**AMIMAL/ VETERINARY PHYSIOLOGY**

**CHAPTER: 1**

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**BLOOD**

* Blood, a fluid connective tissue which consists of plasma, blood cells and platelets. Blood circulates throughout the body delivering the oxygen, nutrients to each and every cell. It also takes away the waste products formed in tissues for excretion. 55% of total blood volume is plasma and remaining 45% is formed elements.
* Total water in animal body is 60-70% of body weight.
* Total body water is classified under two categories:

A) Intracellular fluid (ICF): 40% of animal’s body weight.

1. Extracellular fluid (ECF): 20% of animal’s body weight.
* ECF is further subdivided into 3 categories: -

A) Interstitial fluid (ISF): 15% of animal’s body weight

B) Intravascular fluid/Plasma volume (IVF/PV): 5% of animal’s body weight

C) Transcellular fluid (TCF): Fluid found in body cavities which includes fluid of digestive tract, synovial fluid, cerebrospinal fluid, intraocular fluid, bile and urine.

* Blood makes up to 8% of our body weight.
* Plasma volume in animal body is 5% of body weight.
* Normal pH of blood: 7.4
* Because of CO2, venous blood is more acidic than arterial blood.
* Red color of blood is due to hemoglobin and color of plasma is due to bilirubin.
* Blood on centrifugation gives an upper layer of plasma (55%), middle layer or buffy coat of leukocytes and platelets (<1%) and lower layer of erythrocytes (45%).
* Leucocytes found in blood are of 2 types: -

1. Granulocytes: Eosinophil, Basophil and Neutrophil

2. Agranulocytes: Monocytes, Lymphocytes

NOTE: Lymphocytes includes B -cells, T-cells and natural killer cells.

* **NEUTROPHILS:** Highly phagocytic and first line of defense.
* **EOSINOPHIL:** Allergic reactions and parasitic infections increase their number. It in activates histamines.
* **BASOPHILS:** Histamine and natural anticoagulant like heparin is released by these cells.
* **MONOCYTES**: They are largest leukocytes and largest blood cell too and chronic infections like TB increases their number. They are highly phagocytic.
* **LYMPHOCYTES:** Produce antibodies against infections.

NOTE: Basophil enhance the allergic reaction while eosinophil decrease them.

**MACROPHAGES AND THEIR TISSUE SPECIFIC LOCATIONS**

* **KUFFPER CELLS** - LIVER
* **DUST CELLS**- LUNGS
* **MICROGLIA**- BRAIN
* **MESENGIAL CELLS**- KIDNEY
* **HOLBAUER CELLS**- PLACENTA
* **MONOCYTES**- BLOOD/BONE MARROW
* **OSTEOCLAST­**- BONE
* Serum= Plasma- (Fibrinogen+ Other clotting factors)
* Agranulocytes are also known as Peripheral Blood Mononuclear Cells (PBMCs)
* Granulocytes are known as Polymorphonuclear Leukocytes (PMN/PML/PMNL)
* Cartwheel Shape Nucleus is seen in Plasma cells.
* No. of blood cells per microliter of blood: RBC>Platelets>WBC
* Diameter of blood cells: WBC>RBC>Platelets
* Most numerous leukocytes in ruminants, pigs and poultry: Lymphocytes (60-65%)
* Most numerous leukocytes in horse, dog and cat: Neutrophils (60-65%)
* Immature/ young neutrophil: Band cells
* Mature neutrophil: Segmented cells
* Largest RBC is found in dog (7µm) and smallest in goat (4 µm)
* Avian neutrophil is known as Heterophil
* Anemia is the deficiency of RBCs or hemoglobin in the blood.
* Polycythemia is an increase in the total RBC mass of the blood.
* Poikilocytosis is an abnormally shaped red blood cells.
* Anisocytosis is unequal size of red blood cells.
* **HEMOGLOBIN AND ITS DERIVATIVES**

