Unit 12: Autopsies and Human Remains



By the end of the unit, you will be able to:

* Describe how autopsies are used to determine cause of death
* Describe the process medical examiners use to determine cause and time of death
* Describe how insects can be used to determine cause of death
* Describe how skeletal remains can be used to identify a victim and cause of death
* Describe the process of decomposition

Unit Vocabulary:

* Autopsy:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Livor mortis:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Rigor mortis:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Algor mortis:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Entomology

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* Stages of Decomposition:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Forensic anthropologist: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is Death?

* Death is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_ of life.
* It is characterized by \_\_\_\_\_\_\_\_\_\_\_ stopping of blood \_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_ activity.
* When the heart stops beating, \_\_\_\_\_\_\_\_\_\_ is deprived from body cells and they begin to die, a process known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

What is an Autopsy?

* In cases of suspicious or unnatural death, a pathologist conducts post-mortem examination, called an \_\_\_\_\_\_\_\_\_\_.
  + Autopsies are conducted to determine the:
    - \_\_\_\_\_\_\_\_\_\_ of death- means by which they died
    - \_\_\_\_\_\_\_\_ of death- the reason they died
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of death- specific body failure
    - \_\_\_\_\_\_\_ of death- when they died

Manner of Death

* Five categories of manner of death can appear on death certificates:
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Cause and Mechanism

* Cause of death (COD) is the \_\_\_\_\_\_\_\_\_\_ a person died.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ causes include disease, cancer, physical injury, stroke, heart attack etc.
  + Homicidal and suicidal causes include \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_, poisoning, hanging, drowning, suffocation, etc.
* \_\_\_\_\_\_\_\_\_\_\_\_\_ cause of death' refers to an \_\_\_\_\_\_\_\_\_\_ cause of death, as opposed to the final cause.
  + For example, if someone is exposed to large amount of radiation then develops \_\_\_\_\_\_\_\_\_\_\_\_\_, the proximate cause of death is exposure to radiation.
* Mechanism of death describes the specific \_\_\_\_\_\_\_\_\_\_\_ in the body that brought about the cessation of life.

Mechanism of Death Examples

* If someone has been shot, they may die from \_\_\_\_\_\_of blood, called exsanguination (\_\_\_\_\_\_\_\_\_\_\_ to death).
* If someone has a heart attack, they may die from \_\_\_\_\_\_\_\_\_\_\_\_ arrest (heart stopping).
* If someone is strangled, they may die from asphyxiation (lack of \_\_\_\_\_\_\_\_\_\_\_\_\_).

Time of Death

* During an autopsy, the forensic examiner wants to determine \_\_\_\_\_\_\_ the person died.
* A time of death helps forensic detectives include or \_\_\_\_\_\_\_\_\_\_\_\_\_ suspects based on their \_\_\_\_\_\_\_\_\_\_ or location at that time.

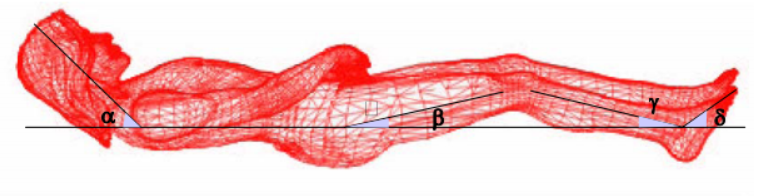
Types of Mortis

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Death color – pooling of blood in tissues after death (lividity)
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Death Stiffness – stiffening of skeletal muscles after death.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Death Heat – cooling of body after death.

Livor Mortis

* As body decomposition begins, blood \_\_\_\_\_\_\_\_ in the lower parts of the victim’s body. Red blood cells break and release \_\_\_\_\_\_\_\_\_\_\_\_\_, which turn \_\_\_\_\_\_\_\_\_ as they spill out of cells. Wherever these \_\_\_\_\_\_\_\_\_ of blood settle, the skin takes on the purple coloring.
* The pooling of blood is known as \_\_\_\_\_\_\_\_\_\_\_.
  + Begin \_\_\_\_\_\_\_\_\_ after death.
  + Between 2-8 hours after death, the color will disappear when the skin is \_\_\_\_\_\_\_\_\_ on.
  + After 8 hours, the discoloration becomes \_\_\_\_\_\_\_\_\_\_\_\_.
* Livor mortis not only helps approximate time of death, but also indicates the \_\_\_\_\_\_\_\_\_\_\_\_\_ of the body during the first 8 hours of death.
  + For example, if all discoloration is on the front of the body, it indicated the person was lying face \_\_\_\_\_\_\_\_\_.
  + Discoloration on many parts of the body can show that a body was \_\_\_\_\_\_\_\_ from one location/position to another.

