FORENSICS TIME OF DEATH

Decomposition and Entomology

DEATH

- **Manner of Death** can be natural, accidental, suicidal, homicidal, or undetermined.
- The most common manner of death is natural.
- **Mechanism of Death** is the specific change in the body that brought about the cessation of life
- **Postmorteum Interval** (PMI) is the time that has elapsed since a person has died If the time in question is not known, a number of medical/scientific techniques are used to determine it. This also can refer to the stage of decomposition of the body.

STUDYING THE HUMAN BODY AND DECOMPOSITION

- Various sciences study the decomposition of human bodies to determine time and cause of death
  - **Forensic Pathologist**—perform autopsies to look for clues to the cause of death
  - **Forensic Entomologist**—study insects and other vermin
    - Kind of organisms, sequence in which they appear, where they are found, and life cycle
    - Helps determine time of death, length of corpse exposure, and if corpse was moved
  - **Forensic Anthropologist**—studies skeletons and human remains to determine identity, race, and sex

Determine Time of Death

*Five Stages of Decomposition**

1. Fresh (0-3 days after death)
2. Bloat (4-10 days after death)
3. Active Decay (10-20 days after death)
4. Advanced Decay (20-50 days after death)
5. Dry/Skeletal (50-365 days after death)

*The duration and degree of each stage is largely influenced by the environment (temperature, humidity, etc.), body mass, any wrappings or coverings of the body, and obviously scavenging or other post-mortem disturbances.

FRESH STAGE

0-3 days after death

- Begins immediately after death
- AUTOLYSIS: destruction of cells and organs
- LIVOR MORTIS: blood seeps down and settles in lower part of body
- LIVIDITY: blood will settle with gravity creating
- RIGOR MORTIS: muscles will also begin to stiffen
- AIGOR MORTIS: cooling of body to temperature of its environment

FRESH STAGE—*Livor Mortis*

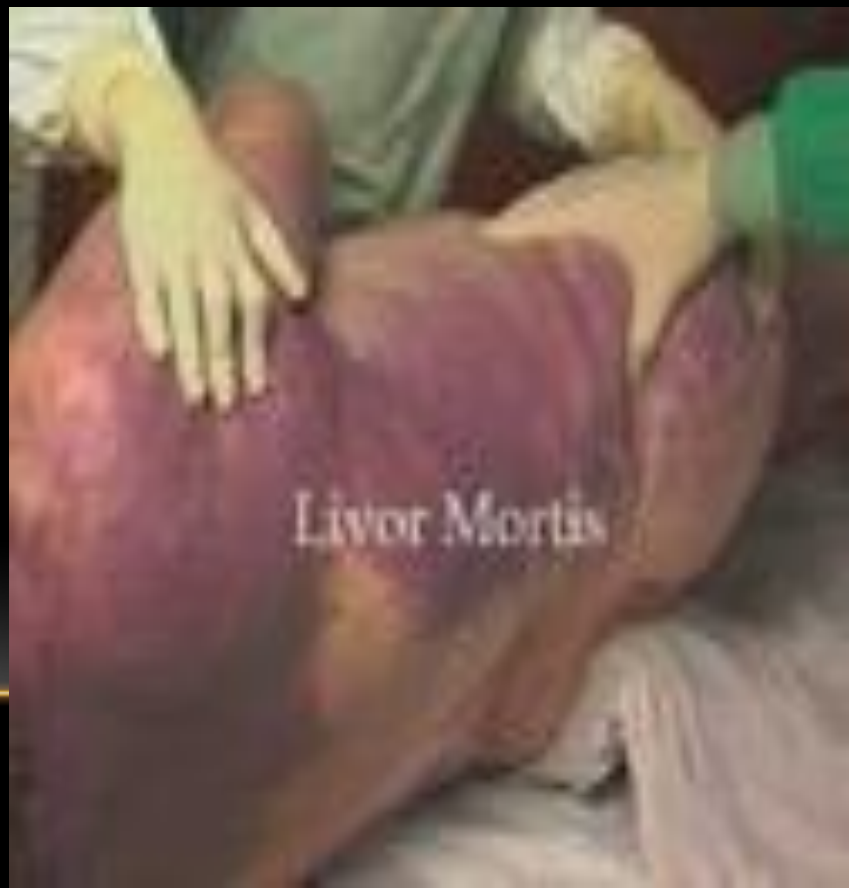
Livor Mortis:

• Process when body decomposes and blood seeps down and settles into lower parts of body.