1. Oxyhemoglobin

2. Carboxy hemoglobin

3. Met hemoglobin

4. Carbamino hemoglobin

**1.Anemia due to destruction of RBCs is known as**

A. Hemorrhagic anemia

**B. Hemolytic anemia**

C. Aplastic anemia

D. None of the above

**2. Extrinsic hemolytic anemia is also known as**

A. Pernicious anemia

B. Megaloblastic anemia

C. Hemorrhagic anemia

**D. Auto immune hemolytic anemia**

**3. In erythropoiesis the RBC attain biconcavity in which stage**

A. Reticulocyte

**B. Mature erythrocyte**

C. Proerythroblast

D. Normoblast

**4. In erythropoiesis, synthesis of hemoglobin starts at what stage**

**A. Proerythroblast**

B. Intermediate normoblast

C. Early normoblast

D. Mature RBC

**5. In erythropoiesis, hemoglobin starts appearing at what stage**

A. Proerythroblast

**B. Intermediate normoblast**

C. Early normoblast

D. Mature RBC

**6. In erythropoiesis, nucleoli disappearing at what stage**

 A. Proerythroblast

B. Intermediate normoblast

**C. Early normoblast**

D. Mature RBC

**7. In erythropoiesis, the stage of cell that enters the capillary from the site of production**

**A. Reticulocyte**

B. Intermediate normoblast

C. Early normoblast

D. Mature RBC

**8. Immature form of neutrophils**

A. Colony forming blastocytes

B. Colony forming unit-E

C. Megakaryocyte

**D. Band cells**

**9. What is the disease that will not affect the person with Sickle cell anemia?**

A. Thalassemia

**B. Malaria**

C. Jaundice

D. Both 1 and 2

**10. Nucleated RBCs are found in**

A. Camel

**B. Aves**

C. Deer

D. All of the above

**11. Hemostasis is**

**A. Arrest of bleeding**

B. Maintaining internal stability

C. Formation of blood factors

D. All of the above

**12. Another name for monocytes based on their function in tissues**

A. Microphages

**B. Macrophages**

C. Basophils

D. Neutrophils

**13. Kupffer cells are related to which of the following**

A. Kidney

B. Brain

**C. Liver**

D. Lungs

**14. Dust cells are related to which of the following**

A. Kidney

B. Brain

C. Liver

**D. Lungs**

**15. Mesangial cells are related to which of the following**

**A. Kidney**

B. Brain

C. Liver

D. Lungs

**16. Microglia cells are related to which of the following**

A. Kidney

**B. Brain**

C. Liver

D. Lungs

**17. During infections with parasite which among the following is likely to rise**

A. Basophils

B. Neutrophils

C. Macrophages

**D. Eosinophil**

**18. Heme portion of hemoglobin is synthesized in**

A. Golgi bodies

**B. Mitochondria**

C. Ribosomes

D. Nucleus

**19. Protein part of hemoglobin is synthesized in**

A. Golgi bodies

B. Mitochondria

**C. Ribosomes**

D. Nucleus

**20. Erythropoietin is mainly secreted by**

A. Spleen

B. Liver

**C. Kidneys**

D. Bone marrow

**21. Graveyard of RBCs is**

**A. Spleen**

B. Liver

C. Kidneys

D. Bone marrow

**22. Most preferred anticoagulant for morphological studies**

A. Heparin

**B. EDTA**

C. Sodium fluoride

D. Sodium citrate

**23. Most preferred anticoagulant for blood glucose studies**

A. Heparin

B. EDTA

**C. Sodium fluoride**

D. Sodium citrate