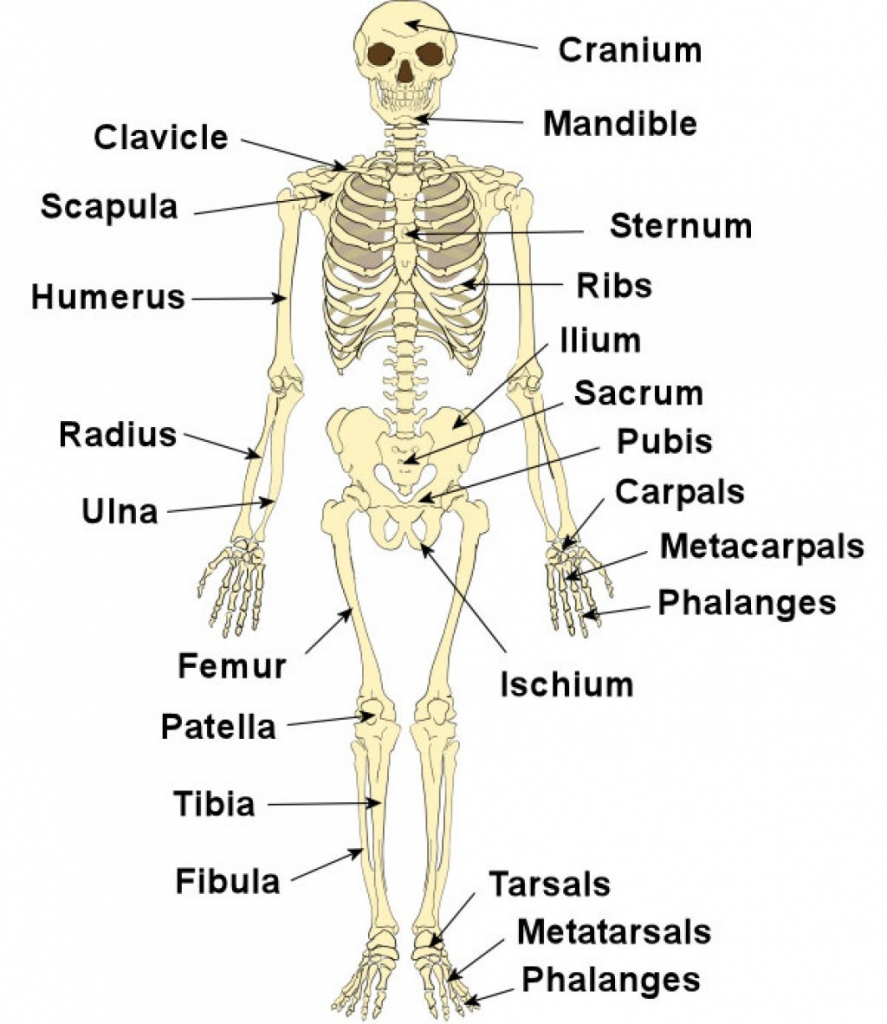
Rigor Mortis

* It is caused by lack of oxygen to cells and \_\_\_\_\_\_\_\_\_\_ buildup in the \_\_\_\_\_\_\_\_\_\_\_\_, causing stiff muscles and joints.
* Rigor mortis begins in the head about \_\_\_\_\_\_\_\_\_\_ after death, and slowly works down the body and legs.
  + Stiffness peaks at about \_\_\_\_ hours.
  + As the cells \_\_\_\_\_\_\_\_\_ during autolysis, the stiffness will slowly disappear.
  + Stiffness completely disappears around \_\_\_\_\_ hours.
* A dead body that is not stiff has probably been dead less than 2 hours or more than \_\_\_\_\_ hours.

