

# Midwest Medical Examiner's Office

A. Quinn Strobl, MD, Medical Examiner

Anne Bracey, MD, Asst. ME

Rebecca Asch-Kendrick, MD, Asst ME

Veena Singh, MD MPH, Asst. ME

# Disclaimer

---

This presentation will include graphic images

14341

MIDWEST  
MEDICAL  
EXAMINERS  
OFFICE





# Overview

- Medical Examiners and Coroners
- Cause and manner of death
- Scene investigation
- Identification
- Time of death
- The Autopsy

*Questions – feel free to interrupt at any time*

# Coroners

Elected or appointed officials

Training variable (may have little, if any, death investigation training)

In MN must be a physician

# Medical Examiners

**Appointed** based on training and experience

By statute, is a forensic pathologist

# The making of a forensic pathologist

Undergraduate	4 years
Medical school	4 years
Residency	4 years
Fellowship	1 year

# The making of a forensic pathologist

Undergraduate	4 years
Medical school	4 years
Residency	4 years <small>(used to be 5)</small>
Fellowship	1 year

---

Total 13 years

# Pathology

## Anatomic pathology

- Surgical specimens
- Biopsies
- Autopsy
- Cytology

## Clinical Pathology

- Chemistry
- Toxicology
- Microbiology
- Transfusion medicine
- Molecular/cytogenetics
- Hematology
- Laboratory management

# Forensic Pathology

## Anatomic pathology

- Surgical specimens
- Biopsies
- Autopsy
- Cytology

## Clinical Pathology

- Chemistry
- Toxicology
- Microbiology
- Transfusion medicine
- Molecular/cytogenetics
- Hematology
- Laboratory management

**All of the above, applied to determine cause and manner of death**

**Additional training : Injury and injury patterns, scene investigation, trial testimony**

# Minnesota Regional Medical Examiner System

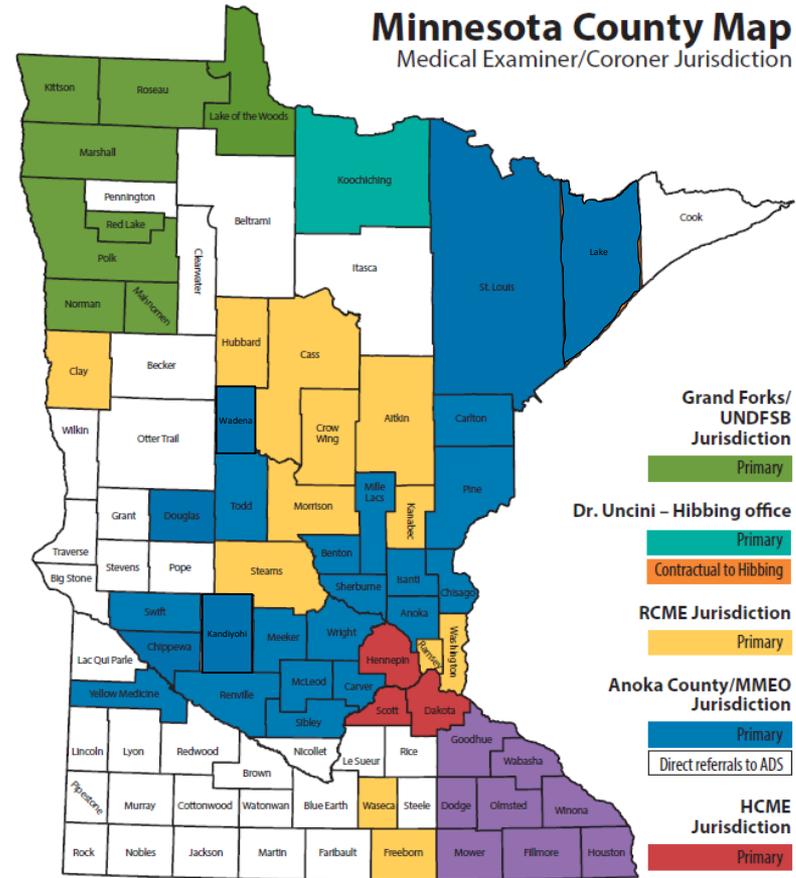
## Medical Examiner (23)

- Anoka
- Benton
- Carlton
- Carver
- Chippewa
- Chisago
- Douglas
- Isanti
- Kandiyohi
- Lake
- McLeod
- Meeker
- Mille Lacs
- Pine
- Renville
- Sherburne
- Sibley
- St. Louis
- Swift
- Todd
- Wadena
- Wright
- Yellow Medicine

**Referrals: MN & WI counties (10)**

## Minnesota County Map

Medical Examiner/Coroner Jurisdiction



### Key

- RCME—Ramsey County Medical Examiner
- HCME—Hennepin County Medical Examiner
- Anoka County ME—Formerly Midwest Forensic Pathology
- Primary—Investigates deaths and performs autopsies for these counties
- Contractual—Performs autopsies only for these counties

### Southern Minnesota Regional Medical Examiner's Office Jurisdiction

- Primary
- Direct referrals to ADS

# How do we end up with cases?

---

1) A death is reported to us

- Law enforcement
- Assisted living facilities
- Hospice staff (if injury occurred)
- Hospital staff
- Families
- Funeral homes

# ME Jurisdiction and Tribal Nations

---

In MN there are **11** Tribal Nations.

For **nine**, the state of MN has criminal jurisdiction via Public Law 280. In these counties, including Carlton, (Itasca), Mille Lacs, Pine, and Yellow Medicine, the County Sheriff investigates, and ME/coroner has jurisdiction over deaths.

For two of the eleven, specifically **Red Lake** and **Bois Forte**, jurisdiction is **Federal**. Parts of Red Lake and Bois Forte tribal land are in the MMEO jurisdiction counties of St. Louis and Beltrami.

The FBI, when requested by the Tribe, may assist in death investigation and send a body to MMEO for examination.

