/HPF	321-12462/ug
3-4.Crude bacilli	1490.49/ug	131.56/HPF	15-1650/ug
3-5.Anaeroflium	294.99/ug	26.04/HPF	0-185/ug
3-6.Cocci/Rods	0.043	0.043	0.017-0.156
3-7.Campylobacter	2.83/ug	0.25/HPF	0-30/ug
3-8.Bacillus	0.00/ug	0.00/HPF	0-40/ug
3-9.Serpentine spirochete	0.00/ug	0.00/HPF	0-0/ug
3-10.Helicobacter	0.00/ug	0.00/HPF	0-0/ug
3-11.Yeast	3.13/ug	0.28/HPF	0-150/ug
4.Cells			
4-1.RBC	739.11/ug	65.24/HPF	0-5/ug
4-2.WBC	4.84/ug	0.43/HPF	0-0/ug
4-3.Epithelial cells	0.00/ug	0.00/HPF	0-12/ug
5.Digestive function			
5-1.Starch granule	0.00/ug	0.00/HPF	0-9/ug
5-2.Lipid drop	0.00/ug	0.00/HPF	0-1/ug
5-3.Plant fiber	0.00/ug	0.00/HPF	0-0/ug
5-4.Muscle fiber	0.00/ug	0.00/HPF	0-0/ug

Negative Positive

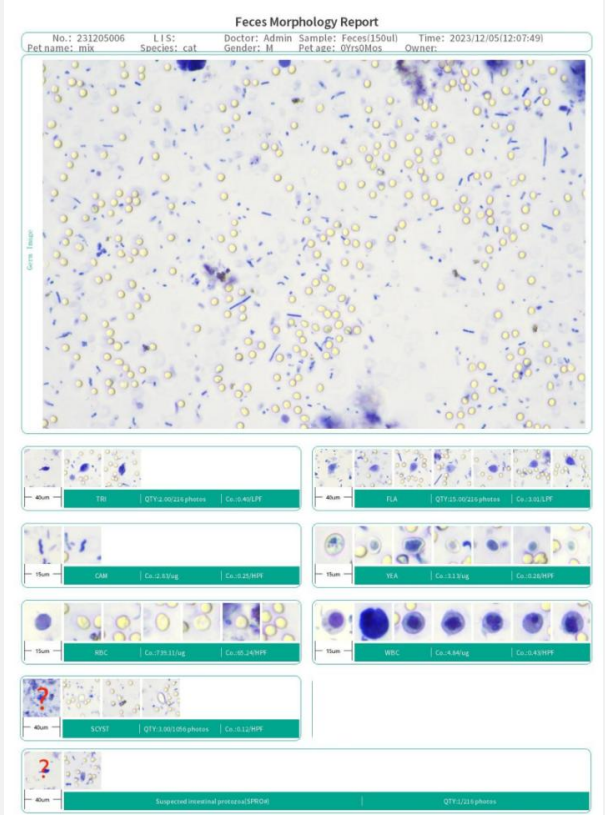
Low Normal High

Diagnostic recommendation

1. 【FLA#>5】Suspected Giardia lamblia infection.
2. 【RBC#>5】Common in the colon, rectum, anus and other bleeding.
3. 【WBC#>0】Common in all kinds of enteritis (bacterial, allergic, viral, parasitic, etc.), tumor and so on.
4. 【LFAT#>1】Common in all kinds of enteritis, dyspepsia, pancreatic insufficiency, acute / chronic pancreatitis, pancreatic cancer and so on.

Combined diagnosis:
1. 【TR#>6、TR#>0】Suspected Trichomonas infection. The quantity is small, it is recommended to confirm by manual microscopic examination.

Due to various factors such as different stages of parasite infection, different parasite sites and different methods, operations and sites of specimen collection, eggs and bodies may be missed. It is recommended to reexamine fecal samples at different sites and at different times to improve the detection rate.
—— (Methods for laboratory examination of parasitic diseases)



Feces Morphology Report

No.: 231205006 LIS: Doctor: Admin Sample: Feces(150ul) Time: 2023/12/05(12:07:49)
Pet name: mix Species: cat Gender: M Pet age: 0Yrs0Mos Owner:

Parasite

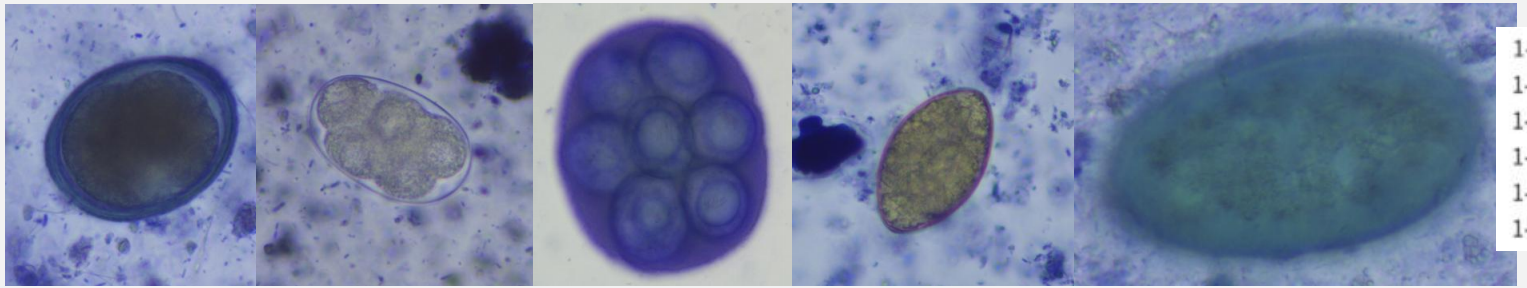
Germs

Cells

Plant fibers, muscle fibers, lipid droplets, starch granules

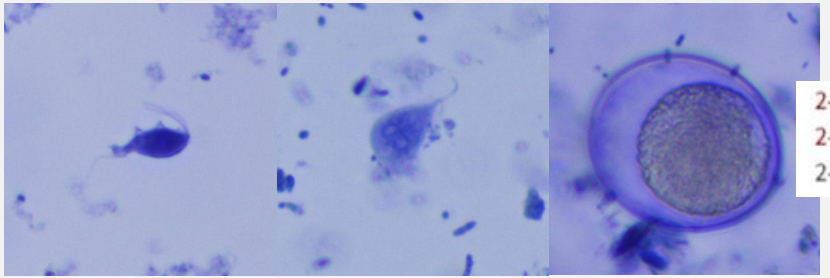
Feces Report with 31 Parameters

Helminth eggs: (x5)



1-1.Ascaris ascaris
1-2.Hookworm
1-3.Tapeworm
1-4.Dipylidium caninum
1-5.Sppirometra
1-6.Alaria alata

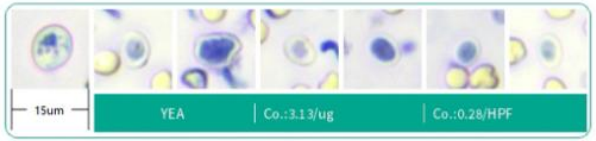
OOcysts: (x3)

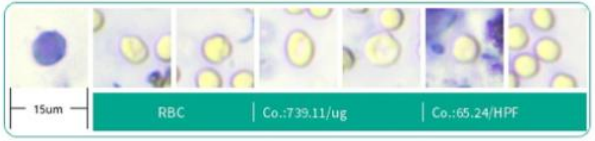


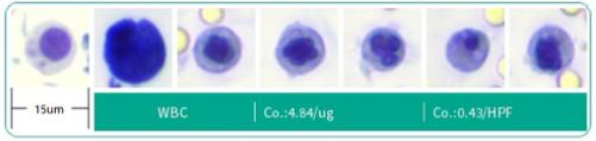
2-1.Trichomonas
2-2.Giardia lamblia
2-3.Isosporium coccidia

Feces Report with 31 Parameters

				Low	Normal	High
3.Germ						
3-1.Cocci	317.29/ug	28.01/HPF	145-729/ug			
3-2.Rods	7374.83/ug	650.97/HPF	510-13904/ug			
3-3.Brevibacterium	5589.35/ug	493.36/HPF	321-12462/ug			
3-4.Crude bacilli	1490.49/ug	131.56/HPF	15-1650/ug			
3-5.Anaerofilum	294.99/ug	26.04/HF				
3-6.Cocci/Rods	0.043	0.0				
3-7.Campylobacter	2.83/ug	0.25/HF				
3-8.Bacillus	0.00/ug	0.00/HF				
3-9.Serpentine spirochete	0.00/ug	0.00/HF				
3-10.Helicobacter	0.00/ug	0.00/HF				
3-11.Yeast	3.13/ug	0.28/HF				
4.Cells						
4-1.RBC	739.11/ug	65.24/HF				
4-2.WBC	4.84/ug	0.43/HF				
4-3.Epithelial cells	0.00/ug	0.00/HF				
5.Digestive function						
5-1.Starch granule	0.00/ug	0.00/HF				
5-2.Lipid drop	140.68/ug	12.42/HF				
5-3.Plant fiber	0.00/ug					
5-4.Muscle fiber	0.00/ug					

