- Dark purple or light to bluish violet in cases of natural death.

- Blue discoloration in cases of death from violent asphyxia.

- Deep blue in carbon dioxide poisoning.
- Bright red in the three cases of red asphyxia:

  Carbon monoxide poisoning.

  Cyanide poisoning.

  Death from cold.
Brownish red or chocolate colour in case of methaemoglobinaemia syndrome caused by nitrates, sulphonamides, chlorates, aniline and barbituric acid derivatives.
Medicolegal importance of hypostasis:

1- Its appearance is a sure sign of death.

2- It denotes the time passed since death.

3- It denotes any change in the position of the dead body. Fading of the primary pattern of lividity and development of a secondary pattern shows that the body had been moved after death. This is clear within the first six hours than at a later period.
4- It may point to the cause of death from its position, extent and colour.

5- It may point to the presence of some toxic agents in the blood just before death.

6- It must be differentiated from antemortem contusion or bruises as the latter shows the following characters:
- Shows different colours according to the age of contusion.

- It is raised and has sharp edges.

- Appears anywhere of the body.

- Shows different shapes according to the cause.
Rigor mortis or muscular stiffening

Rigor mortis is the muscular progressive rigidity and shortening including both voluntary and involuntary muscles of all the dead body. It follows the state of primary flaccidity and remains till it is replaced by secondary flaccidity due to the autolysis of muscular proteins. Rigor mortis results from a physico-chemical changes in muscle protein.
At the point of death, the supply of oxygen to the muscle tissue is stopped because the blood is no longer pumped by the heart. The production of energy is stopped and there is no more ATP.

Increase the levels of pyruvic and lactic acids which leads to the decrease of pH levels to 6 or may be less. This decrease in ATP and acidic pH leads to irreversible linkage between actin and myosin results in coagulation of the actinomyosin or muscular stiffening.
Typically, rigor mortis is first apparent in the small muscles such as eyelids, lower jaw and neck. Followed by limbs, chest and abdomen. It also involves first the small joints of the fore and hind limbs then the larger joints such as elbow, shoulder and hip joints.
Why?!

This apparent progression through the small muscles and joints to the larger ones reflects the fact that although rigor mortis begins to develop simultaneously in all muscles, it completely involves small masses of muscles much more rapidly than large masses.
Time of rigor mortis:

- It begins after 1-2 hours in the small muscles of the head and neck.
- Progressing to fore limbs after 2-4 hours.
- In the muscles of hind limbs after 4-6 hours.
- Fully established and complete after 9-12 hours
- Lasts for another 12 hours till putrefaction.
- Begins to disappear after 18-24 hours from death as secondary flaccidity begins.
Conditions affecting rigor mortis:

1- Temperature: The onset of rigor mortis is accelerated and its duration shortened when the temperature is high. Cases of death from heat stroke or death from burns are good examples of it.

2- Musculature and muscular activity: Rigor mortis is rapid in onset and of short duration after prolonged muscular activity just before death due to rapid exhaustion of ATP. In muscular animals, onset and duration of rigor mortis is relatively longer than in small or cachexic animals.
Medicolegal importance of rigor mortis:

1- It is a sure sign of death.

2- Point to the cause of death.

3- Aid tool in the estimation of the time elapsed since death.
4-It should be differentiated from other causes of postmortem muscular stiffening or condition simulating rigor mortis such as:

a) Cadaveric spasm.

b) Cold stiffening.

c) Heat stiffening.
Cadaveric spasm
OR
Instantaneous rigor

It is the muscular stiffening in special muscles and special type of death.

* It occurs in voluntary muscles and in cases of deaths accompanied with violence (violent death).

* Accompanied by severe mental and nervous excitation.
-It occurs as a continuation of the antemortem contraction of muscles *Just* before death without passing the stage of primary flaccidity.

-Cadaveric spasm records the last act of life *Just* before death.
- Cadaveric spasm cannot be fabricated.

