Supplemental Handout for AP 2402 Lab: Hematology

Dr. Weis

Intro: Hematologic examination and testing of blood provides valuable insight regarding the health and status of the patient. This information helps the clinician in determining a diagnosis, various treatment options, and prognosis for the patient.

Purpose: The purpose of this supplemental handout is to provide students with the information needed to evaluate non-primate blood and gain experience with some of the various hematological testing methods done in a clinical lab setting. The students are directed to their text and lab manual for a more in depth discussion and presentation on blood.

Objectives :

To safely handle all blood products and lab equipment
To perform specific lab tests on non primate blood
To become familiar with other testing methods for blood
To record and analyze results from specific lab tests
To answer discussion questions at the end of the handout

Precautions : The emphasis is SAFETY FIRST by use of gloves, cleaning of any spills and disposal of blood products and sharps in proper containers.
There is still a small chance that these animals may have contracted some unknown pathogen.
Remember :: SAFETY FIRST

GENERAL PROCEDURE :: Lab tests on Non-primate blood, outline

I. Blood smear and stain to observe
   a. RBC color, size, shape
   b. WBC differential count
   c. Platelets appearance and number

II. Hematocrit (PCV%) and Total Protein

III. Blood Typing (ABOD groups)

IV. Other tests (see lab manual for discussion)
   a. Total RBC
   b. Total WBC
   c. Hemoglobin
   d. Sedimentation rate
   e. Coagulation time

V. View other prepared slides : Leukemia, Mononucleosis, Sickle Cell Anemia
VI. Normal reference values
VII. Results Table
VIII. Questions
IX. References

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Equipment needed :

1. Non-primate blood in proper collection tube :

    a. Ruminant (bovine, ovine)
    b. Equine
    c. Canine
    d. Feline
    e. Rabbit

2. Slides, 1 box

3. Stain (Diff Quick / or Wrights)

4. Gloves

5. Sharps container and medical biohazard waste bag

6. Lab manual/ Text/ Handout/ Data sheet

7. Microhematocrit Centrifuge

8. Hematocrit tubes/ clay/ cardreader

9. Clinical refractometer

10. Human ABOD antisera (human antisera test kits)

11. Disposable plastic pipets

12. Toothpicks

13. Grease pen

14. Immersion oil

To use diff quick stain (modified Wright's stain), dip dried slid into each copland jar ~ 10 times at 1 second per dip. Allow excess stain to drain off before switching to next jar.
The first jar will be a light blue alcohol wash
The second jar will be a red eosin stain
The third jar will be a dark blue methylene blue stain
The fourth jar will be dH20 for the final rinse.

Please keep the lids on these stains when not in use.
Use forceps to dip the slides (or you will have stained fingers)

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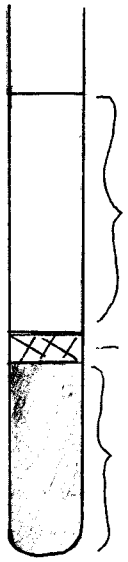
PCV tube
(enlarged to
show detail)



ABO and Rh blood typing

Observation of agglutination reactions with human ABO and anti D sera in different animal species has been observed. Since the epitope for the ABO antigens consists of an oligosaccharide with four sugar components, the results can be explained due to similarities in these small saccharide chains rather than to the more variable peptide sequences of the antigens.

Results of positive agglutination reactions using animal blood and human antisera have not widely been published. From classroom observation, these are possible results * :

Canines.....B+
Rabbits.....B+
Goats.....A+
Bovine.....O+
Equine.....O+
Sheep.....O-

* remember that non-primate blood types are actually classified differently than human ABOD groups.

Mark a card or slide with the appropriate species and perform the blood typing as directed.

A positive reaction will appear as small dark spots at the margin of the mixing area. The reaction takes approximately 5 minutes. If the blood remains a homogenous pool, then you can assume that the antigen is absent.