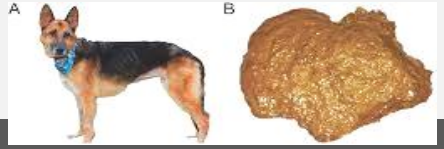






Antibiotica or Probiotica necessary?

exocrine pancreatic insufficiency [EPI] Diagnostics



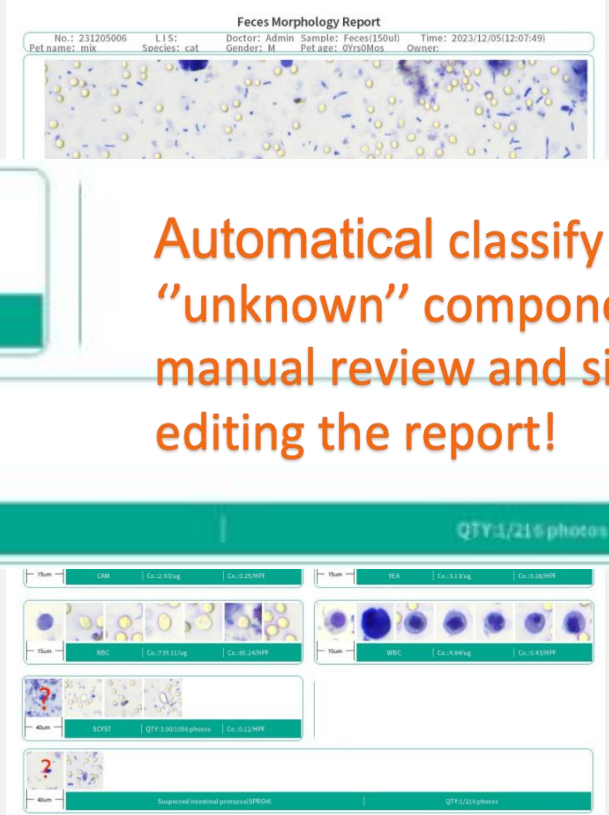
Diagnostic recommendation

1、【FLA#>5】Suspected Giardia lamblia infection.
2、【RBC#>5】Common in the colon, rectum, anus and other bleeding.
3、【WBC#>0】Common in all kinds of enteritis (bacterial, allergic, viral, parasitic, etc.), tumor and so on.
4、【LFAT#>1】Common in all kinds of enteritis, dyspepsia, pancreatic insufficiency, acute / chronic pancreatitis, pancreatic cancer and so on.

Combined diagnosis:
1、【TRI#<6、TRI#>0】Suspected Trichomonas infection. The quantity is small, it is recommended to confirm by manual microscopic examination.

Due to various factors such as different stages of parasite infection, different parasite sites and different methods, operations and sites of specimen collection, eggs and bodies may be missed. It is recommended to reexamine fecal samples at different sites and at different times to improve the detection rate.
—《Methods for laboratory examination of parasitic diseases》

Feces and Urine Report - Review and Edit



Automatical classify the "unknown" component for manual review and simply editing the report!

3-in-1 Innovation!

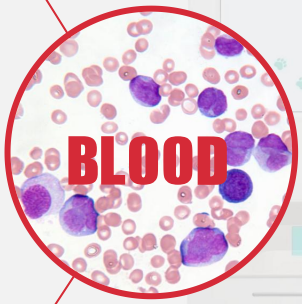
The first morphology and hematology analyzer with ——

Special features of the 3-in-1 Innovation

What AI-100Vet Can 'SEE':

46 x Blood Parameters

- Reticulocyts, nucleuted RBC
- ETG/SPH/AGG RBC
- Band/Seg. Neutrophil (Left/right shift)
- Large & Agg. Platelet
- Reptils, (birds)



Casts with patho. diff.