# How do we end up with cases?

---

## 2) An investigation is performed

- On scene (MMEO death investigator)
- Over the phone
- By law enforcement



# How do we end up with cases?

---

## 3) Jurisdiction is assumed

- An autopsy is performed
- Ancillary studies are completed
  - Toxicology
  - Histology
  - Molecular
  - Chemistry
- A death certificate and autopsy report is produced



# Religious objection to autopsy

## MN statute 390.11 subd. 2b

---

If the representative of the decedent objects to the autopsy on religious grounds, an autopsy must not be performed unless the coroner or medical examiner determines that there is a **compelling state interest** to perform the autopsy.

compelling state interest" means that:

- (i) the autopsy is necessary to investigation of a suspicious death or suspected **crime**;
- (ii) the autopsy is necessary to prevent a potential **public health threat** and essential to ascertain the cause or manner of death;
- (iii) the autopsy is necessary to ascertain the cause or manner of death following an unexpected death, regardless of the decedent's underlying disease, in order to **protect the public's health**;
- (iv) the autopsy is necessary to obtain **proper toxicologic or other specimens** that may represent evidence of a crime and may deteriorate over time;
- (v) the death is an unexpected and unexplained death of a **child**;
- (vi) the death is associated with **police action**;
- (vii) the death is ... occurred within **..Department of Corrections..**
- (viii) the death is due to acute **workplace** injury;
- (ix) the death is caused by apparent **electrocution**;
- (x) the death is caused by unwitnessed or suspected **drowning**;
- (xi) the body is unidentified and the autopsy may aid in identification;
- (xii) the body is skeletonized but not subject to the provisions of section [307.08](#);
- (xiii) the death appears to be caused by **fire** or explosion; or
- (xiv) the need for an autopsy is otherwise established under paragraph (g);

If the coroner or medical examiner determines that there is a compelling state interest to perform an autopsy .....the coroner or medical examiner may bring an action in district court for an order authorizing the autopsy.

The court shall grant the relief sought in the petition if it finds that the ....need outweighs the state's interest in observing the decedent's religious beliefs.

If the petition is denied and no stay is granted by the court, the body must immediately be released in accordance with chapter 149A.

Autopsies performed after a religious objection under this subdivision must be the least intrusive procedure consistent with the state's compelling interest in performing the autopsy.

A coroner or medical examiner is not liable for the failure to perform an autopsy if an objection to the autopsy on religious grounds has been made under this subdivision.

# How do we end up with cases?

---

## 3) Jurisdiction is assumed

- An autopsy is performed
  - External, radiology, toxicology
  - Full examination
- Ancillary studies are completed
  - Toxicology
  - Histology
  - Molecular
  - Chemistry
- A death certificate and autopsy report is produced



# How do we end up with cases?

---

- 3) Jurisdiction is assumed
- An autopsy is performed
  - **Body is released to FH**
  - Ancillary studies are completed
    - Toxicology
    - Histology
    - Molecular
    - Chemistry
  - A death certificate and autopsy report is produced



# How do we end up with cases?

---

## 3) Jurisdiction is assumed

- An autopsy is performed
- Ancillary studies are completed
  - Toxicology
  - Histology
  - Molecular
  - Chemistry
- A death certificate and autopsy report is produced





# Receiving and imaging

---



# Autopsy suite and viewing

---



# Anatomy of an autopsy

---

Imaging if necessary

External examination

Internal examination

Specimens acquired

- Blood
- Urine
- Gastric contents
- Vitreous fluid
- Tissue

Results are acquired

Autopsy report/DC is produced



# Role of the medical examiner

Identification

Cause of death

Manner of death

Perform autopsy

Collect evidence

Document findings

Recover projectiles and related materials

Interpret medical findings

Estimate time since death

Expert witness

# Death Certification

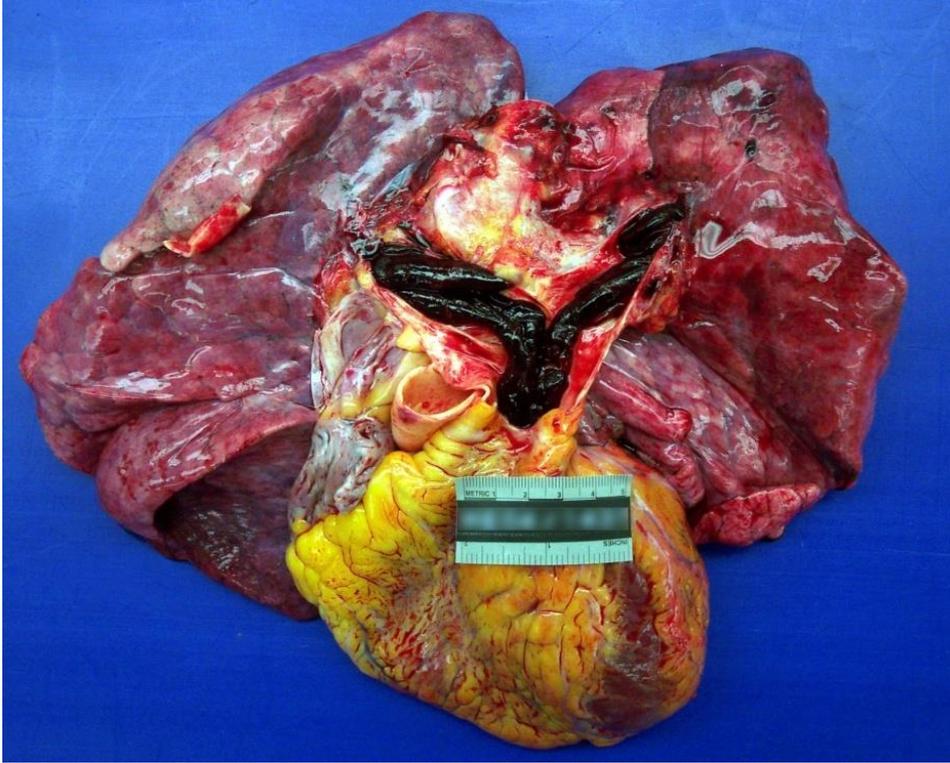
“CAUSE OF DEATH”

&

“MANNER OF DEATH”

Cause of Death

**Whatever disease or injury  
caused the person to die**



Cause of Death



Pulmonary thromboEmbolism

# Manner of Death

**How the cause of death  
came about**

*(circumstances under which the person died)*

# Manners of Death

Natural

Accident

Suicide

Homicide

Undetermined

# Natural

Solely due to recognized underlying disease process

# Accident

Injury or poisoning causes death and there is little or no evidence that the action of injury or poisoning occurred with intent to harm or cause death.

or

Fatal outcome was unintentional

Drug toxicity

Pedestrian – auto fatality (criminal vehicular homicide)

Vulnerable adult or an infant drowns in bathtub  
(culpable neglect; unintentional homicide)

# Suicide

Intent to die

'preponderance of evidence' (> 70%) as opposed to reasonable medical certainty (more likely than not; > 50%)

Or a volitional act is performed that would clearly cause death (russian roulette)

# Homicide

“Death due to the deliberate or volitional actions (or inaction) of another”