**24. Factor VII among blood clotting factors is known as**

A. Labile factor

**B. Stable factor**

C. Anti-hemophilic factor

D. Hageman factor

**25. Factor VIII among blood clotting factors is known as**

A. Labile factor

B. Stable factor

**C. Anti-hemophilic factor**

D. Prothrombin

**26. Factor IX among blood clotting factors is known as**

**A. Christmas factor**

B. Stuart Prower factor

C. Anti-hemophilic factor

D. Prothrombin

**27. Factor X among blood clotting factors is known as**

A. Christmas factor

**B. Stuart Prower factor**

C. Anti-hemophilic factor

D. Prothrombin

**28. Factor XII among blood clotting factors is known as**

**A. Hageman factor**

B. Stuart Prower factor

C. Anti-hemophilic factor

D. Prothrombin

**29. Largest leucocyte**

A. Neutrophil

**B. Monocyte**

C. Eosinophil

D. Basophil

**30. Mature RBC lack**

A. Nucleus

B. Mitochondria

**C. Both 1 and 2**

D. Ribosomes

**31. Loss of iron in hemorrhage or deficiency of iron in feed leads to ………. Anemia**.

A. Microcytic normochromic

B. Macrocytic hypochromic

**C. Microcytic hypochromic**

D. All of the above

**32. Protein deficiency leads to ……. Anemia.**

A. Microcytic normochromic

**B. Macrocytic hypochromic**

C. Microcytic hypochromic

D. Pernicious anemia

**33. Folic acid deficiency leads to …… Anemia.**

A. **Megaloblastic anemia**

B. Macrocytic hypochromic

C. Microcytic hypochromic

D. Pernicious anemia

**34. Normocytic normochromic anemia is seen in……**

A. Hemolytic anemia

B. Aplastic anemia

C. Acute hemorrhagic anemia

**D. All the above**

**35. Microcytic hypochromic anemia is seen in ……**

A. Chronic hemorrhagic anemia

B. Iron deficiency

C. None of the above

**D. Both A and B**

**36. Decrease in plasma volume while increase in red cell mass in blood is……**

A. Absolute polycythemia

**B. Relative polycythemia**

C. Polycythemia vera

D. None of the above

**37. Increase in red cell mass and no decrease in plasma volume in blood is …….**

**A. Absolute polycythemia**

B. Relative polycythemia

C. Polycythemia vera

D. None of the above

**38. Low levels of oxygen in blood is known as**

A. Hypoxia

**B. Hypoxemia**

C. Hyperemia

D. None of the above

**39. Low levels of oxygen in tissue is known as**

**A. Hypoxia**

B. Hypoxemia

C. Hyperemia

D. None of the above

**40. Pyridoxine deficiency in swine produces …… anemia**

**A. Microcytic hypochromic**

B. Macrocytic hypochromic

C. Megaloblastic

D. Aplastic anemia

**41. Adult hemoglobin has ……chains**

**A. 2 alpha and 2 beta**

B. 2 alpha and 2 delta

C. 2 alpha and 2 gamma

D. 2 beta and 2 gamma

**42. Fetal hemoglobin has ……chains**

A. 2 alpha and 2 beta

B. 2 alpha and 2 delta

**C. 2 alpha and 2 gamma**

D. 2 beta and 2 gamma

**43. 2 molecules of succinyl CoA combine with 2 molecules of glycine and condense to form …… by ALA synthase in the synthesis of Hb**

**A. δ - aminolevulinic acid**

B. α - aminolevulinic acid

C. β - aminolevulinic acid

D. γ - aminolevulinic acid

**44. ……… is transported back from cytoplasm to mitochondria, where it is oxidized to form protoporphyrinogen IX by ………… in synthesis of Hb.**

