**Pulse**

**INTRODUCTION**

* The wave of dilatation of elastic arteries due to force of blood from heart, which travels along the course taken by blood in all major arterial trunk is known as ‘pulse’.
* The periodic pulsation occurs in arteries which are near to surface and felt by touch with fingers.
* The heart beat drives blood out from left ventricle to aorta and arterial trunk.
* The arterial trunk becomes dilated due to this extra blood which moves throughout the course of vessels causing a wave of dilatation “pulse”.
* The fingers are put over any artery which lies near the surface; the wave of pulsation is felt and counted.
* The pulse rate is described as number of such waves per minute. This rate varies from animal to animal and in one species according to health status of animal.
* During fever the pulse rate increases while it decreases in weak and debilitating animals.
* Generally the pulse rate and heart rate are similar but a difference between the two may also occur.
* Slower pulse is recorded than heart rate in weak ventricle contractions and cardiac insufficiency.

**METHOD OF PULSE RATE DETERMINATION**

* Pulse is observed by putting the two fingers on the surface of artery and counting the number of waves of pulsation per minute.
* Along with rate, the rhythm, character and quality of pulse should also be recorded.
* The pulse rate is counted at different sites. It varies from species to species of animals.

***Horse***

* In horses, the pulse is taken from external maxillary artery situated on the medial aspect of the ventral border of the mandible.
* Pulse can also be observed from facial artery in midway between base of ear and the eye.

***Cattle***

* Pulse can be taken from facial artery on the lateral side of the mandible or from middle coccygeal artery, which is palpable on the underside of the base of tail about 4-5 inches below the level of anus.

***Dog and Cat***

* The pulse can be recorded from femoral artery on the medial side of thigh.

***Sheep and Goat***

* The pulse is taken from femoral artery situated on the medial side of the thigh.
* If the pulse is not palpable due to fat or wool, the heart beat should be counted and taken into consideration as pulse rate.

**CHARACTER OF PULSE**

* Character of pulse includes its rate, rhythm, amplitude, tone and pulse pressure.
1. *Rate:* The pulse rate is counted as number of vibrations/pulsations per minute which may alter during exercise, excitement, fever, pain and acute abdominal diseases. The pulse rate (Table 5.1) is specific for a given species of animal. The slow pulse rate is known as bradycardia which may occur during tumor or abscess in cranium, diaphragmatic adhesions, chronic hydrocephalus, alcohol and lead poisoning. The increased pulse rate is observed in septicemia, toxemia, pain, excitement, circulatory failure and is known as tachycardia. Increased pulse rate is a sign of damage to heart parenchyma.
2. *Rhythm:* The rhythm may be regular or irregular. In adult horse, every 5th beat is dropped. During rest, this is regular and constant but this beat is restored after exertion and rhythm becomes regular. The rhythm is of following two types:
	1. The time between two peaks of the pulse waves.
	2. Amplitude of the waves, the irregular rhythm is observed during myocardial disease.
3. *Amplitude:* Amplitude of pulse is determined by the amount of digital pressure required to obliterate the pulse waves. It should be observed over a reasonable period of time. It is a measure of cardiac stroke volume. One should see the force of impulse, degree to which the pressure wave is maintained and form of pressure wave. The beat may be quick, strong, abrupt, long, slow, soft, very fast, thin and thready. The amplitude of pulse is weak during myocardial diseases while it is strong in incompetence of aortic semilunar valves.

**FACTORS AFFECTING PULSE RATE**

* Pulse rate varies among animals owing to many factors affecting the rate.
* The following factors or points must be taken into consideration while interpretating the pulse rate in order to arrive at any diagnosis.
1. *Species:* The pulse rate varies in different species of animals. Usually pulse rate is higher in smaller animals while it is lower in large animals.
2. *Size of animal:* Pulse rate is lower in heavy animals than lighter ones in same species.
3. *Age:* The pulse rate is higher in younger animals than adults or older animals. In neonatal calves the pulse rate is 100-120/ minutes while it is 50-80/minutes in older animals.
4. *Condition of animal:* The pulse rate is lower in animals which are continuously put on hard work load or exercise, e.g. race horses, draught ox.
5. *Sex:* Usually the female animal has slightly higher pulse rate than male animals.
6. *Pregnancy:* Due to mild degree of hypertension in late stage of pregnancy, the pulse rate is slightly higher than nonpregnant animals.
7. *Parturition:* At the time of parturition the pulse rate is increased.
8. *Lactation:* The dry animals have their normal pulse rate (Table 5.1), while the milking animals have slightly increased pulse rate. Usually, it is 10% higher than normal.
9. *Excitement:* Excitement may cause an increase of pulse rate upto 10%. The excitement may occur due to handling of animal during restraining and clinical examination. The sexual excitement may also result in higher pulse rate, which is due to increased output of the adrenal secretion responsible for increased heart rate.
10. *Rumination:* The pulse rate is increased during rumination upto about 3%.
11. *Posture:* The pulse rate becomes 10% lower in animals during sitting position than normal animal in standing position.
12. *Exercise:* The increased pulse rate is recorded when animal is put on physical exercise. About 50-60% increased pulse rate is observed in cattle during exercise. It has, therefore, been advisable to take the pulse rate when animal is in rest. In veterinary clinic, when farmers bring their animal from a long distance, animal should be allowed to rest for at least 30-60 minutes before recording the pulse rate.
13. *Feeding:* If the pulse rate is taken when animal is ingesting feed, the pulse rate is higher. Pulse rate should, therefore, be taken either before feeding or after 1-2 hours of feed. In Ayurved, the vedyas like to take the pulse only before meal for a proper diagnosis.
14. *Oestrus:* During the oestrus, pulse rate is slightly higher than normal.
15. *Environmental temperature:* Pulse rate becomes higher due to high or low environmental temperature. Increased environmental temperature causes hyperthermia leading to increased heart rate while low temperature is responsible for increased secretion of adrenaline leading to increased heart rate.
16. *Fever:* In fever, the pulse rate is increased in animals.
17. *Cardiovascular disease:* In heart diseases, the pulse rate is increased.
18. *Pain:* Pain is responsible for increased pulse rate.