Neutral term for medical examiners

‘Intent to kill’ is not considered by medical examiner

Case examples

- Hunting ‘accident’
- Reverse Russian roulette

Intent arguable in court of law

# Undetermined –

< 50% certainty

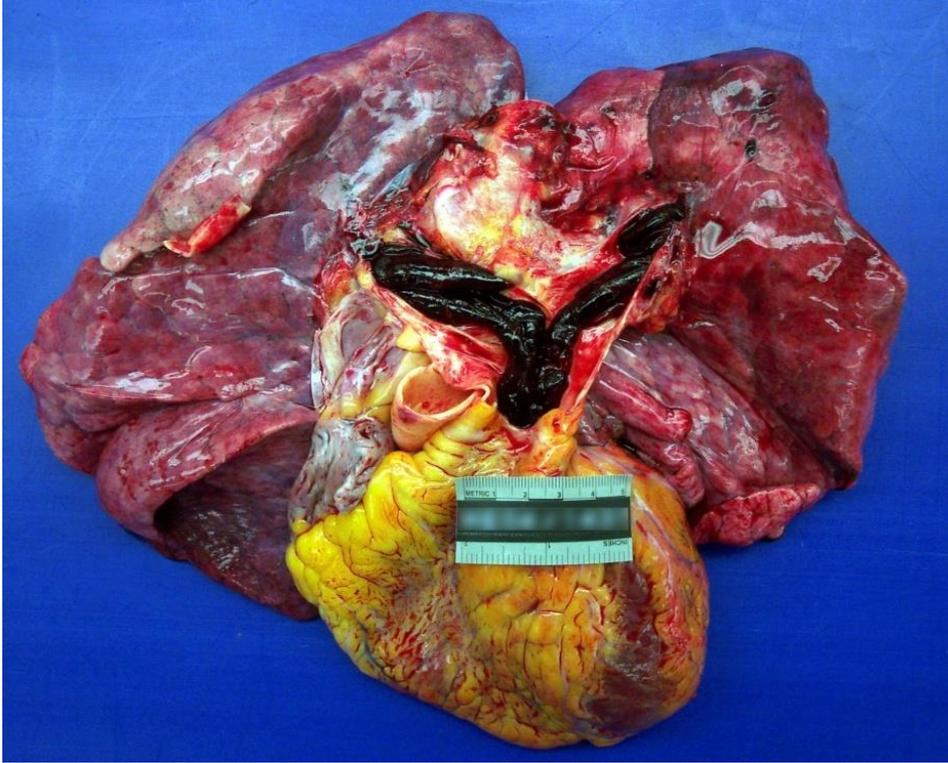
Sudden unexplained infant deaths

- Acc vs. nat vs. homicide

Drug overdoses

- Accident vs. suicide

No anatomic cause with history of drug use (unidentified substance) or suspicious circumstances



Cause of Death



Pulmonary thromboEmbolism

## Manner of death?

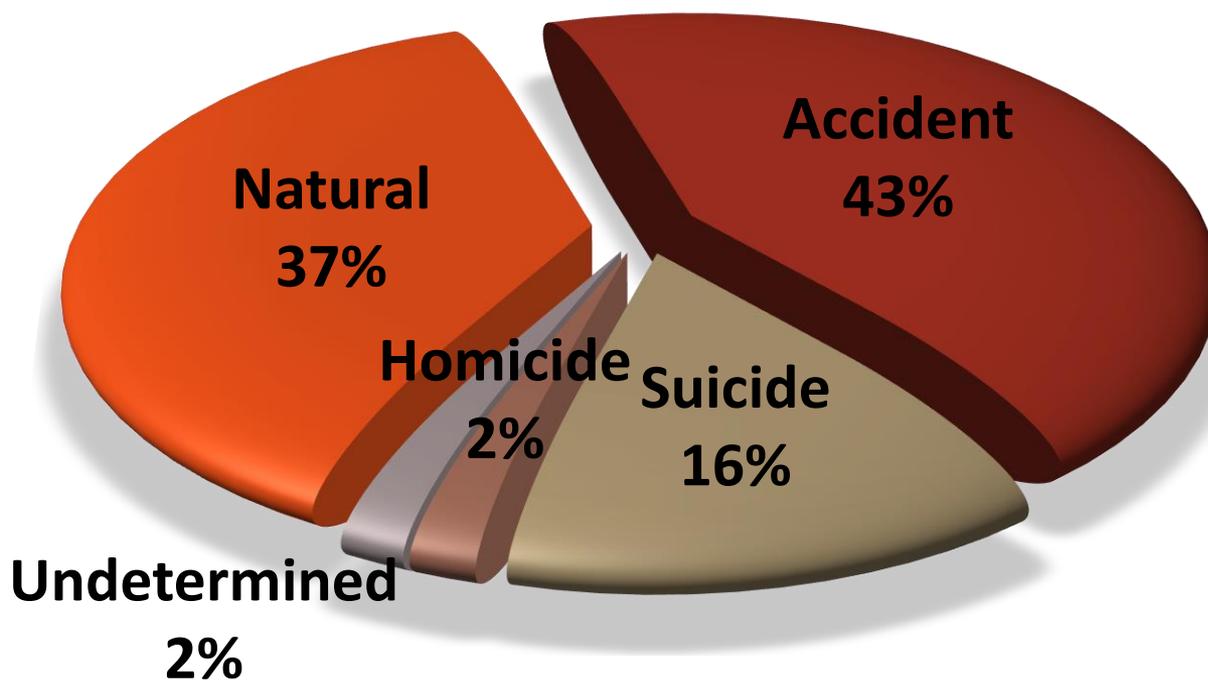
Genetic clotting disorder – Natural

Elderly woman immobilized in bed after tripping over her dog and fracturing hip - Accident

Wheelchair bound due to gunshot wound to the back, 10 years ago – Homicide



# Case types



# The Death Certificate

Legal documentation of decease

Demographics and basic descriptive information

Cause, manner, and circumstances of death

Disposition information

Certificate forwarded to National Center for health Statistics (NCHS)

# The Death Certificate

## Personal/Family

- Permanent record of death
- Medical history

## Medicolegal Purposes

- Criminal
- Civil
- Insurance

# Importance of the Death Certificate

Evidence based medicine

Vital statistics

- Statistical information for mortality surveillance
- Epidemiologic research
- Public health planning
- Allocation of funding for health and safety research projects and programs

# What to Report to the M.E.

*“All sudden or unexpected deaths*

*and*

*all deaths that may be due entirely, or in part, to any factor other than natural disease must be reported to the medical examiner for evaluation.”*

# How are Cause & Manner Determined?

- The death investigation process
  - ◆ Scene investigation
  - ◆ Knowledge of circumstances
    - ◆ The autopsy



*Cause & manner are determined by taking into account all 3 facets*

# Role of Field Death Investigator

- To assist the Medical Examiner by:
  - Investigation of death scene
  - Investigation of
    - Medical
    - Social
    - Environmentalcircumstances of death

Death Investigators' background, education and experience vary widely!

# Role of the Death Investigator



# What Constitutes a Death Scene?

- The body
  - Any area where evidence pertinent to the death can be collected
  - Any area where observation pertinent to the death can be made



# Questions for the medical examiner

Who is the body?

