Name ____TEACHER COPY_____Period _____ Date _____

Forensic Science - DEATH

Chapter 11 - Death: Meaning, Manner, Mechanism, Cause, and Time

Directions: Fill in the information from the Classroom Chart or the online chart.

Forensic Science Standard and element:

SFS2. Students will use various scientific techniques to analyze physical and trace evidence.

a.) Evaluate how post mortem changes are used to determine probable time of death: rigor mortis, livor mortis, algor mortis, and gastric contents.

1.) Put chart in Science Notebook behind the Charts section after it has been checked. ____yes ____no
2.) All information was accurate and complete. ____yes ____no
3.) All information was large enough to be easily read. ____yes ____no
4.) Information had no abbreviations, was dark enough to be easily read, and chart was neat. ____yes ____no
(Part of Notebook Grade)

HISTORY OF DEATH

History	• In the 17th century, anyone with a weak heartbeat that couldn't be detected or in a coma was considered dead and was buried. The fear of being buried alive led to a fad of placing a bell in the coffin. If anyone was buried by mistake and woke up, he or she could ring the bell to get someone's attention. • To avoid burying people before they were dead, "waiting mortuaries" were established in the 17th century. Those people thought to be dead were placed on cots and observed until the body began to rot. Only then was the person declared dead.

DEFINITION OF DEATH

One definition of death is the cessation, or end, or life. Or, the irreversible cessation of the circulation of blood.

CELL BREAK DOWN

When a cell dies, it breaks down. Once enough cells break down, life cannot be restarted. Cell breakdown is called ***autolysis***. When the cell membrane dissolves, enzymes and other cell contents spill out and digest surrounding tissues.

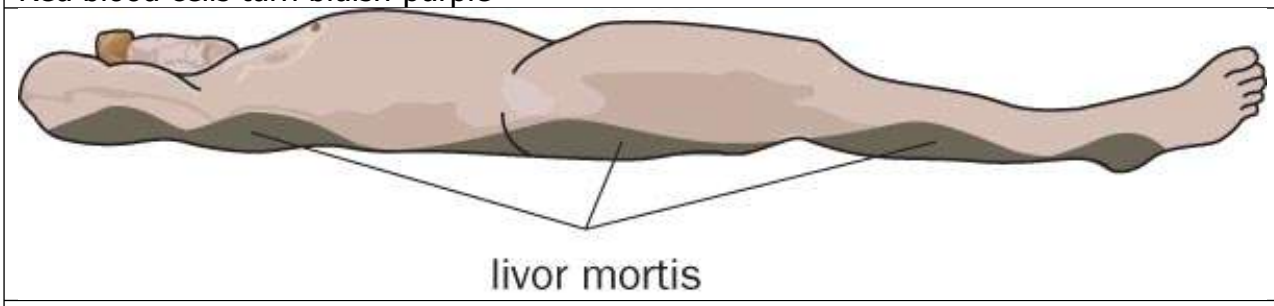
MANNER OF DEATH

Natural death (most common)	Accidental death	Suicidal death	Homicidal death
Undetermined - About 3% of U.S. deaths cannot be determined.			
Forensic pathologist - A forensic pathologist is a medical professional who specializes in determining the cause of death. S/he is a medical doctor who has completed training in anatomical pathology and who has subsequently sub-specialized in forensic pathology.			

CAUSE AND MECHANISM OF DEATH

Cause of death	• Natural death: disease, physical injury, stroke, heart attack • Homicide: bludgeoning, shooting, burning, drowning, strangulation, hanging, suffocation • Accidental: any trauma large enough to damage major organs and tissues can cause death • Suicidal: any toxic material that causes the major organs and tissues to stop functioning can cause death
Mechanism of death	• describes the specific change in body that brought about the cessation of life; shooting causes the body to lose too much blood

TIME OF DEATH - LIVOR MORTIS *(Death Color)*

Lividity - With decomposition, blood seeps down and settles in the lower parts of the a body
Red blood cells turn bluish-purple

Lividity begins about two hours after death
Discoloration becomes permanent after about twelve hours
Ambient temperature affects the speed of decomposition
Lividity can determine the position of the body during the first eight hours

