Death
Importance of TOD

• 1st question at most murder scenes: "How long has this person been dead?"

• It's crucial to know when the crime was committed.
  – it can help narrow the search for a suspect or
  – it can help rule out potential suspects who had alibis at the time the victim was killed.
The postmortem interval is the time since death (how long has this person been dead?)

• **What Time Did the Person Die?**
  - Best estimate; offered with a reasonable degree of medical and scientific certainty.
  - Impossible to be 100% accurate.
  - UNLESS a witness (who doesn’t lie) is present at the time of death, it generally is an estimate of time (2-4 hour window is the usual).
Estimating Time of Death

1. Rigor mortis
2. Livor mortis: (Lividity)
3. Algor mortis: Body Core Temperature
4. Potassium levels + Clouding of the cornea
5. Stomach Contents
6. Evidence of Decompositional Process
7. Presence/absence of purge fluids
8. Drying of the tissue
9. Insect Larval Instars
Algor Mortis

- Uses body temperature to determine time of death
- Normal body temperature is 98.6°F
- A body loses heat at a rate of 1.4°C per hour until the ambient temperature is reached
  - Rate varies according to environmental temperature
- Once ambient temperature is reached, you cannot use this method to determine time of death ~24 hours
TOD Temp Calculations

- Normal body temperature is 98.6°F
- Loss of body temperature at rate of 1.4 °F/hour for the first 12 hours
- After the first 12 hours at a rate of 0.7 °F/hour

\[
\frac{98.6 - \text{body temperature}}{1.4} = \# \text{ hours deceased}
\]
### Factors affecting Algor Mortis

<table>
<thead>
<tr>
<th>Factors affecting Algor mortis</th>
<th>Event</th>
<th>Effect</th>
<th>Circumstances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>Cold</td>
<td>Accelerate</td>
<td>Lose heat faster</td>
</tr>
<tr>
<td></td>
<td>Warm</td>
<td>Slows</td>
<td>Lose heat slower</td>
</tr>
<tr>
<td>Wind</td>
<td>Windy</td>
<td>Accelerate</td>
<td>Faster heat loss</td>
</tr>
<tr>
<td></td>
<td>Calm</td>
<td>Slows</td>
<td>Slower heat loss</td>
</tr>
<tr>
<td>Body fat</td>
<td>Obese</td>
<td>Slows</td>
<td>Slow down heat loss</td>
</tr>
<tr>
<td></td>
<td>Thin</td>
<td>Accelerate</td>
<td>Speed up heat loss</td>
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<tr>
<td>Clothing</td>
<td>Clothed</td>
<td>Slows</td>
<td>Slow down heat loss</td>
</tr>
<tr>
<td></td>
<td>Naked</td>
<td>Accelerate</td>
<td>Speed up heat loss</td>
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Rigor mortis

- The medical condition that occurs after death
  - Results in the shortening of muscle tissue and the stiffening of body parts
  - Body stays in the position they are in when death occurs

- Begins within **12 hours** and ends after **48 hours**:
  - After 48 hours, muscle cells begin to **autolyze**
Rigor Mortis Timeline

• **1-4 hours**: Jaw and neck rigid, rest of body limp
• **At ~8 hours**: everything down to the legs is rigid
• **At ~12 hours**: everything remains rigid
• **24 hours**: Jaw is limp, everything else is rigid
• **30-32 hours**: everything but the legs are limp
• **36 hours**: entire body is limp (*no rigidity*) decomposition has begun

"So do I still get the reward money or what?"
Rigor Mortis
# Factors affecting Rigor Mortis

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<tbody>
<tr>
<td>Temperature</td>
<td>Warm</td>
<td>Accelerate</td>
<td>Slower onset</td>
</tr>
<tr>
<td></td>
<td>Cold</td>
<td>Slows</td>
<td>Faster onset</td>
</tr>
<tr>
<td>Activity Before Death</td>
<td>Anaerobic Exercise</td>
<td>Accelerate</td>
<td>Buildup of lactic acid and heat; accelerates rigor</td>
</tr>
<tr>
<td></td>
<td>Sleep</td>
<td>Slows</td>
<td>Fully oxygenated muscles slow down rigor</td>
</tr>
<tr>
<td>Body fat</td>
<td>Obese</td>
<td>Slows</td>
<td>Fat stores oxygen</td>
</tr>
<tr>
<td></td>
<td>Thin</td>
<td>Accelerate</td>
<td>Body loses more oxygen</td>
</tr>
</tbody>
</table>
Livor mortis

- Pooling or settling of blood in tissues after death
- Begins 2 hours after death becomes permanent after 8

Livor mortis can Determine Time of Death
- Within 2-8 hours, can press skin and color disappears
  - Blanching
    - Thumb pressure indicates that the lividity is not fully fixed
- Reveal the position of the corpse within first 8 hours
  - If on back, blood will pool along backside

- Reveal if the body was moved
Blanching
Livor Mortis
Livor Mortis
Clouding of the Cornea

- Cornea is the clear covering of your eyes
  - Becomes cloudy and opaque after death
    - Takes only **2 hours** after death if eyes are **open** at death
    - It takes **24 hours** if eyes are **closed** at death
Stomach Contents

- Food flows from *stomach* to *small intestine* to *large intestine* before leaving the body.
- If there is undigested food in the *stomach*, death occurred 0 to 2 hours after the meal.
- If there is undigested food in the *small intestine* but not *stomach*, death occurred 4 to 6 hours after meal.
- If there is food in the *large intestine* but not the *small intestine* or *stomach*, death occurred 12+ hours.
Example –
Determine the time of death from the last meal if food is found in the small intestine

Answer: Death occurred 4 - 6 hours after the last meal
## Summary of Factors

### Promoting Decay
- Oxygen supply not restricted
- Warm temperature (15-37°C)
- Humid atmosphere
- Presence of invertebrate detritivores (e.g. blowfly larvae)
- Wasp, ant and other invertebrate predators feeding on corpse
- Wounds permitting invertebrates easier access to internal body tissues
- Surface burning causing skin to crack and thereby allowing easier access of invertebrates and oxygen to internal tissues
- Obesity
- Suffering from septicemia or myiasis before death
- Body exposed to the environment above ground
- Body resting on soil

### Delaying Decay
- Oxygen supply restricted
- Cold temperature (<10°C; decay will cease below 0°C)
- Dry atmosphere
- Absence of invertebrate detritivores
- Wasp, ant and other invertebrate predator feeding on detritivores
- Inability of detritivores to gain access to all or part of the corpse
- Intense burning resulting in tissues becoming carbonized and drying out.
- Burial on land or underwater (rate of decay declines with increasing depth)
- Body suspended above ground (e.g. hanging)
- Formation of adipocere
- Mummification
- Embalming