Stained Cytology

6x Crystals

21 x Urine Parameters

31 x Feces Parameters

- 5x Helminths eggs
- Giardia, Trichomonas, Isospora
- Intestinal flora/patho. bacteria
- Cells (intestial blooding & inflammation)
- Digestion function

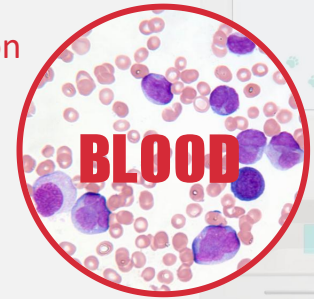
Special features of the 3-in-1 Innovation

What AI-100Vet Can HELP:

Save Time
Save Labor
Save Money

- Acute Kidney
  cystitis, uroliths...

- Anemia classification
- Haemolysis/IMHA screening
- Left shift (infection monitoring)
- Thrombopenia confirming
- Exotic animals



- Parasites
  infection Dx and Tx monitoring
- Dysbiosis and/or intestinal bact. infection
- EPI screening

Convenient & Efficient!

Simple Operation

No preanalysis of samples required
Liquid staining and loading can be done in 3 simple steps
Fully automated AI detection

In 7-10 minutes

Qualitative and Quantitative report
Visual results with morphology images
AI diagnostics interpretation available
Review on display instead of manual

Only 30 KG

AI extendable to more... (body fluid, dermatology, more specise, etc.)

High Accuracy

Over 95% for celles (compare with Sysmex XN-1000 and manual microscopy),
Over 90% for parasites, protozoa, casts etc. (compare with microscopy),
Observe 1000+ HPF and counts 200-500K cells

Simple Maintenance

No liquid-way
No calibration, washing, puffering required
Consumables in room temprature 15 months safe

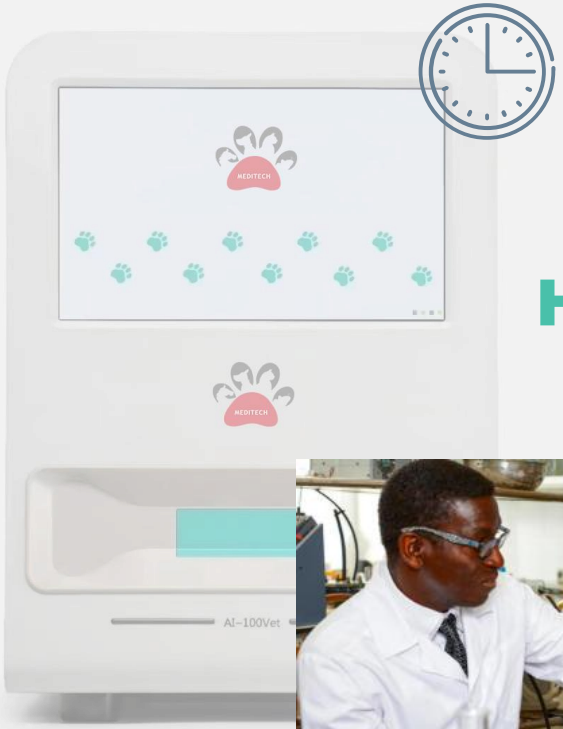
Co

AI extendable to more… (body fluid, dermatology, more specise, etc.)

Convenient & Efficient!

Advantage Summary:

1. More parameters: more clues for vets
2. Shorter turn-around-time of diagnostics: early start of therapy
3. Saving time and labor: better hospital managerment and financial efficience!



Happy Clients
Happy Staff

THANK YOU!

TOOTOO Meditech Co., Ltd.

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Tel: +86-755-28306385
Email:info@newtootoo.com
Web: www.newtootoo.com

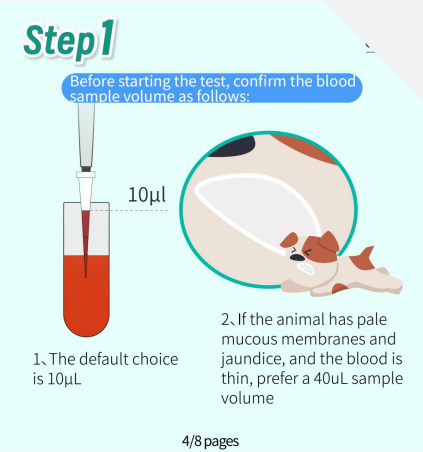
Technical Specification of AI-100Vet - 1