TIME OF DEATH - RIGOR MORTIS *(Death Stiffness)*

The rigidity of death is caused from lack of oxygen in the blood. • calcium accumulates in the muscles • muscles stiffen
Starts in the head and expands throughout
After about 15 hours • muscle fibers begin to dissolve • softening begins
Live muscle fibers slide back and forth. After death, muscle fibers become locked in a flexed position.
OBSERVATION: • the body in at its most rigid state in just over 2 hours • no visible signs of rigor at less than 2 hours or more than 48 hours ago • stiffness generally disappears after 36 hours
FACTORS AFFECTING RIGOR MORTIS: • ambient temperature - air temperature of immediate surroundings • weight of the body • type of clothing or lack of it • general health of person at time of death • level of physical activity at time of death • sun exposure

TIME OF DEATH - ALGOR MORTIS *(Death Heat)*

THE CHILL OF DEATH Body heat falls after death • about 1.5 degrees per hour immediately after death • slowing to less than 1.0 degree per hour after about 12 hours • heat loss is affected by the ambient temperature • Corpse temperature is measured by a thermometer inserted into the liver
Time of death is expressed as a range of time Stomach and intestinal contents: • if undigested food is present in stomach, then death occurred zero to two hours after the last meal • if stomach is empty, but food is found in the small intestine, then death occurred at least four to six hours after a meal

TIME OF DEATH - ALGOR MORTIS *(Death Heat)* CONTINUED FROM PREVIOUS PAGE
Stomach and intestinal contents: • if small intestine is empty and waste is found in the large intestine, then death occurred 12 or more hours after a meal

TIME OF DEATH - STAGES OF DECOMPOSITION

Within two days after death: • cell autolysis begins following death • green and purplish staining occurs from blood decomposition • the skin takes on a marbled appearance • the face becomes discolored
After four days: • the skin blisters • the abdomen swells with the gas carbon dioxide that is released by bacteria living in the intestines
Within six to ten days: • the corpse bloats with carbon dioxide as bacteria continues to feed on tissues • eventually, the gas causes the chest and abdominal cavities to burst and collapse • fluids begin to leak from the body openings as cell membranes rupture • eyeballs and other tissues liquefy • the skin sloughs off

STAGES OF DECOMPOSITION

STAGE 1: AUTOLYSIS/ FRESH STAGE (1-2 days)	• Corpse appears normal on the outside, but is starting to decompose from the actions of bacteria and autolysis. • Enzymes dissolve cells from the inside out • Little odor/first insects arrive
STAGE 2: PUTREFACTION/ BLOAT STAGE (2-6 days)	• Odor of decaying flesh is present and the corpse appears swollen. • Destruction of soft tissues occur • Greenish cast to the skin/marbling effect • Blow flies, flesh flies, and beetles arrive
STAGE 3: BLACK PUTREFACTION/ ACTIVE DECAY STAGE (5-11 days)	• Deflation of carcass as larvae pierce the skin and gases escape • Corpse has wet appearance due to liquefaction of tissues breaking down with flesh appearing to have a cream consistency • Strong odor with insect activity increasing • Exposed body parts turn black
STAGE 4: BUTYRIC FERMENTATION/ ADVANCED DECAY STAGE (10-24 days)	• Some flesh remains but most of the flesh is gone and the cadaver is drying out • Strong odor begins to fade with a slight cheesy odor from the acids
STAGE 5: DIGENESIS/ DRY DECAY (24+ days)	• Corpse is almost dry. Further decay is very slow from lack of moisture. • Mainly bones, cartilage and small bits of dry skin remain • Little or no odor/any remaining odor is probably fur or dry skin • Slow rate of decay

INSECTS

Forensic entomologist	• collects insect evidence from on, above, and below the body • within minutes of a death, certain insects arrive to lay their eggs on the warm body – blowflies • as the corpse decomposes, other kinds of insects arrive
Blowfly	• 8 hours after death, the blowfly eggs can be found in the moist, warm areas of a corpse •

	(INSECTS – Continued) • within 20 hours, the first of their 3 larva stages occur • on 4th or 5th day, the 3rd of their larva stages occurs • in 8 to 12 days, the larvae migrates to a dry place • in 18 to 24 days, the early pupa, which is immobile, changes from light brown to dark brown • by the 21st - 24th day, the pupa cases will split open and the adult blowflies will emerge
Benefits and drawbacks of insect studies in criminal investigations	• the insect life cycle provides scientists with a benchmark to estimate time of death • insect evidence can provide a close estimate of time of death • insect evidence cannot provide an exact time of death because of fluctuating environmental conditions