Algor Mortis

* Describes a body’s temperature \_\_\_\_\_\_ after death.
* When a person is alive, the body maintains \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and regulates a \_\_\_\_\_\_\_\_\_\_\_ temperature.
* After death, the body no longer can maintain its heat and it begins to \_\_\_\_\_\_\_\_\_ down.
* To record the temperature of a corpse, forensic investigators insert a thermometer into the \_\_\_\_\_\_\_\_\_\_.
* A body cools at a rate of about \_\_\_\_\_\_\_ degrees per hour immediately after death, then slows to \_\_\_\_\_\_\_ degrees per hour after about 12 hours, until it reaches the \_\_\_\_\_\_\_\_\_ temperature as the environment.

Forensic Anthropology

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** analyze skeletal remains to determine the identity of a victim as well as his/her life history, cause of death, or other clues about a crime.
* Main Characteristics:
  + **\_\_\_\_\_\_\_\_\_\_\_** - Determined by examining the skull, pelvis, humerus, and femur
  + **\_\_\_\_\_\_\_\_\_\_\_** and **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** (height/build) – Determined by analyzing the development of the teeth, bone growth, cranial suture lines, and the length of specific  bones,  such as the femur.
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** – Determined by analyzing the skull for characteristics  that are common among people of different races.

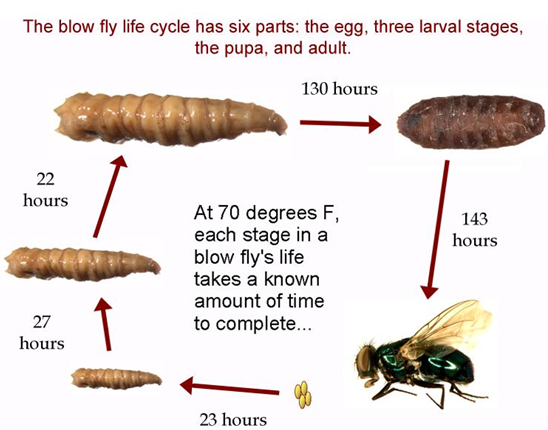
What Can the Bones Tell Us?

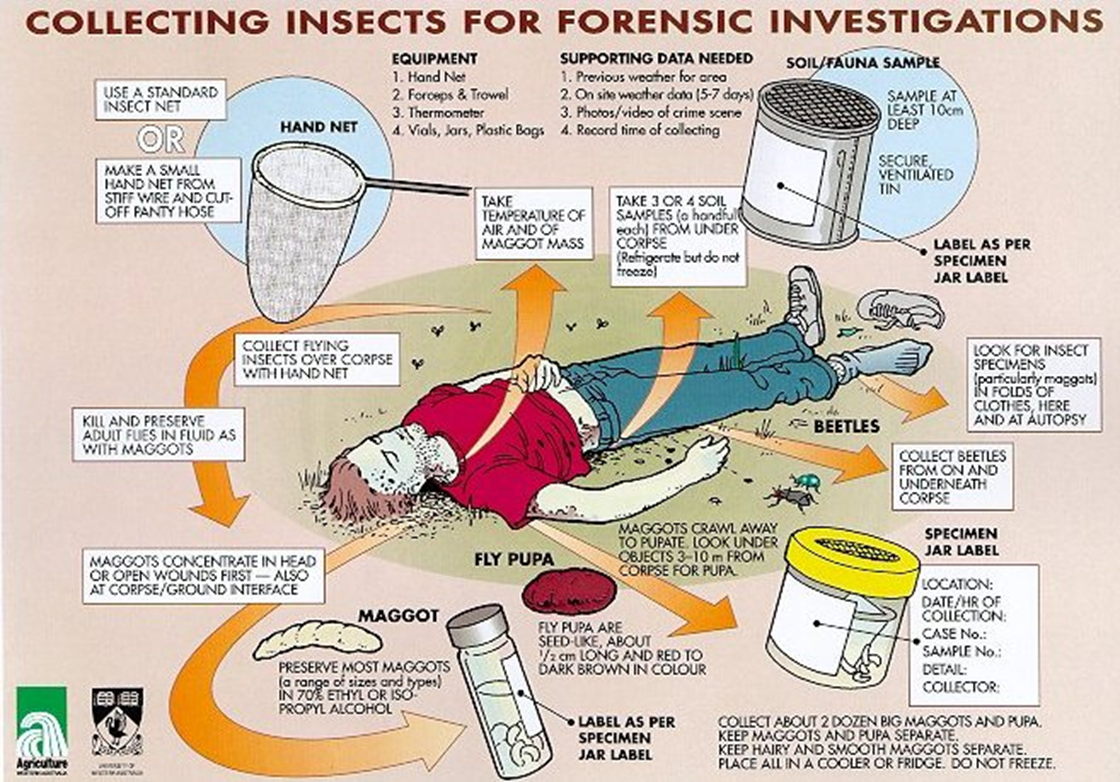
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** can be collected from bone, teeth, and hair to provide clues to a person’s identity.
* Scientists may also be able to gain clues as to a person’s past, recent **\_\_\_\_\_\_\_\_\_\_\_\_**, or the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** based on bone fractures and other signs of trauma.