A. Uroporphobilinogen I, Uroporphobilinogen I synthase

B. Protoporphyrin IX, Ferrochelatase

**C. Coproporphyrinogen III, Coprophyrinogen oxidase**

D. Coproporphyrinogen III, Ferrochelatase

**45. ……… combines with iron to form heme in the presence of ferrochelatase.**

A. Coproporphyrinogen III

**B. Protoporphyrin IX**

C. Uroporphobilinogen I

D. Uroporphobilinogen III

**46. Nucleus occupies the whole cytoplasm, a rim of cytoplasm may or may not be seen in…….**

A. Basophil

B. Macrophage

C. Eosinophil

**D. Lymphocyte**

**47. Largest leucocyte is ….**

**A. Monocyte**

B. Neutrophil

C. Basophil

D. Lymphocyte

**48. Among the following, Non-nucleated cells are ……**

A. RBC and lymphocytes

B. Eosinophil and Basophil

C. RBC, Eosinophil and platelets

**D. RBC and platelets**

**49. Increase in WBC count is known as….**

**A. Leukocytosis**

B. Leukopenia

C. Leukemia

D. Lymphocytopenia

**50. Decrease in WBC counts is known as ….**

A. Leukocytosis

**B. Leukopenia**

C. Leukemia

D. Lymphocytopenia

**51. Abnormal and uncontrolled increase in WBC count is known as…..**

A. Leukocytosis

B. Leukopenia

**C. Leukemia**

D. Lymphocytopenia

**52. Increase in lymphocyte count is known as ……**

**A. Lymphocytosis**

B. Lymphocytopenia

C. Leukocytosis

D. Leukemia

**53. Decrease** **in lymphocyte count is known as ……**

A. Leukemia

B. Lymphocytosis

**C. Lymphocytopenia**

D. Leukocytosis

**54. Agranulocytosis is …….**

A. Abnormal increase in number of granulocytes

B. Abnormal decrease in number of granulocytes

C. Abnormal increase in number of agranulocytes

**D. Absolute lack of granulocytes**

**55. Granulocytopenia is …….**

A. Abnormal increase in number of granulocytes

**B. Abnormal decrease in number of granulocytes**

C. Absolute lack of granulocytes

D. Abnormal increase in number of agranulocytes

**56. Granulocytosis is …..**

**A. Abnormal increase in number of granulocytes**

B. Abnormal decrease in number of granulocytes

C. Absolute lack of granulocytes

D. Abnormal increase in number of agranulocytes

**57. In polycythemia vera ………. is seen.**

A. Eosinophilia

**B. Basophilia**

C. Neutrophilia

D. Monocytosis

**58. In acute infection, metabolic disorders and in acute hemorrhage which of the following is seen?**

A. Neutropenia

B. Eosinopenia

C. Monocytopenia

**D. Neutrophilia**

**59. Platelets lose their discoid shape and form sticky projections known as ……. For adherence of injured blood vessels.**