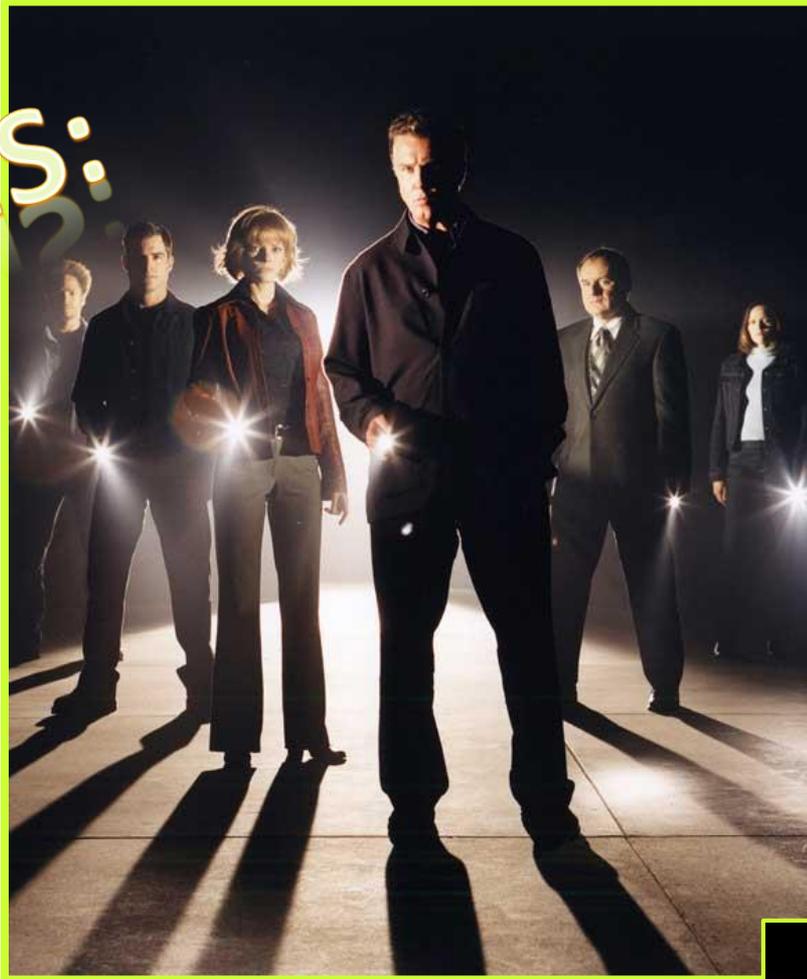
What happened before and after the death?

When did the death occur?

Where is the death scene?

How did the death happen?

MYTHS:



THE CSI EFFECT



ID  
The  
Body  
BOqλ





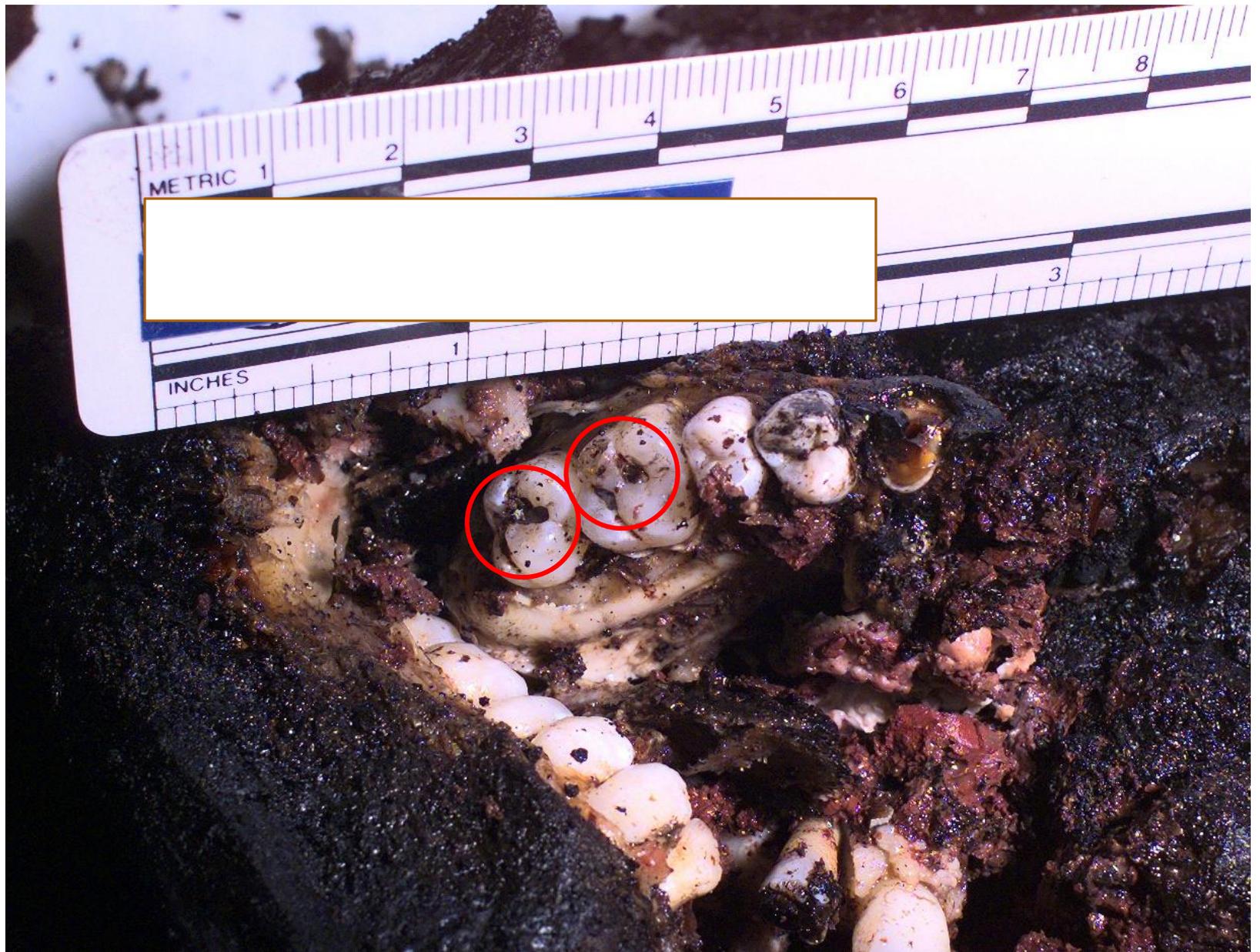
# Identification

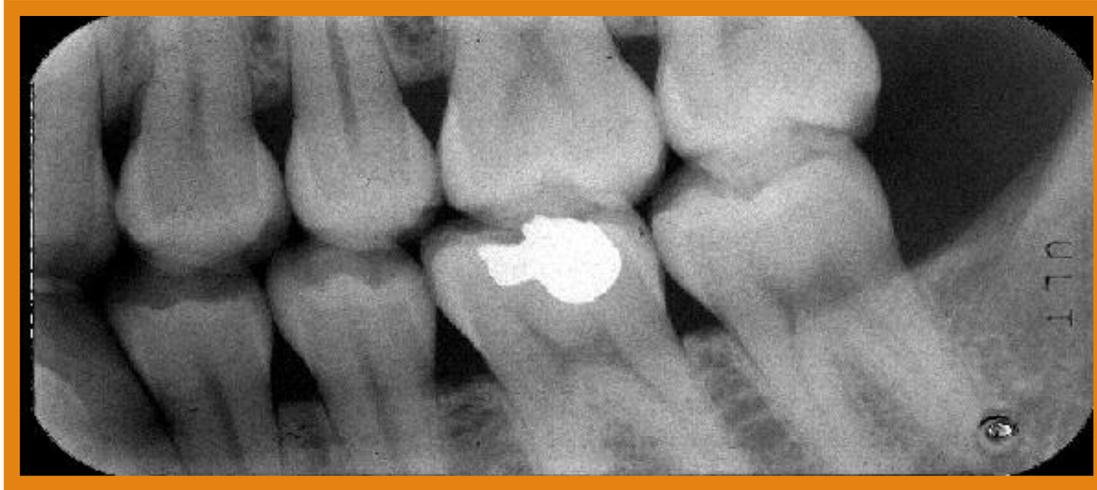
## Scientific (positive)

- Fingerprints
- Dental radiographs
  - Dentures within the mouth
- DNA
- Radiographs (must have antemortem comparison)
  - Cranial sinuses
  - Vertebral column
  - Orthopedic devices
  - Distinctive calcified structures

## • Nonscientific (presumptive only!)

- Visual
  - Driver's license
  - Identification by friend/relative/law enforcement
- Physical attributes
  - Sex, race, age
- Distinctive marks
  - Tattoos
  - Scars
  - Bony anomalies
  - Piercings
- Circumstantial
  - Location (residence of deceased)
  - Papers on/with body





# Scene and Body

Who is the body?

What happened before and after the death?

When did the death occur?

Where is the death scene?

How did the death happen?

# The Body as Evidence

Temperature (Ambient vs. body)

Livor

Rigor

# The 'window of death'

Time interval prior to which it is known/can be certain the decedent was alive

## Biologic clues

- The longer the time interval since death, the wider the estimated range for time of death

## Non-biological or environmental clues

- Witnesses
- Newspapers
- Mail
- Receipts
- Food
- Clothing
- Cell phone/text messages

# Postmortem changes

Algor mortis: Cooling of the body

Livor mortis: Pooling of blood

Rigor mortis: Stiffening of the body

Decomposition

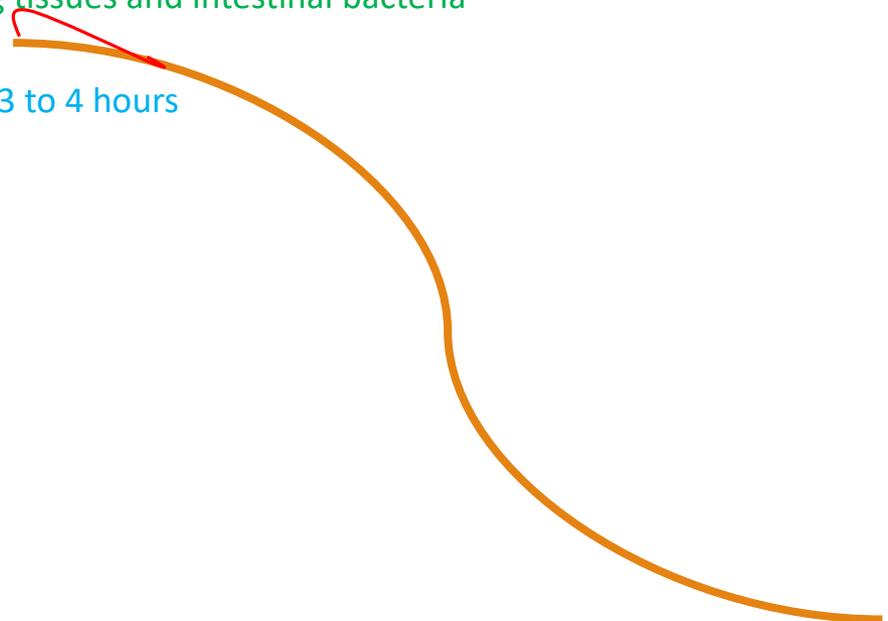
# Algor Mortis

Temperature decreases *or increases* until it reaches ambient temperature

Rate of temperature change decreases as time increases

Initial plateau: heat generated by dying tissues and intestinal bacteria

3 to 4 hours



# Algor mortis

- Environmental factors
  - Ambient temperature
    - Greater differential, greater rate of change
    - Hot environment – body temp increases!
  - Surface upon which body is resting
    - (cement floor, carpet, heating grate)
  - Air currents (convection)
    - Open air vs. closet