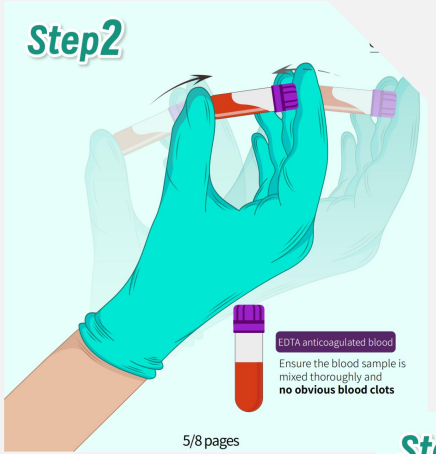
Product Name	AI-100Vet		
Methology	Chamber-slide-based automated microscopy and AI morphology on liquid staining samples		
Sample type	Blood, urine, feces		
Species	Dog, cat, rabbit, chinchilla, mouse, rat, hamster, ferretm turtle		
Sample volume	Blood: 10μL Urine: 500μL Feces:150μL	**Testing time**	Blood: 7-9min Urine: 9min Feces:9min
Parameters	Blood(x46): WBC, NEU, NST, NSG, NSH, LYM, MON, EOS, BAS, RBC, RET, ETG, SPH, % of above, NRBC, NRBC/WBC%, AGG, HGB, HCT, MCV, MCH, MCHC, RDW/HDW-SD/CV, PLT, PCT, MPV, LPLT, P-LCR, APLT, PDW-SD/CV Urine (x21): HYA, CEC, GRA, WAC, MAP, COC, COMC, COD, CP, UAC, CYSC, RBC, WBC, RTE, SEC, TEC, SPE, COS, BAC, SAC, FAT, PHL Feces (x30): ALE, ANE, CEE, DIP, SPI, TRE, TRI, FLA, COD(0-2), COS, BACI, SBAC, CBAC, TBAC, C/B, CAM, BAC, SS1, SS2, YEA, RBC, WBC, EPC, STA, LFAT, PLA, AF		

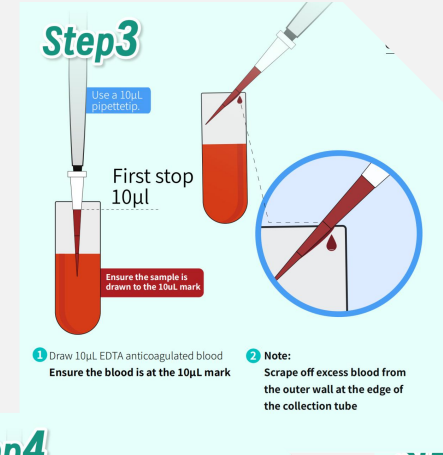
Technical Specification of AI-100Vet - 2

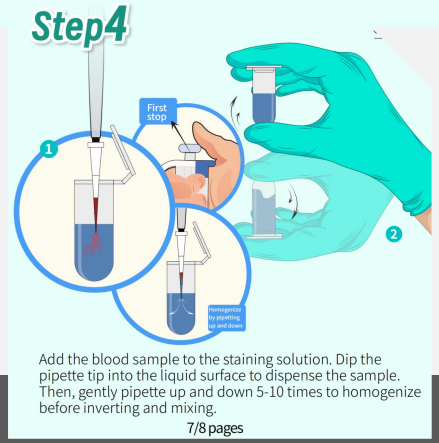
Product Name	AI-100Vet
PC	Integrated, Windows 10
Display	Integrated touch screen, 12 inch LCD (1280x800dpi)
Data connection	USB(3.0), Wlan, network cabel
Power supply	110-240 VAC, 50-60Hz, 650VA
Language	English, Spanish, Chinese
Size	485x485x335 (mm)
Weight	30.8kg