- Cadaveric spasm occurs in injuries of the CNS, drowning, suicide, struggling homicide and such cases of death with nervous over stimulation.
Medicolegal importance of cadaveric spasm

1- In cases of drowning, the dead animal keeps the mouth grasping some aquatic plants, weeds, and mud which is a sure sign of drowning.

2- In human forensic medicine, the hand of the victim is seen firmly grasping the weapon in suicide or the cloths or hairs of the assailant in homicide.
Heat and cold stiffening

Exposure of a body to intense heat results in heat stiffening due to coagulation of the muscle protein. Shortening of the muscles due to the effect of heat or fire of hot liquids. Heat coagulation or stiffening persists till the beginning of secondary flaccidity.
Cold stiffening of muscles is due to the effect of very low temperature or freezing. It is reversible if the dead body warmed, the dead body then passes the primary flaccidity and rigor mortis as soon as thawing takes place.
Postmortem Decomposition or Putrefaction or Secondary Flaccidity

This is the process by which the soft tissues of the animal are finally broken down or disintegrated leaving nothing but bones. It is the last stage in the tissues dissolution from the organic to the inorganic state by the action of bacteria and enzymes.
From the medicolegal aspect of view, the main changes which can be recognized in the tissues undergoing putrefaction are changes in colour, evolution of gases and liquefaction.
Any antemortem bacterial infection of the animal, particularly septicemia, will hasten the onset and evolution of putrefaction. Environmental temperature has a very great influence on the rate of development of putrefaction.
A high temperature as well as a high environmental humidity will enhance putrefaction. Putrefaction is optimal at temperatures ranging from 28 to 38°C and retarded when the temperature falls below 10°C.
Typically, the first visible sign of putrefaction is a greenish discolouration of tissue under the skin due to the sulph-haemoglobin formation as a result of combination between $\text{H}_2\text{S}$ liberated and haemoglobin of the blood.
The abdominal wall veins become visible as green lines called “venous tree” or it is often described as “marbling”. Due to their distention by putrefactive gases and discoloration by decomposed blood pigments they called also “putrefactive arborization”.
Putrefactive froth is a coarse, dark, foul (of bad smell or malodorous) bloody froth at the mouth and nostrils. It must be differentiated from drowning froth which is fine, white, non-smelling froth due to the mixture of air, mucous and water during drowning. Putrefaction *starts* one day after death in summer and two days in winter.
Adipocere formation

Saponification or adipocere formation is a modification of putrefaction in cases of dead animals present submersed in damp areas. It is characterized by the transformation of fatty tissues into a yellowish-white, greasy, wax-like substance with a sweetish rancid odour called adipocere.
It takes place due to the hydrogenation of the more oily unsaturated fatty acid as oleic acid and palmitic acid into highly saturated fatty acid as stearic acid.

\[
\begin{align*}
\text{Oleic acid} & \quad \text{Stearic acid} \\
\text{(oily)} & \quad \text{(Hard fat and insoluble in water)}
\end{align*}
\]
Under ideal damp conditions, adipocere may be apparent to the naked eye after 3-4 weeks. It requires 5-6 months to be completed. It will remain unchanged for years.
The medicolegal importance of adipocere lies in establishing time of death and its ability to preserve the dead body to an extent which can aid in identification and recognition of injuries or cause of death. The presence of adipocere indicates that the post mortem interval is at least weeks and probably several months.
Mummification

Mummification is a modification of putrefaction characterized by dehydration or desiccation of the animal tissues. Mummification develops in conditions of dry heat, especially when there are dry air currents such as in the desert or inside a chimney.
The forensic importance of mummification lies primarily in the preservation of the dead body which aids in identification and recognition of the cause of death. To be completed, mummification takes at least 6 months.
Concentration of potassium in vitreous humour

Using of potassium concentration in aqueous and vitreous humour as an aid in estimating the time since death has been used confidently. Up to 100 hours postmortem, K concentration can be used.

There is a linear relationship between potassium concentration and time after death. Acid phosphatase activity found to be also useful.
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