Effects of Death on the Body

* Stomach and Intestinal Contents
  + Time of death can also be estimated by looking at the digestive tract and its contents.
  + It takes about:
    - 4–6 hours for the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** to empty its contents into the small intestine
    - **\_\_\_\_\_\_\_\_\_** hours for the food to leave the small intestine.
    - 24 hours from the time a meal is eaten until all undigested food is released from the **\_\_\_\_\_\_\_\_\_\_\_\_** intestines
  + The location of food in the digestive tract helps scientists estimate how long after a person **\_\_\_\_\_\_\_**, that they died.
* Changes in the Eye
  + Following death, the surface of the eyes **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.
  + If the eyes were open at death, a thin **\_\_\_\_\_\_\_\_\_\_\_** will appear on the eyes in 2-3 hours. If the eyes are closed, it takes about **\_\_\_\_\_\_\_** hours for this film to appear.

Forensic Entomology

* Insects are so useful in crime investigation there is a whole branch devoted to it called forensic **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.
* Duties of a forensic entomologist are to:
  + Record detailed crime scene **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** (temperature, moisture, wind)
  + Collect **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** evidence on, above, below, and surrounding the corpse
  + Determining an estimate for the postmortem interval or PMI (the time between death and the discovery of the body)
* If insects from another region are found on a corpse, it suggests that the corpse may have been **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and provide important evidence to determine a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** crime scene.
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** in court to explain insect-related evidence found at the crime scene
* The first stages of decomposition give off an \_\_\_\_\_\_\_\_\_\_\_\_ which attracts insects to lay their \_\_\_\_\_\_\_\_\_\_\_\_\_ on the body within minutes od death
  + Ex. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are one of the first insects to arrive at a body
  + Their four stages of development are:
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/instar1🡪 larva/instar 2 🡪 larva/instar 3
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

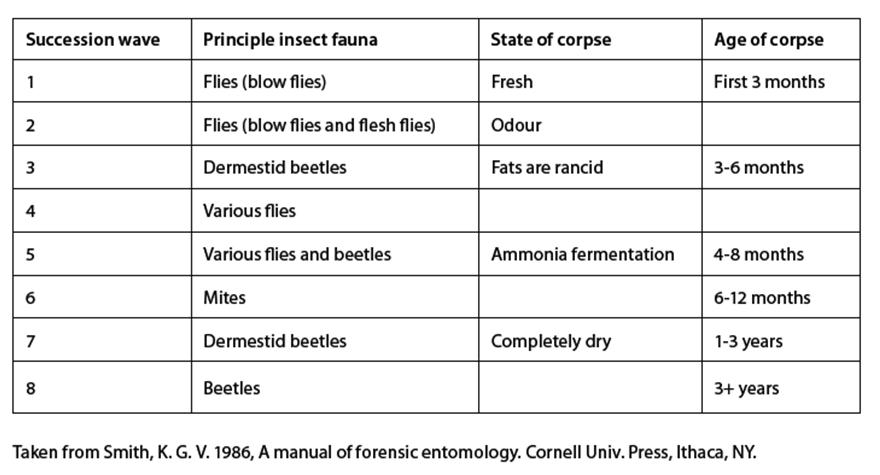


Why are Insects Used in Forensic Science?