# Ocular changes

## Corneal cloudiness

- 2 to 3 hours if eyelids parted
- 24 hours if eyelids sealed

## Tache noire

- Hours

## Globe collapse – loss of intraocular fluid

- days



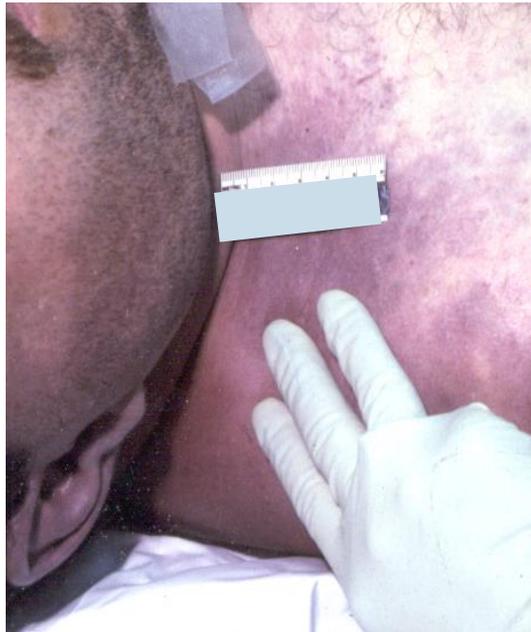
# The Body

## Livor mortis

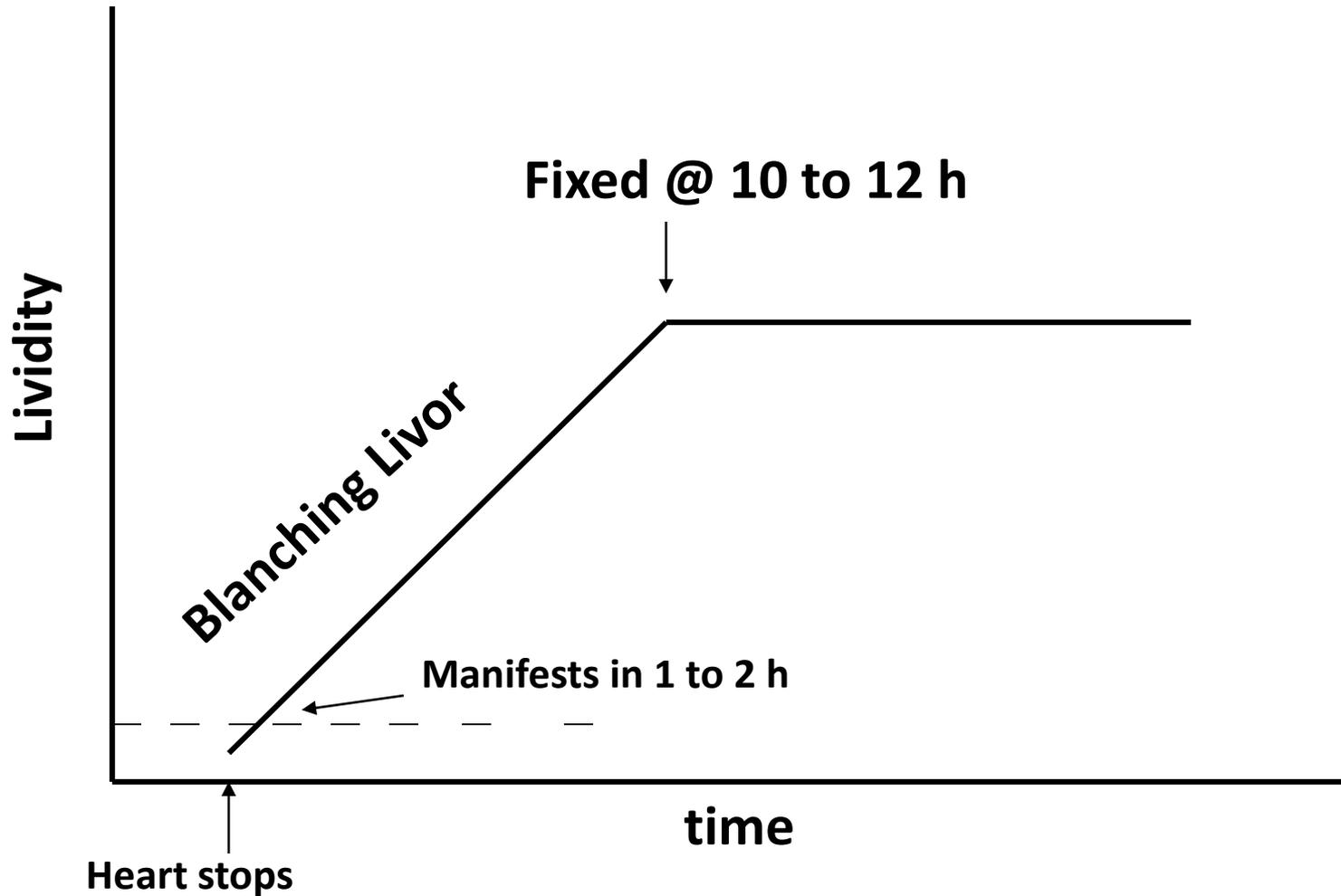
- Settling of blood in dependent portions of the body
- Gravity-dependent phenomenon



