Determining the Time of Death (TOD)

Why is it important to know the time of death?
• TOD can set the time of murder
• Eliminate or suggest suspects
• Confirm or disprove alibis

Time of Death
• Postmortem interval (PMI)-time between the death and the attempt to determine the TOD
• Time that the fatal injury occurred is not always the TOD

Factors used in determining the TOD

Ocular changes
• Thin film appears over the cornea of opened eye within minutes of death (closed eyes-hours)
• Corneal cloudiness (2-3 hours in open eyes and 24 hours in closed eyes)
• Tache noire-blackish discoloration develops
• No intraocular fluid after four days

Rigor Mortis
• Postmortem rigidity due to buildup of lactic acid and causing myosin and actin to harden
• Immediately following death-body is flaccid, followed by increasing rigidity due to lack of ATP and buildup of lactic acid
• Adenosine Triphosphate (ATP)-energy source produced in respiration in mitochondria of cells

ATP-Adenosine Triphosphate

Respiration

\[
C_6H_{12}O_6 + 6O_2 \rightleftharpoons 6H_2O + 6CO_2 + 36 ATP
\]

• Muscles need ATP for actin and myosin to interact
• Postmortem- body uses ATP, but stops making it
• ATP, actin, and myosin lock up until decomposition occurs
• Appears 2-4 hours after death and after 6-12 hours, rigor mortis is complete

Rigor Mortis
• Cadaveric spasm-instantaneous appearance of rigor mortis due to forceful death-ex. Drowning
• Arrector Pili contract-muscles surrounding hair follicle-hair is in upright position and does not continue to grow postmortem
**Algor Mortis**

- Postmortem cooling - 2-2.5 degrees F per hour for first hours, 1.5-2 degrees F for first 12 hours, and then to one degree for next 12-18 hours

**Assumptions of Algor Mortis**
- Body temperature was 98.6 degrees F at TOD (may be hypothermic or hyperthermic)
- Body cooling is constant
- Time of assault different than time of death
- Temp changes of “inner core” - rectal, liver or brain temp change is slower, predictable
- External factors affect rate of cooling - ex. Body fat and external temperature

**Livor Mortis**

- Postmortem hypostasis purple coloration in dependent (compressed) areas of the body due to lack of blood circulation
- Caused by accumulation of blood in vessels in dependent areas due to gravity
- Also called lividity

**Livor Mortis**

- Evident 30-120 minutes postmortem
- 8-12 hours (24-36 hours in cooler temps) postmortem- maximum color or “fixed” livor mortis due to hemolysis (blood vessels break down)
- May occur antemortem (before death) in slow deaths
- Can congest internal organs

**Livor Mortis**

- Advanced stages - skin capillaries burst and cause hemorrhaging leading to petechiae hemorrhage (purple spots on skin)
- May go unnoticed in dark-skinned individuals
- May be misinterpreted as bruising - applying pressure to bruise does not cause blanching (loss of color) while unfixed livor mortis does
- Incision into bruise shows diffuse hemorrhage into tissue, but livor mortis is confined to vessels

**Livor Mortis**

- Dependent areas resting against firm surface will be pale due to compression of blood vessels
- Prevents accumulation of blood
- Color may be red or pink due to carbon monoxide (CO) or cyanide poisoning
- Red coloration due to predominance of oxygenated hemoglobin

Stomach Contents
• Digestion takes between ½ hour-6 hours depending on size and content of meal
  Affected by many factors:
• Density-increase density-slower digestion
• Drugs and alcohol-alcohol slows down digestion and narcotics speed up digestion
• Medical Conditions-Diabetes delays digestion and shock causes content retention for days
Chemical Changes in body fluids
  Potassium in vitreous humor increases from TOD
  (increases as decomposition increases)
Scene Markers/Environmental Evidence
• Any factor in the environment of the deceased which could determine TOD
• Ex. Uncollected mail, lights on/off, sales receipts in deceased’s pockets, witness accounts
Decomposition
  Disintegration of body tissue after death
  Embalming and mummification-preservation of the body-occurs faster in a hot and dry climate
Forensic Entomology
  Using the developmental stages of insects to determine TOD

Pupal Stages of House Fly