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RESULTS TABLE

Species	HCT	WBC Diff	ABOD

TABLE I.1. Hematology Values

	Canine	Feline	Bovine	Equine	Porcine	Ovine	Caprine
Hematocrit (PCV), %	37-55 (25-34)[a]	30-45 (24-34)[a]	24-46	32-48[b]	36-43(26-35)[a]	27-45	22-38
Hemoglobin (Hb), g/dl	12-18	8-15	8-15	10-18	9-13	9-15	8-12
Red blood cell count (RBC), n x 10^6/µl	5.5-8.5	5.0-10.0	5.0-10.0	6.0-12.0	5-7	9-15	8-18
Reticulocyte count (Retic), %	0-1.5	0-1.0	0	0	0-12[d]	0	0
Mean corpuscular volume (MCV), fl	60-77	39-55	40-60	34-58	52-62[d]	28-40	16-25
Mean corpuscular Hb (MCH), pg	19.5-24.5	13.0-17.0	11.0-17.0	13.0-19.0	17-24	8-12	5.2-8.0
Mean corpuscular Hb conc. (MCHC), g/dl	32-36	30-36	30-36	31-37	29-34	31-34	30-36
Platelet count, n x 10^5/µl	2-9	3-7	1-8	1-6	2-5	2.5-7.5	3-6
White blood cell count (WBC), n/µl	6,000-17,000	5,500-19,500	4,000-12,000	6,000-12,000	11,000-22,000	4,000-12,000	4,000-13,000
Segmented neutrophil (seg), (%) n/µl	(60-77)3,000-11,400	(35-75)2,500-12,500	(15-45) 600-4,000	(30-75)3,000-6,000	(20-70)2,000-15,000	(10-50) 700-6,000	(30-48)1,200-7,200
Band neutrophil (band), (%) n/µl	(0-3) 0-300	(0-3) 0-300	(0-2) 0-120	(0-1) 0-100	(0-4) 0-800	0	0
Lymphocyte (lymph), (%) n/µl	(12-30) 1,000-4,800	(20-55) 1,500-7,000	(45-75)2,500-7,500	(25-60)1,500-5,000	(35-75)3,800-16,500	(40-75)2,000-9,000	(50-70)2,000-9,000
Monocyte (mono), (%) n/µl	(3-10) 150-1,350	(1-4) 0-850	(2-7) 25-850	(1-8) 0-600	(0-10) 0-1,000	(0-6) 0-750	(0-4) 0-550
Eosinophil (eos), (%) n/µl	(2-10) 100-750	(2-12) 0-750	(2-20) 0-2,400	(1-10) 0-800	(0-15) 0-1,500	(0-10) 0-1,000	(1-8) 50-650
Basophil (baso), (%) n/µl	Rare	Rare	(0-2) 0-200	(0-3) 0-300	(0-3) 0-500	(0-3) 0-300	(0-1) 0-120
Myeloid/erythroid ratio (M/E)	0.75-2.4/1.0	0.6-3.9/1.0	0.3-1.8/1.0	0.9-3.8/1.0	1.2-2.2/1.0	0.8-1.7/1.0	0.7-1.0/1.0
Plasma protein (PP), g/dl (refractometry)	6.0-7.5[e]	6.0-7.5[e]	6.0-8.0[e]	6.0-8.5[e]	6.0-8.0[e]	6.0-7.5	6.0-7.5
Plasma fibrinogen (fib), mg/dl (heat precipitation)	150-300	150-300	100-600	100-400	200-400	100-500	100-400
Serum iron (SI),[f] µg/dl	94-122	68-215	57-162	73-140	91-199	162-222	...
Unbound iron binding capacity (UIBC),[f] µg/dl	170-222	105-205	63-186	200-262	100-262	141±10	...

Source: Derived, with slight modification, from Schalm OW et al: Veterinary Hematology, 3rd ed, Philadelphia, Lea and Febiger, 1975; Leman AD et al: Diseases of Swine, 5th ed, Ames, Iowa State University Press, 1981; and Kaneko JJ: Clinical Biochemistry of Domestic Animals, 3rd ed, New York, Academic Press, 1980. See references for more precise age differences.

a. Parenthetic values: 5-to-6-wk-old pups; kittens; 3-to-45-day-old pigs.

b. Lower values in foals and cold-blooded horses.

c. Reticulocytes increase to maximum value about 3 wks old and decrease to less than 1% by 6 to 7 mos old.

d. MCV 59 to 73 in pigs from birth to 1 wk old.

e. Lower values in young.

f. Laboratories report SI and total iron binding capacity (TIBC); TIBC = SI + UIBC.

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Additional Laboratory Report Questions

1. Compare and contrast mononucleosis to agranulocytic leukemia.

2. If a person with blood type A marries a person with blood type B, what are all the possible blood types for their offspring.

3. What is a transfusion reaction and why does this occur ? What are the possible consequences ?

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