# Livor mortis – blanching

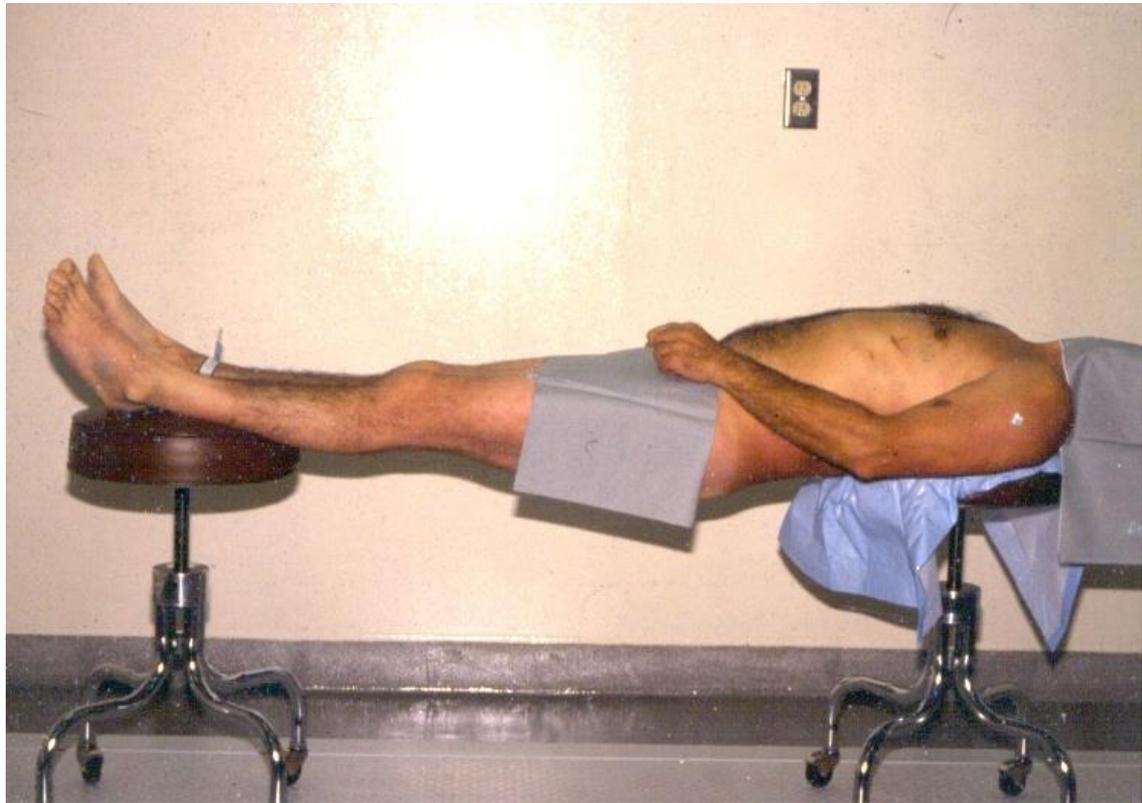


# Livor Mortis and Time of Death

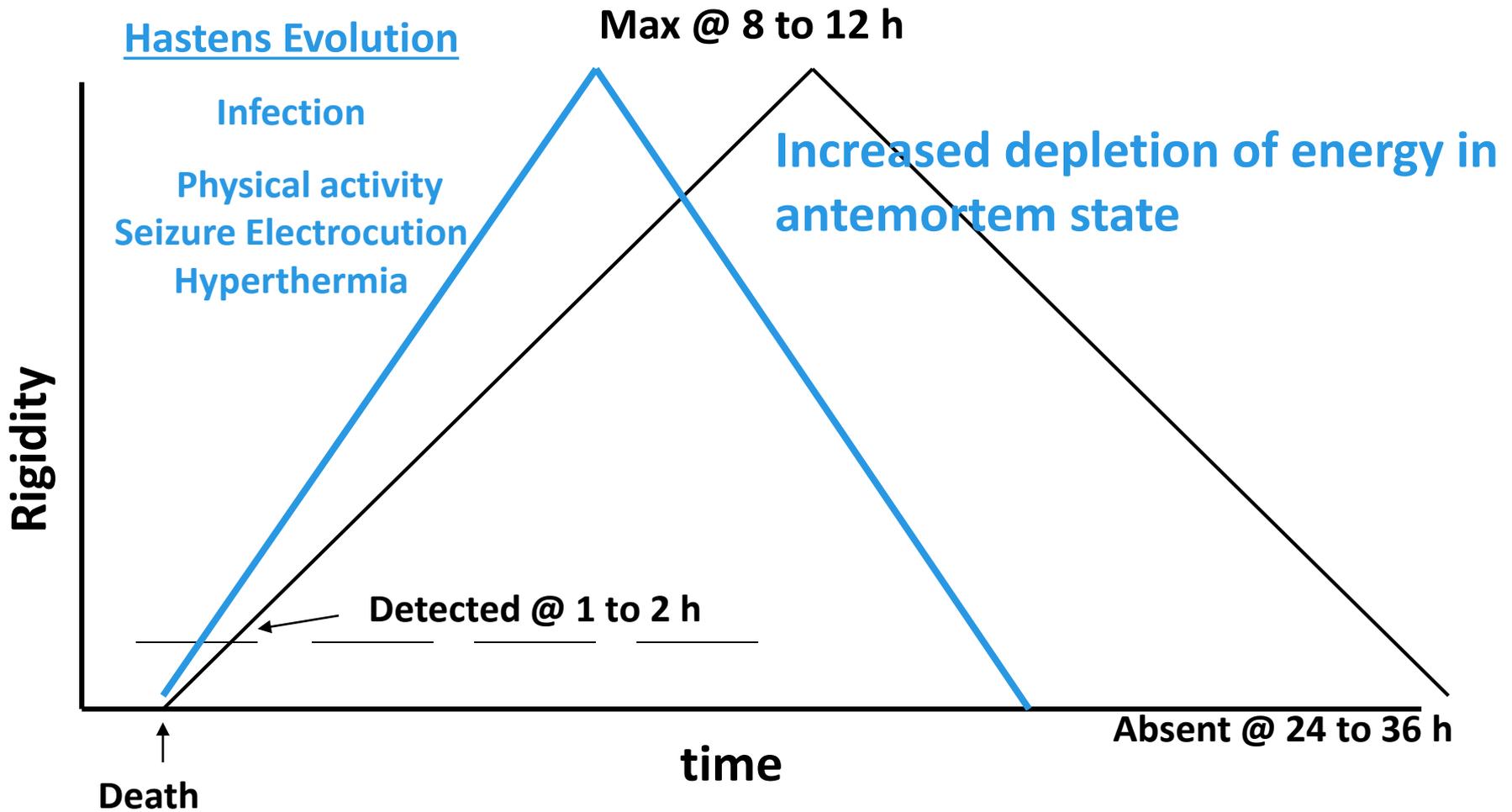


# Rigor Mortis

- Initial muscle flaccidity followed by muscle stiffening (rigidity)