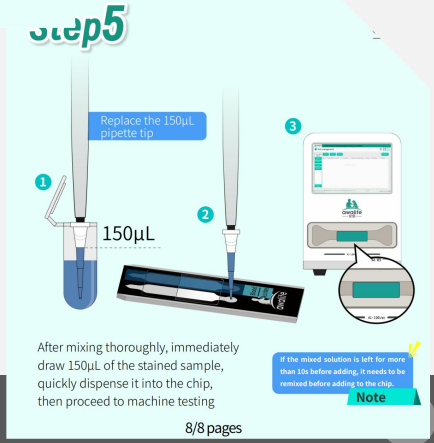
Correct Pipetting of Blood Samples



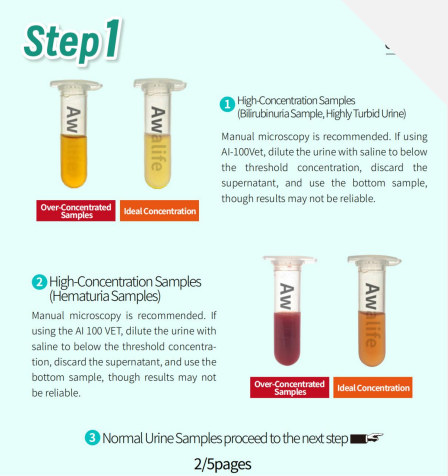


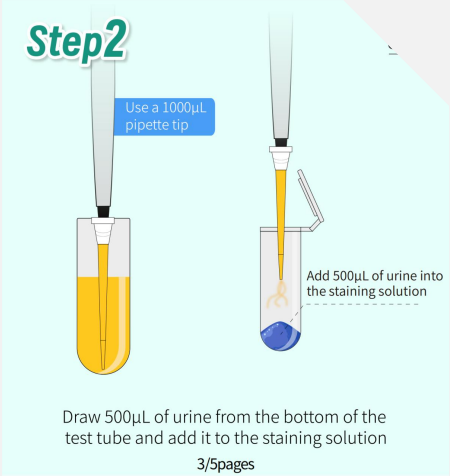


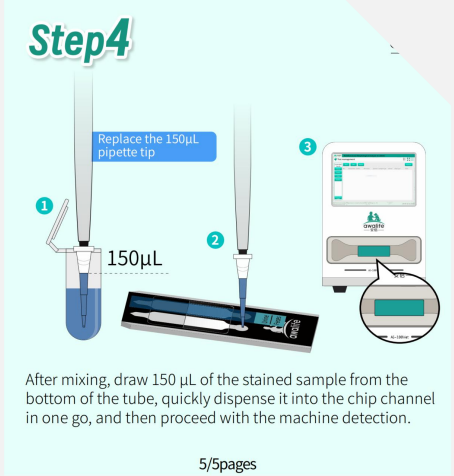




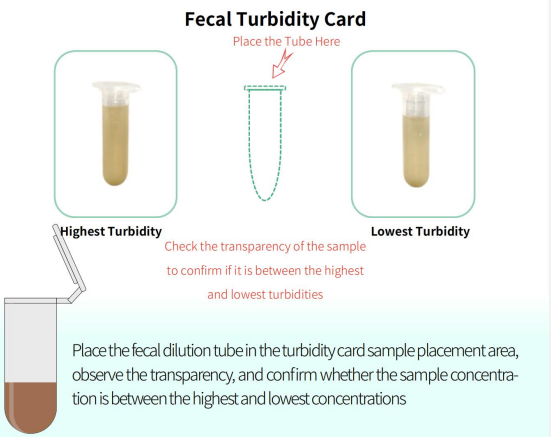
Correct Preparing of Urine Sample





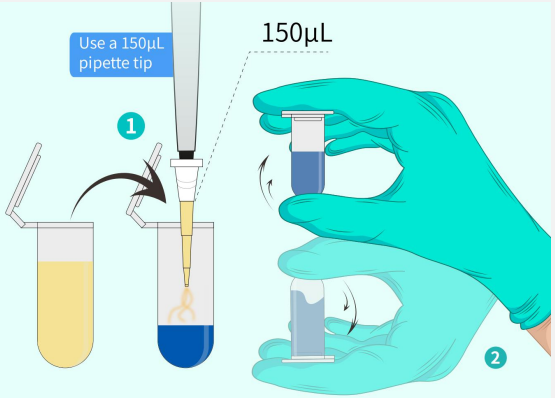


Correct Preparing of Feces Sample



Place the fecal dilution tube in the turbidity card sample placement area, observe the transparency, and confirm whether the sample concentration is between the highest and lowest concentrations

2/7pages



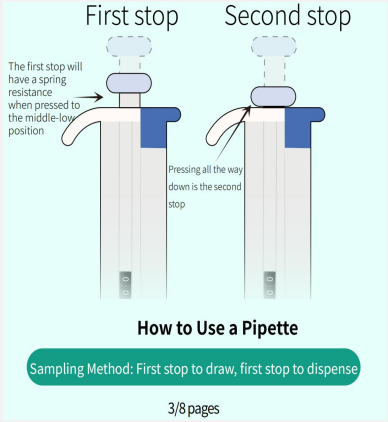
Draw 150μL of the fecal sample and add it to the staining solution, invert and mix 5-10 times