Lividity :

• pooling or settling of blood in tissues after death.

• Begins 2 hours after death becomes permanent after 8.



Determine Time of Death —*Livor Mortis*

- **Help Determine Time of Death**
  - Within 2-8 hours, can press skin and color disappears
- **Can reveal the position of the corpse within first 8 hours**
  - If on back, blood will pool along backside
- **Can reveal if the body was moved**
  - If moved, may show dual lividity from first position and then from second position

Factors affecting Lividity

- Ambient temperature, anything that could impede flow of blood to area

FRESH STAGE—RIGOR MORTIS

Stiffening of the skeletal muscles after death

- At death, skeletal muscles cannot relax because of a lack of oxygen and build up of calcium in the muscles
- Rigor mortis starts in the head and works its way down to the legs.

FRESH STAGE—RIGOR MORTIS

- **2 -6 hours** postmortem (after death), rigor begins in the head
- **12 hours** postmortem, rigor is complete and throughout the entire body
- **15 -36 hours** postmortem, the muscle fibers begin to dissolve, and softening begins *(rigor mortis* starts to end).
- **36 -48 hours** postmortem, rigor ends and is relaxed throughout the entire body.

FRESH STAGE: RIGOR MORTIS

Factors that affect rigor mortis

- Ambient temperature (cold = slow rigor)
- The weight of the body (obesity = slow rigor)
- The body's clothing or lack of it
- Any illness the person had at the time of death
- The level of physical activity at the time of death
- Sun exposure

FRESH STAGE: ALGOR MORTIS

Cooling of the body after death

- In death a body no longer generates warmth and begins to cool down.
- To find the standard temperature of a corpse, a thermometer is inserted into the liver.
- Time of death determined by temperature calculations is expressed as a range of time.

  - Normal body temperature is 98.6°F (37°C)

FRESH STAGE: ALGOR MORTIS

Calculations

- **First 12 hours** after death:
  - Body cools **0.78 °C (1.4 °F)** per hour
- **After 12 hours** after death:
  - Body cools **0.39 °C (0.7 °F)** per hour
- **Example**
  - What is the **temperature loss** for someone who has been dead for 12 hours?
    - 0.78 ° C x 12 hours = 9.36 ° C

4-10 days after death

BLOAT STAGE

- **Putrefaction**: the gases being produced begin to build and will give the body a distended appearance.
- Gases and fluid will eventually escape through the natural orifices as the pressure builds.
- As the bacteria multiply and can lead to conditions like marbling which is a discoloration pattern seen in the skin.
- You may also see green discoloration in the abdomen areas and eventually a darkening (blackish) coloring of the skin.

ACTIVE DECAY

10-20 days after death

- Body begins to lose much of it's fluids and mass (tissue) through purge and insect and/or vertebrate scavenging (coyote, fox, lion, etc).
- May see very large maggot masses
- May notice a considerable increase in foul odors.

ADVANCED DECAY

10-50 days after death

- End of the active decay process.
- Temperatures can either speed up (heat) or slow down (cold) how quickly a body reaches this phase.
- The body has very little body mass and soil staining of the surrounding soils is still evident.
- Maggots will migrate away from the body to pupate and flies will cease laying eggs.

DRY/SKELETAL STAGE

50-365 days after death

- Last measurable stage of decomposition
- Timing of this stage varies widely by environment.
- Mostly the body is reduced to bones and connective tissue.
- No biomass available for diverse insect colonization.
- Over time the bones may “bleach” (turn white) with exposure to sunlight and eventually will begin to exhibit cracks after several years.

Determine Time of Death —*Insects*

Forensic Entomology

- Within minutes of a death, certain insects arrive to lay their eggs on the warm body.
  - Blowflies are a common example.
- As a corpse progresses through the stages of decomposition, other kinds of insects arrive.