Death and Postmortem Changes

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By the end of these lectures the student should be:

1- Able to decide whether the animal is dead or not.

2- Estimation of the time passed since death.

3- Differentiate between Antemortem and postmortem changes.
4.- Differentiate between natural and criminal deaths.

5.- Understand the medicolegal importance of postmortem changes.

6.- Able to write a good and correct medicolegal report.
One of the mean duties of veterinarian is the diagnosis of death from the medicolegal aspect of view and to decide the cause of death and to write down a medicolegal report about the dead body or remnants of it.
Death is a state of persistent cessation of respiration and circulation together.

- Somatic death.
- Cellular death or molecular death.
- Natural death.
- Unnatural death.
Clinical death or Heart beating death or suspended animation or death like state.

Molecular life persists for few hours after somatic death.

The time between molecular death and somatic death is very long in snakes, frogs, lizards and very short in higher animals and man.
Causes of death:

1- Syncope: Cessation of circulation or circulatory failure.

2- Asphyxia: Cessation of respiration or respiratory failure.

3- Coma: Nervous failure usually due to disturbance of respiration or/and circulation.

A flat iso-electric EEG for 10 minutes is a sure sign or brain death.
Causes of sudden death:

Sudden death is unexpected death which occurs in apparently healthy animals or death within 24 hours after the onset of the illness.

1-Acute circulatory failure:
   • As in cases of:
     - Thrombosis.
- Embolism.
- Severe hemorrhage as in ruptured aneurism.

* Fatty degeneration of the heart in cases of phosphorous and chloroform toxicity.

* Acute traumatic pericarditis.
2-Acute respiratory failure:

* As in cases of:

→ Pulmonary embolism after parturition or large operation.

→ Occlusion of the upper respiratory passages of foreign body (choking).

→ Laryngeal edema from local inflammatory conditions or irritant gases.
3- Acute CNS affections:

* As in cases of brain hemorrhages or post concussion compression.
Natural causes of death:

1-Death from heat:

Heat stroke or sun stroke

According to humidity classified into:

A) Heat hyperpyrexia $\rightarrow$ increase humidity.

B) Heat exhaustion $\rightarrow$ decreased humidity.

C) Heat Cramps $\rightarrow$ decreased humidity but less severe than exhaustion.
2-Death from cold:
- Death due to failure of the respiratory and heat regulating centers in the hypothalamus. Death occurs from respiratory failure or asphyxia.

3-Death from starvation:
- Deprivation of animals from food lead to the use of its own fat and protein for the production of needed energy. The dead body shows emaciation, absence of adipose tissue and empty GIT.
4-Death from electricity:

Electric current leads to ventricular fibrillation, paralysis of the respiratory muscles as well as paralysis of the medullary centers followed by death. Mineralization or presence of metals from the wire is a sure sign. Arborization is the congestion of blood vessels and engorgement with blood along with the pathway of the electric current.
5-Death from lightening:
- Effect of lightening resembles that of electricity but more severe.

6-Death from radiation:

7-Death from burns:
- Physical heat or fire, moist heat or scalds and corrosion due to chemicals are the major causes of burns. Clinically burns classified into slight, moderate and severe burns. It can be classified into first, second and third degree of burns.
- Death from burns within the first six hours is due to neurogenic shock, asphyxia due to CO and CO2 and also due to head injuries and brain concussion.

- From 6 - 48 hours; death occurs, due to haematogenic shock, toxaemic shock and fat embolism.

- After 48 hours to one week, death occurs due to infection or surgical complications.

- After two weeks, death occurs from septicemia.
What are the sure signs of death?

- It appears ridiculous to try to give a list of signs for such a well-known occurrence of death, but we will try.

1- Absence of pulse and heart beats on auscultation.

2- No spread of injected colored substance.

3- No bleeding on cutting a small peripheral artery.
4- Absence of thoracic and abdominal movement.

5- Primary flaccidity due to the loss of muscular tone.

6- Loss of corneal reflexes and drop of the eye ball.

6- Cooling of the body.
What are the postmortem changes?

1- Cooling of the body.
2- Primary flaccidity.
3- Hypostasis.
4- Rigormortis.
5- Secondary flaccidity or putrefaction.
6- Adpipcere formation.
7- Mummification.
Algor mortis refers to the rate at which a body cools after death. It is the most useful single indicator of the time of death during the first 24 hours postmortem.
Basis of measurement:

1- Direct measurement of the intra abdominal temperature either per rectum or the intra-hepatic /sub-hepatic temperature through an abdominal stab which allows insertion of the thermometer on to the undersurface of the liver.

2- An ordinary clinical thermometer is useless because its range is too small and it is too short.

3- A chemical thermometer 25-30 Cm long with a range from 0-50º Celsius is ideal. Digital readout or a printed record can also be used.
The body temperature should be recorded as early as possible and the environmental temperature should also be recorded. Since heat production ceases soon after death but loss of heat continues, the body cools. The fall in body temperature after death depends mainly upon a loss of heat through radiation and convection between the dead body and the environment.

In ideal conditions, the rate at which a body cools is one degree per hour.
There are many factors that affect the rate of cooling such as:

I-Animal-Related factors or cadaveric-Related factors:

-The size of the animal: The greater the surface area of the body relative to its mass, the more rapid will be its cooling.

-Age of the animal: small animals lose heat more quickly than large ones.

-Subcutaneous fat acts as insulator decreasing the rate of cooling.
II-Environment-Related factors:

-Air temperature and movement: Air movement accelerates cooling of animal body.

-Immersion in water: A cadaver cools more rapidly in water than in air because water is a better conductor of heat than air.

-Humidity of the air cooling is more rapid in a humid atmosphere.
-Time elapsed since death can be calculated from the formula:

Normal animal temperature – Temp. at the examination time

Rate of cooling

= ___________ hours

Give some examples!
Primary Flaccidity

Death is followed immediately by total muscular relaxation called in forensic medicine primary muscular flaccidity. It affects voluntary and non-voluntary muscles due to loss of muscular tone. This leads to drop of jaw, dilatation of eye pupils and the heart.
Hypostasis or postmortem lividity or livor mortis or postmortem suggillations.

Lividity is a dark purple discoloration of the skin resulting from the gravitational pooling of blood in the veins and capillary beds of the most dependent parts of the animal body, following cessation of the circulation.
Time of hypostasis:

Within about one hour after death as red patches coalesce with each other forming extensive areas of reddish-purple discoloration.

* It is visible two to three hours after death.

* Fixed in its primary position after 6 hours.

* Complete and maximum intensity after 10 hours.
Position of hypostasis:

- In its primary position, it appears in the lower side of the dead body.

- In cases of drowning, it appears in the head, neck and upper parts of the chest.

- In hanging, it appears in the legs and the lower parts of the dead body.
Extent of hypostasis:

- It is minimal in deaths from hemorrhage due to the loss of blood volume.

- It is less marked in malnutrition and cachexic animals.

- It is extensive in cases of congestive heart failure and long-standing diseases.