5/7pages

After settle down for 1 minute, immediately draw 150μL of the bottom stained sample, quickly inject it into the chip in one go and then proceed with the machine testing

7/7pages

Attention



Common Error:

HCT too high:
- too much sample is added (pipette tip attached, pipette pressed too much)
- sediment RBC are aspirated (not well mixed anemia blood)
- aspirated and dissociated blood clots

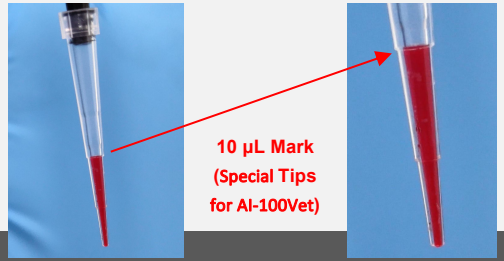
HCT too low:
- not enough sample (bubbles, blocks, tip cleaning error)
- supernatant are aspirated (not well mixed anemia blood)
- blood clots

Solution: repeat AI-testing → repeat operation repeat → repeat with heparin blood

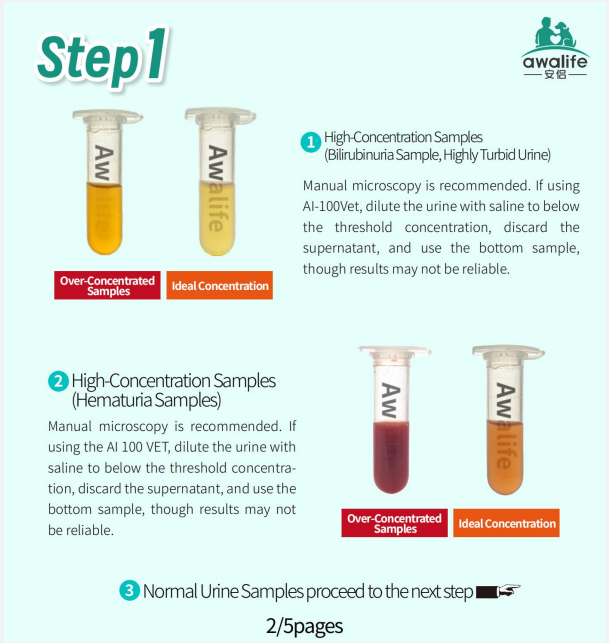
Anemia blood:

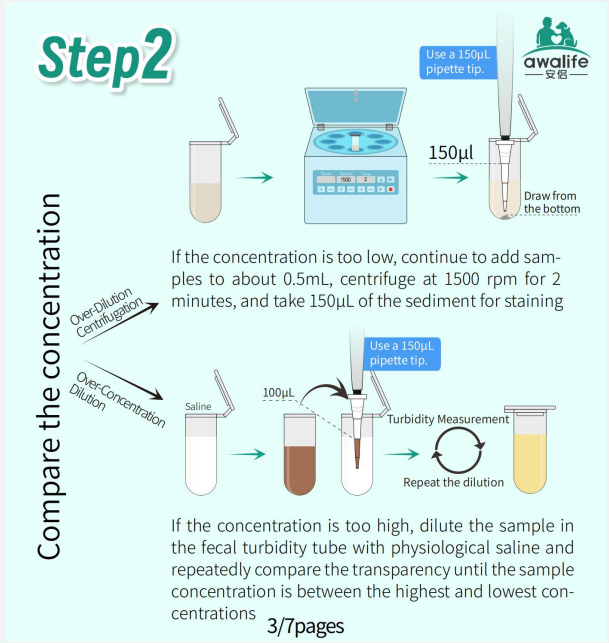
Sample Volume: 10ul 40ul 80ul

Mixing and immediately testing!!!