# Variation of Rigor Mortis



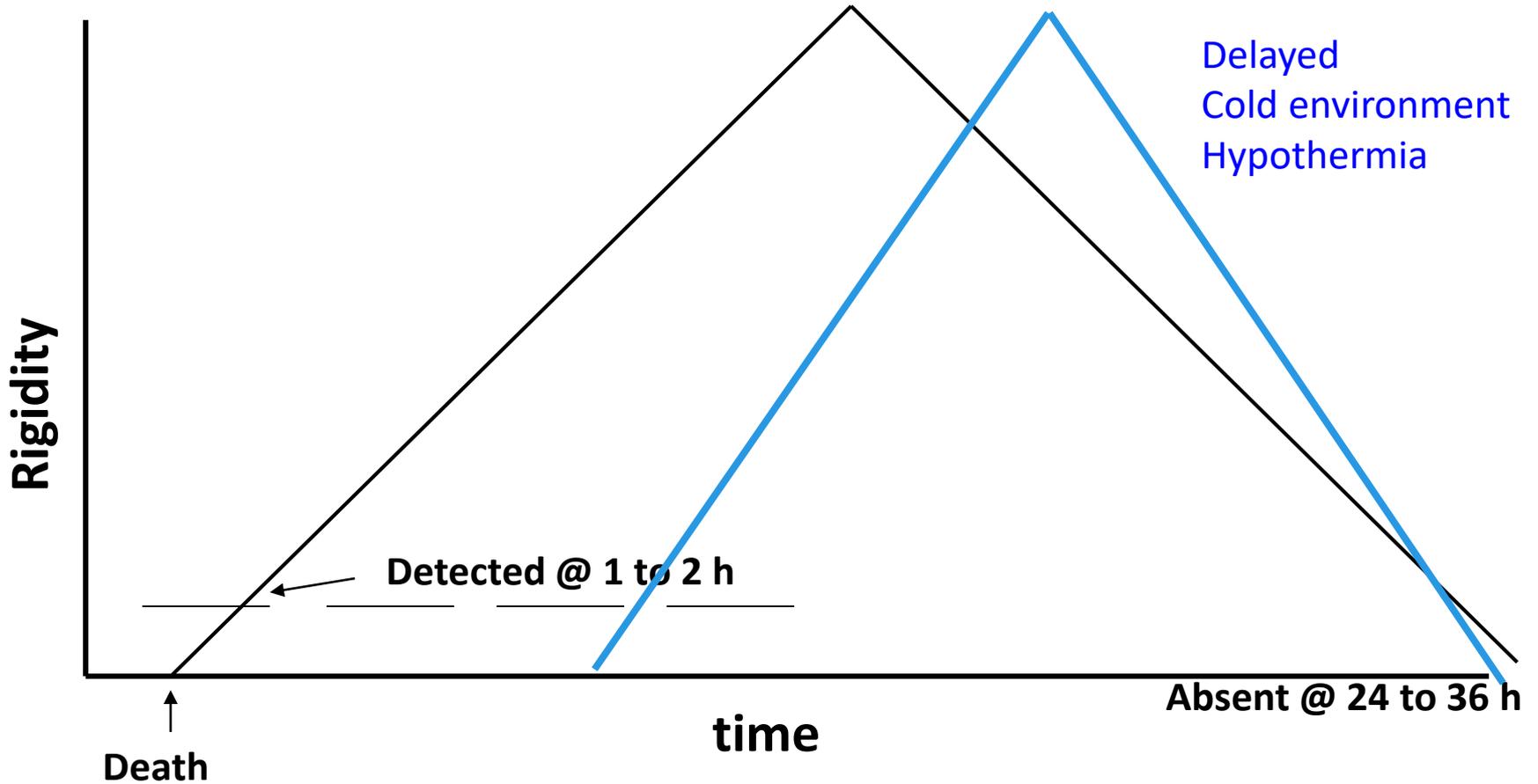
# Variation of Rigor Mortis

Max @ 8 to 12 h

Delayed  
Cold environment  
Hypothermia

Detected @ 1 to 2 h

Absent @ 24 to 36 h



# Decomposition

## Autolysis

- Chemical breakdown of tissues caused by release of intracellular enzymes
- Temperature dependent

## Putrefaction

- Breakdown of tissues by bacterial activity
- External factors: temperature, humidity
- Intrinsic factors: sepsis, obesity, hyperthermia

# Medical Examiner Autopsies

All apparent accidents, suicides

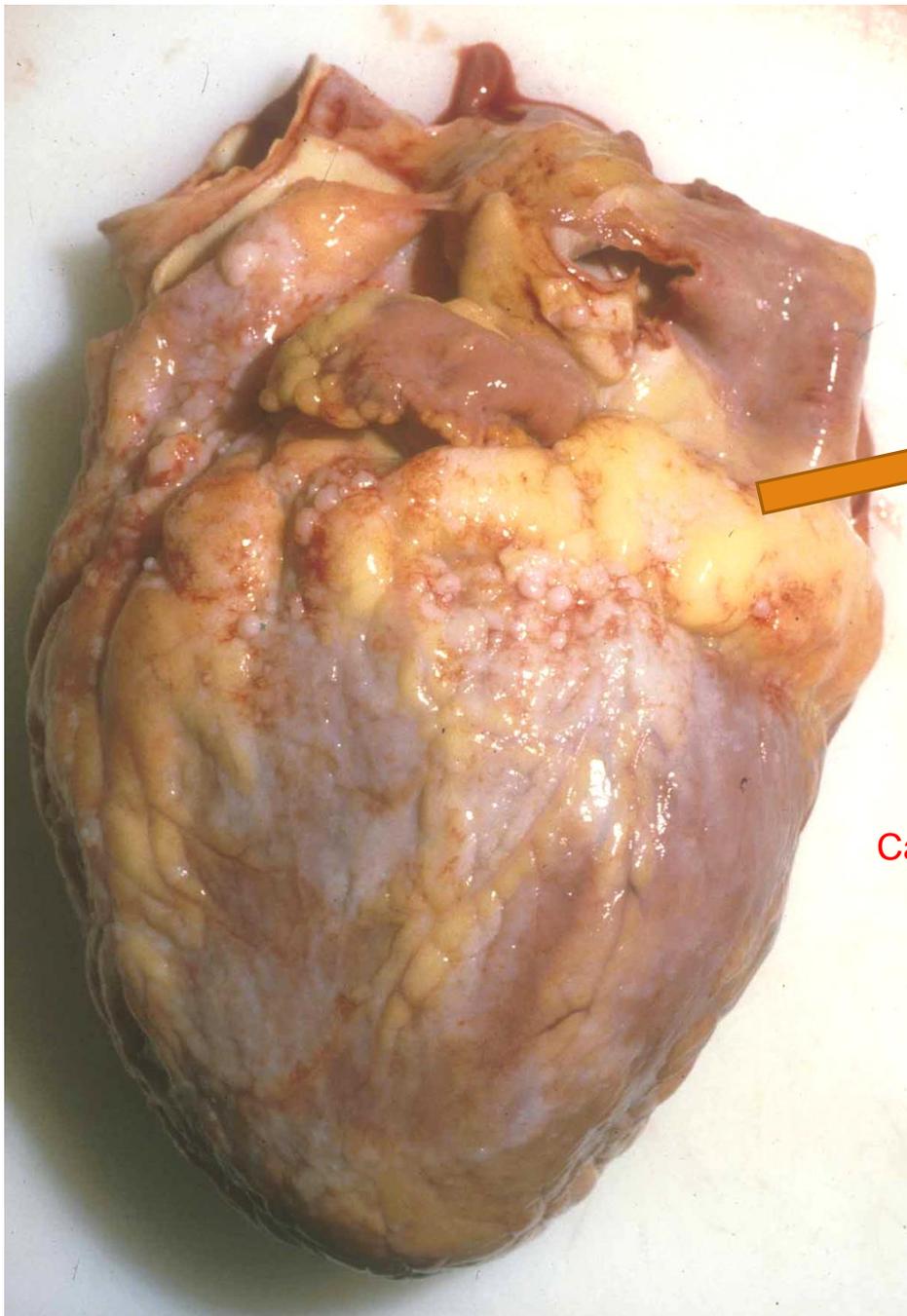
- If hospitalized for prolonged period may not do autopsy

All unexpected, natural deaths of decedents  
< 60 (65) years of age who have no known  
underlying disease process (or risk factors)

78 year old unrestrained driver dead at scene  
Cause of death - Blunt force injuries – right?

Does he need an autopsy?





Cause of death: Atherosclerotic coronary artery disease

Manner: Natural

# Medical Examiner Autopsies

All homicide, no matter how remote the event or intervening hospitalization

- Directly link death to initial event
- Rule out competing causes
- Document injury process

# Forensic Autopsy

Who may observe an autopsy?

- Law enforcement personnel involved with case
- **Medical** personnel involved with care



# Purpose of the autopsy

Confirm cause of death

Formulate manner of death

Exclude contributing causes of death

Document injury and injury patterns

Collect evidence

- Bullet (s)
- Trace (hair, fibers, grass...)

Collect samples (blood, vitreous, bile, gastric contents, liver) for **toxicology**, **microbiology**

4710

**HOMICIDE**  
BULLETS

M  
D  
D

Description projectile from left tissue  
posterior to @ proximal  
humerus

Remarks 

Released to \_\_\_\_\_  
(department / address)

Date \_\_\_\_\_ Time \_\_\_\_\_

Released by \_\_\_\_\_

E 55

# Document Injury Patterns

Are injuries consistent with the story

Weapon

- Does recovered weapon fit the injury
- Document injuries with scale if no weapon available

# Medical Examiner Summary

Investigate all sudden and/or unnatural deaths in appointed counties

Completely independent of law enforcement or county attorney's office

Available 24/7

Exist to serve the needs of law enforcement, public health, the courts, and families