A. Spikes

B. Pseudopodia

C. Cilia

**D. Pseudopods**

**60. Platelet aggregation is accelerated by ……. factor.**

A. Platelet aggregation factor

**B. Platelet activating factor**

C. Plasma thromboplastin antecedent factor

D. VI factor

**61. Adherence of platelets to the collagen is accelerated by ……factor.**

A. Platelet activating factor

**B. Von-Willebrand factor**

C. Labile factor

D. Contact factor/ Hageman factor

**62. Which of the following is known as classical hemophilia?**

**A. Hemophilia type A**

B. Hemophilia type B

C. Hemophilia type C

D. Hemophilia type D

**63. Lack of factor VIII leads to which type of hemophilia?**

**A. Hemophilia type A**

B. Hemophilia type B

C. Hemophilia type C

D. Hemophilia type D

**64. Lack of factor IX leads to which type of hemophilia?**

A. Hemophilia type A

**B. Hemophilia type B**

C. Hemophilia type C

D. Hemophilia type D

**65. Lack of factor XI leads to which type of hemophilia?**

A. Hemophilia type A

B. Hemophilia type B

**C. Hemophilia type C**

D. Hemophilia type D

**66. The process of blood cells formation is known as …...**

A. Erythropoiesis

**B. Hematopoiesis**

C. Both A and B

D. None of the above

**67. The percentage of RBC in the total blood volume is known as…**

A. Hemoglobin

B. Buffy coat

C. Blood volume

**D. Hematocrit**

**68. WBCs and platelets are seen in …….**

A. Hematocrit

**B. Buffy coat**

C. Plasma

D. All the above

**69. Hb has …….. times more efficiency for Carbon monoxide than oxygen.**

A. 2 times

B. 20 times

**C. 200 times**

D. 500 times

**70. The concentration of Hb in the blood of domestic animal is …. percent of body weight.**

A. 5%

 **B. 8%-10%**

C. 10%-15%

D. 15%-20%

**71. Iron is stored in MPS cells in the form of …. and …… after hemolysis of RBCs.**

A. Ferritin and transferrin

B. Apotransferrin and hemosiderin

**C. Ferritin and hemosiderin**

D. Hemosiderin and apotransferrin

**72. After hemolysis of RBCs, iron is transferred to plasma, where it combines with …….. to become …….**

A. Apotransferrin, hemosiderin

B. Ferritin, transferrin

C. Hemosiderin, apotransferrin

**D. Apotransferrin, transferrin**

**73. In, liver, insoluble bilirubin conjugates with …… to form bilirubin glucuronide.**

**A. Glucuronic acid**

B. Urobilinogen

C. Biliverdin

D. Bilirubin

**74. In large intestine, bacteria reduce ........to urobilinogen.**

A. Biliverdin

B. Bilirubin

C. Apotransferrin

**D. Bilirubin glucuronide**

**75. Color of urine is because of ……**

**A. Urobilin**

B. Urobilinogen

C. Stercobilin

D. Bilirubin

**76. Color of feces is because of ……**

A. Bilirubin

B. Biliverdin

C. Urobilin

**D. Stercobilin**

**77. Only condition when carbon monoxide is formed in body is in….**

A. Spermatogenesis

**B. Degradation of RBCs**

C. Formation of WBCs

D. Gas exchange in lungs

**78. First product formed in liver after free bilirubin is released into plasma and dumped in liver is ……**

A. Biliverdin

B. Bilirubin

**C. Bilirubin glucuronide**

D. Urobilin

**79. When RBCs are hemolyzed intravascularly, the hemoglobin is first bound to …..**

A. Albumin

**B. Hepatoglobin**

C. Biliverdin

D. Bilirubin

**80. Excess hemoglobin in blood plasma is .…...**

**A. Hemoglobinemia**

B. Hemoglobinuria

C. Hemolysis

D. Icterus

**81. Excretion of free hemoglobin in urine is ……**

A. Icterus

B. Hemolysis

C. Hemoglobinemia

**D. Hemoglobinuria**

**82. Highly yellow color plasma is seen in which among the following species?**

A. Cat

**B. Horse**

C. Cow

D. buffalo

**83. Nitrates, glutamine and amino phenol increase the concentration of which among the following.**

A. Myoglobin

**B. Methemoglobin**

C. Carboxy hemoglobin

D. Sulphohemoglobin

**84. The plasma protein responsible for colloidal osmotic pressure of blood.**

A. Hemoglobin

B. Hepatoglobin

C. Both A and B

**D. Albumin**

**85. …… pigment chiefly contributes to yellow color of plasma.**

**A. Bilirubin**

B. Biliverdin

C. Urobilin

D. Urobilinogen

**86. Oxygen carrying capacity of hemoglobin is ……… % more than that of plasma.**

A. 40%

B. 50%

**C. 60%**

D. 65%

**87. Ferrihemoglobin is also known as**

A. Myoglobin

 **B. Methemoglobin**

C. Carbomonoxy hemoglobin

D. Carboxy hemoglobin

**88. 2g hemoglobin can carry ……... ml of oxygen.**

**A. 2.68**

B. 3.34

C. 0.67

D. 1.7956

**89. When CO2 combines with hemoglobin, it is known as**

A. Ferrihemoglobin

**B. Carboxy hemoglobin**

C. Carbomonoxy hemoglobin

D. Methemoglobin

**90. When CO combines with hemoglobin, it is known as**

A. Methemoglobin

B. Carboxy hemoglobin

C. Ferrihemoglobin

**D. Carbomonoxy hemoglobin**

**91. When H2S combines with hemoglobin, it is known as**

**A. Sulphohemoglobin**

B. Ferrihemoglobin

C. Carboxy hemoglobin

D. Carbomonoxy hemoglobin

**92. One myoglobin consists of how many polypeptide chains?**

**A. 1**

B. 2

C. 3

D. 4

**93. One myoglobin consists of how many heme groups?**

**A. 1**

B. 2

C. 3

D. 4

**94. After RBC life span is over ……. % is removed by intravascular hemolysis and …. % is removed selectively by MPS.**

A. 90%, 10%

**B. 10%, 90%**

C. 30%, 70%

D. 70%, 30%

**95. Plasma constitute ……. % of blood volume and cellular components account about …… %.**

**A. 55-70%, 30-45%**

B. 30-45%, 55-70%

C. 65-75%, 25-35%

D. 25-35%, 65-75%

**96. Golden yellow color of plasma is seen in which among the following?**

A. Sheep

B. Horse

C. Human

**D. Dog**

**97. Life span of erythropoietin is ….**

**A. Less than 1 day**

B. 3 days

C. 7 days

D. 48 hours

**98. Smallest RBC is found in which among the following animals?**

A. Dog

**B. Goat**

C. Deer

D. Sheep

**99. Largest RBC is found in which among the following animals?**

A. Sheep

**B. Goat**

C. Deer

D. Dog

**100. Rouleaux formation is accelerated by which plasma protein(s).**

A. Albumin

B. Fibrinogen

C. Globulin

**D. Both B and C**

**101. pH of blood is**

A. 7.0

B. 7.2

**C. 7.4**

D. 7.6