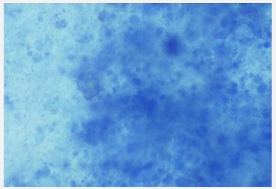


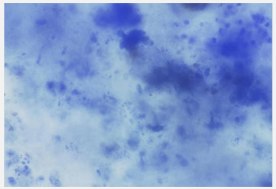
Attention





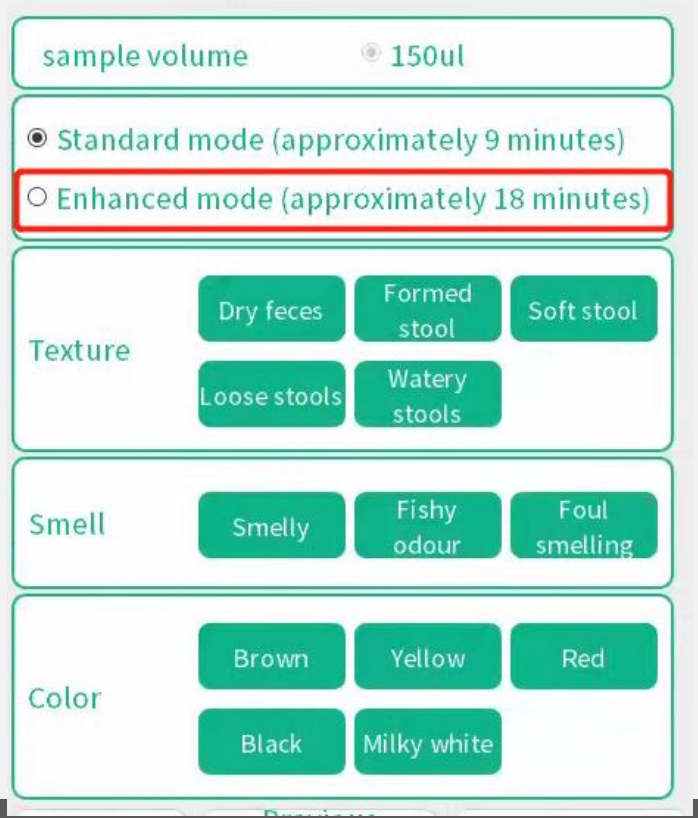
Filling Status





Focusing Images

18-min Enhance Mode for Urine and Feces



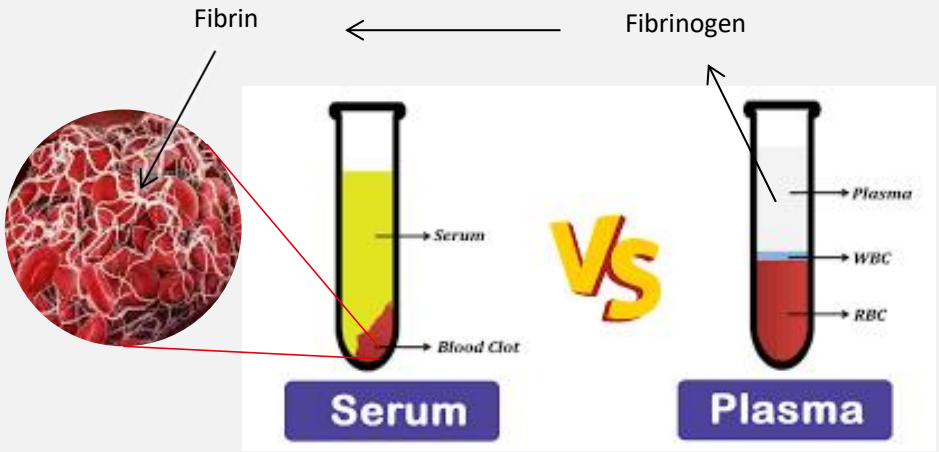
- ✓ Enhanced mode takes double so many FOV images as standard mode
- ✓ It takes photo from the edge of the chamber for parasites eggs

More important question for solid fecal sample:
is the sampling homogeneous??

- ➢ total sample dilution
  or
- ➢ 5-10 different position sampling

Cave: pus inclusive parasites eggs
→ shake!

- Cave: Plasma VS Serum



In-vivo: Whole blood = plasma+blood cells
In-vitro:
With anticoagulant: plasma+blood cells → hematology, PCR, coagulation
Without anticoagulant: serum+blood clot → biochemistry, immunoassay

ANTICOAGULANTS:

EDTA-blood:
Mammals' hematology
Blood type
Blood smear
Coomb's test

Heparin-blood:
Reptiles & birds' hematology
Small mammal animals

Sodium-citrate-blood:
Coagulation test
(blood:citrate 1:9 mixing)

Natrium-fluoride-blood:
Glucose and lactose test