Normal pulse rate in different animals :

1. Cattle 45-50
2. Buffalo 40-45
3. Horse 36-42
4. Sheep and Goat 70-80
5. Camel 28-32
6. Dog 90-100
7. Cat 100-120
8. Pig 70-80
9. Fowl 120-160
* Normally the pulse rate is 3 to 4 times more than respiration rate.
* In large horses, the ratio of pulse and respiration rates is 1:3 while in small horses it is 1:4 or 1:5.
* During acute respiratory disorders, the ratio is disturbed and becomes 1:1.

**QUALITY OF PULSE**

* The quality of pulse include its size, strength and hardness which can be learned by experience.
* Normally the quality of pulse vary species to species such as in:
* Horse: Pulse is large, strong and artery is moderately tense.
* Cattle: Pulse is smaller, mild and artery is tenser.
* Small animal: Pulse is quick, strong and hard.
* The quality of pulse may alter from normal which may be characterized by the following points.
1. *Full pulse:* Full pulse occurs in cardiac weakness, anemia, loss of blood and exercise. This occurs in association with tachycardia, hypertrophy of the left ventricle and insufficiency of aortic valve. The full pulse is observed due to more quantity of blood in arteries while empty pulse is characterized by low amount of blood in arterial trunk.
2. *Pulse wave:* Inequal pulse wave is observed in cardiac weakness. A small wave is followed by large wave which is an indication of a beginning of heart disease.
3. *Hard pulse:* Hard pulse occurs in severe pain, peritonitis, tetanus and acute brain diseases.
4. *Strong pulse:* During hypertrophy of the heart the pulse wave is strong while it is weak in degeneration of cardiac muscles.
5. *Trembling pulse:* The trembling pulse wave is observed in distended artery. The wave is so small that only slight trembling is felt.
6. *Thready pulse:* This pulse is so small, weak and soft that it is hardly perceptible. If the thready pulse is associated with cyanosis of mucous membrane, it indicates a bad prognosis.
7. *Wiry pulse:* This pulse is small, tense and very hard and occurs in colic and chronic nephritis.

**PULSE IN DISEASES**

1. Acute laminitis in horses—the pulse is strong bounding and rate becomes 80/minute.
2. Chronic interstitial nephritis in dogs— strong incompressible pulse.
3. Sepsis in animals—soft pulse.
4. Pleurisy in animals—fast soft pulse.
5. Colic/acute impaction/volvulus — pulse is fast 120/minute.
6. Acute endocarditis—pulse is quick and wiry.
7. Severe cardiac palpitation—Irregular fluttering pulse, vary in rate, rhythm and character.
8. Strangles—pulse is weak, amplitude is low.
9. Black quarter—pulse rate is increased 100-120/minute.
10. Bovine malignant catarrh—pulse rate is increased to 100-120/minute.
11. Fog fever—the pulse rate is 80-120/ minute.

**PULSE IN VEINS**

* Normally in cattle, the pulse is observed in jugular vein.
* The jugular vein and anterior vena cava becomes enlarged.
* The continuous flow of venous blood into right heart suffers during the ystole of the right auricle.
* The blood congesting in the anterior vena cava and jugular vein causing a brief distention of the jugular vein which simulates a pulsation. It is, therefore, not a true pulse.
* A true venous pulse is pathological. It is coincidentally occurs with heart’s systole and is produced by a defective closing of atrioventricular valves; the blood remains in the auricles.
* The true venous pulse is characteristic of tricuspid insufficiency.