* In most seasons and environments, insects \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ a dead body almost immediately after death
* Their \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and species dynamics over time can be used to accurately determine time since death.
* After \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, entomological evidence is the most accurate method to determine the elapsed time since death.
* Scientists have collected information on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of development at given temperatures for all types of insects known to feed on corpses.  This allows forensic entomologists to estimate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ based on insect evidence gathered at a crime scene.

What Can Insects Tell You?

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ interval
* Whether the body was \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ after death
* Whether the body was \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Presence and position of wound sites
* If the victim used \_\_\_\_\_\_\_\_\_\_\_\_\_\_ or was \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Length of time of abuse or neglect in living victims



Body Farm

* The University of Tennessee Anthropological Research Facility, nicknamed the “**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**”, investigates human decomposition. Bodies are placed in different settings throughout the facility and left to decompose. The bodies are exposed in a number of ways in order to provide insights into decomposition under **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** conditions.

What are the Stages of Decomposition

* Bodies begin to decompose shortly after death and do so in five predictable stages:
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** or Putrefaction
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** or Black Putrefaction
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** or Skeletonization



Stages of Decomposition: Fresh

* Begins almost **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** after death.
* Livor, rigor, and algor **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** occur.
* Autolysis, or self-**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, begins as lysosomes break down and release their digestive **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** into the cell.
* Visible changes caused by decomposition are limited during the fresh stage, although autolysis may cause **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** to appear at the surface of the skin.

Stages of Decomposition: Bloat/Petrification

* This stage of death is mostly due to the activities of **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**; first intestinal flora, then saprophytic bacteria and fungi.
* Characterized by the production of **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** which gives rise to the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** appearance of the decomposing body and strong **\_\_\_\_\_\_\_\_\_\_**.
* Skin turns a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** color as blood decomposes.
* Skin may break apart and **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** can flow out from the openings.

Stages of Decomposition: Active Decay

* This stage is recognizable by a great loss in **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, due largely to feedings by **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and other insects. Parts of flesh may be **\_\_\_\_\_\_\_\_\_\_\_\_** and corpse gives off an even stronger odor.
* As gases escape and the body leaks decomposition fluids, the body may **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.
* The end of this stage is marked by the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** of the maggots from the body.

Stages of Decomposition: Advanced Decay

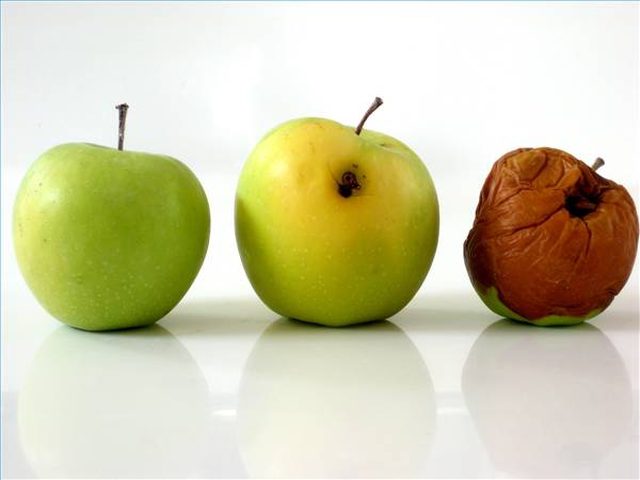
* The body begins to **\_\_\_\_\_\_\_\_\_\_** and preserve itself; most of the **­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_** is gone.
* Odor and insect activity **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.
* Body may form a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** layer known as the adipocere.

Stages of Decomposition: Dry Remains

* Final stage
* Recognizable by a loss of everything on the body but dried up **\_\_\_\_\_\_\_\_\_\_\_\_**.

What Effects the Speed of Decomposition?

* **\_\_\_\_\_\_\_\_\_\_\_\_**
  + Young decompose faster than elderly.
* **\_\_\_\_\_\_\_\_\_\_\_\_** of body
  + Overweight people decompose faster than average.
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
  + Naked decompose faster than clothed.
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
  + Sick decompose faster than healthy.
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** Conditions
  + Bodies decompose fastest in **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** oF



**Daily YOYO Sheet**

Week of: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Directions:** Write the answer to the YOYO in the correct box below.

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**Daily YOYO Sheet**

Week of: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Directions:** Write the answer to the YOYO in the correct box below.

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